MECHANICK EXERCISES:
Or, the Doctrine of
Handy-works.
Applied to the ART of
Mold-Making, Sinking the Matrices,
Casting and Dressing of
Printing-Letters.

§. 15. ¶. 1. Of making the Mold.

THE Steel Punches being thus finish'd, as afore was shewed, they are to be sunk or struck into pieces of Copper, about an Inch and an half long, and one quarter of an Inch deep; but the thickness not assignable, because of the different thicknesses in Letters, as was shewed in §. 2. and shall further be shewed, when I come to the sinking and justifying
fitting of Matrices. But before these Punches are sunk into Copper, the Letter-Founder must provide a Mold to justify the Matrices by: And therefore it is proper that I describe this Mold to you before I proceed any farther.

I have given you in Plate 18. at A, the Draft of one side or half of the Mold; and in Plate 19. at B, its Match, or other half, which I shall in general thus describe.

Every Mold is made of two parts, an under, and an upper Part; the under part is delineated at A, in Plate 18, the upper part is marked B, in Plate 19, and is in all respects made like the under part, excepting the Stool behind, and the Bow, or Spring also behind; and excepting a small roundish Wyer between the Body and Carriage, near the Break, where the under part hath a small rounding Groove made in the Body. This Wyer, or rather Half-Wyer in the upper part makes the Nick in the Shank of the Letter, when part of it is received into the Grove in the under part.

These two parts are so exactly fitted and gaged into one another, (viz. the Male Gage, marked C in Plate 19, into the Female-Gage marked g, in Plate 18.) that when the upper part of the Mold is properly placed on, and in the under part of the Mold both together, makes the entire Mold, and may be slid backwards for Use so far, till the Edge of either of the Bodies on the middle of either Carriage comes just to the Edge of the Female-Gages, cut in each Carriage: And they may be slid forwards so far, till the Bodies on either Carriage touch each other. And the sliding of these two parts of the Mold backwards, makes
makes the Shank of the Letter thicker, because the Bodies in each part stand wider asunder; and the sliding them forwards makes the Shank of the Letter thinner, because the Bodies on each part of the Mold stand closer together.

This is a general Description of the Mold; I come now to a more particular Description of its parts.

a The Carriage.
b The Body.
c The Male-Gage.
d e The Mouth-Piece.
f i The Register.
g The Female-Gage.
h The Hag.
a a a a The Bottom Plate.
b b b The Wood the Bottom Plate lies on.
c c e The Mouth.
d d The Throat.
e d d The Pallat.
f The Nick.
g g The Stool.
h h g The Spring or Bow.

I have here given you only the Names of the parts of the Mold, because at present I purpose no other Use of it, than what relates to the sinking the Punches into the Matrices: And when I come to the casting of Letters, You will find the Use and Necessary of all these Parts.
2. Of the Bottom-Plate.

The Bottom Plate is made of Iron, about two Inches and three quarters long, and about the same breadth; its thickness about a Brevier: It is planished exactly flat and straight: It hath two of its Fore-Angles, as a a cut off either straight or rounding, according to the pleasure of the Work-man.

About the place where the middle of the Carriage lies, is made a Hole about a Great Primmer square, into which is rivetted on the upper side a Pin with a Sholder to it, which reaches about half an Inch through the under side of the Bottom Plate. This Pin on the under side the Bottom Plate is round, and hath a Male-Screw on its end. This Pin is let through a Hole made in the Wood of the Mold to fit it; so that when a square Nut, with a Female-Screw in it, is turned on the Male-Screw, it may draw and fasten the Half Mold firm to the Wood.

The Hind side of the Carriage lies on this Bottom-Plate, parallel to the Hind side of it, and about a Two-Lin'd-English within the Hind Edge of it; and so much of this Bottom-Plate as is between the Regifter and the left hand end of the Carriage (as it is posited in the Figure) is called the Stool, as g g in the under half of the Mold, because on it the lower end of the Matrice rests; but on the upper half of the Mold is made a square Notch behind in the Bottom-Plate, rather within than without the Edge of the Carriage, to reach from the Regifter, and half an Inch towards the left hand (as it is posited in the Figure) that
that the upper part of the fore-side of the Matrice may stand close to the Carriage and Body.

¶ 3. Of the Carriage.

On the Bottom-Plate is fitted a Carriage, (as a) This Carriage is almost the length of the Bottom-Plate, and about a Double Pica thick, and its Breadth the length of the Shank of the Letter to be cast.

This Carriage is made of Iron, and hath its upper side, and its two narrow sides filed and rubbed upon the using File, exactly straight, square and smooth, and the two opposite narrow sides exactly parallel to each other.

On one end of the Carriage, as at g, is made a long Notch or Slit, which I call the Female-Gage: It is about a Double Pica wide, and is made for the Male-Gage of the other part of the Mold to fit into, and to slide forwards or backwards as the thickness of the Letter to be cast may require.

¶ 4. Of the Body.

Upon the Carriage is fitted the Body, as at b. This Body is also made of Iron, and is half the length of the Carriage, and the exact breadth of the Carriage; but its thickness is alterable, and particularly made for every intended Body.

About the middle of this Body is made a square Hole, about a Great Primmer, or Double Pica square; and directly under it is made through the Carriage such another Hole exactly of the same size.

¶ 5. Of
5. Of the Male-Gage.

Through these two Holes, viz. That in the Body, and that in the Carriage, is fitted a square Iron Shank with a Male-Screw on one End, and on the other End an Head turning square from the square Shank to the farther end of the Body, as is described at c; but is more particularly described apart at B in the same Plate, where B may be called the Male-Gage: For I know no distinct Name that Founders have for it, and do therefore coyn this:

a The square Shank.
b The Male-Screw.

This square Shank is just so long within half a Scaboard thick as to reach through the Body, Carriage, and another square Hole made through the Bottom-Plate, that so when a square Nut with a Female-Screw in it is turned on that Pin, the Nut shall draw and fasten the Body and Carriage down to the Bottom-Plate.

The Office of the Male-Gage is to fit into, and slide along the Female-Gage.

6. Of the Mouth-Piece.

Close to the Carriage and Body is fitted a Mouth-Piece marked d e. Letter-Founders call this altogether a Mouth-Piece: But that I may be the better understood in this present purpose, I must more nicely distinguish its parts, and take the Freedom to elect Terms for them, as first,

c e The Mouth.

d The
Plate 19.

The upper half of the Mold
d The Palate.
c e d The Jaws.
d d The Throat.

Altogether (as aforesaid) the Mouth-Piece.

The Mouth-Piece hath its Side returning from the Throat filed and rubb'd on the Using File exactly straight and square to its Bottom-side, because it is to joyn close to the Side of the Carriage and Body; but its upper Side, viz. the Palate is not parallel to the Bottom, but from the Side d d, viz. the Throat falls away to the Mouth e, making an Angle greater or smaller, as the Body that the Mold is made for is bigger or less: For small Bodies require but a small Mouth, because small Ladies will hold Metal enough for small Letters; and the smaller the Ladle, the finer the Geat of the Ladle is; and fine Geats will easier hit the Mouth (in a Train of Work) than the coarse Geats of Great Ladies: Therefore it is that the Mouth must be made to such a convenient Width, that the Ladle to be used and its Geat, may readily, and without fumbling, receive the Metal thrown into the Mold.

But again, if the Mouth-Piece be made too wide, viz. the Jaws too deep at the Mouth, though the Geat of the Ladle does the reader find it, yet the Body of the Break of the Letter will be so great, that first it heats the Mold a great deal faster and hotter; and secondly, it empties the Pan a great deal sooner of its Metal, and subjects the Workman sometime to stand still while other Metal is melted and hot: Therefore Judgment is to be used in the width of the Mouth; and though there be no Rule for the width of it; yet this in general for such Molds as I make
make, I observe that the Orifice of the Throat may be about one quarter of the Body for small Bodies; but for great Bodies less, according to Discretion, and the Palate about an Inch and a quarter long from the Body and Carriage. The reason that the Orifice of the Throat is so small, is, because the Substance at the end of the Shanck of the Letter ought also to be small, that the Break may easier break from the Shanck of the Letter, and the less subject the Shanck to bowing; for the bowing of a Letter spoils it; and the reason why the Palate is so long, is, that the Break being long, may be the easier finger’d and manag’d in the breaking.

If it be objected, that since the smallness of the Break at the end of the Shanck of the Letter is so approvable and necessary for the reason aforesaid, then why may not the Break be made much more smaller yet? The Answer will be, No; because if it be much smaller than one quarter of the Body, Metal enough will not pass through the Throat, to fill both the Face and Shanck of the Letter, especially if the Letter to be cast prove thin.

Near the Throat and Jaw is made straight down through the Palate a square Hole (as at k.) This square Hole hath all its Sides on the Upper-Plain of the Palate opened to a Bevel of about 45 Degrees, and about the depth of a thick Scaboard. Into this square Hole is fitted a square Pin to reach through it; and within half a Scaboard through a square Hole, made just under it in the Bottom-Plate which the Mouth-Piece lies upon. On the upper end of this square Pin is made a square Shoulder, whose under sides are filed Bevil away, so as
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To comply and fall just into the Bovil made on the Palate aforesaid, and on the under end of the Pin is made a Male-screw long enough to contain a square Nut, with a Female-screw in it about a Pica or English thick, which Nut being twitted about the Pin of the Male-screw, draws and fastens the Mouth-piece close down to the Bottom-Plate, and also close to the Carriage and Body of the Mold.

Note, that the square Hole made in the Bottom-Plate to receive the square Shank of the Pin, must be made a little wider than just to fit the square Shank of the Pin, because the Mouth-piece must be so placed, that the end of the Jaw next the Throat must lie just even with the Body it is to be joined to; and also that the Throat of the Mouth-piece may be thrust perfectly close to the Sides of the Carriage and Body: And when Occasion requires the Shank of the Letter to be lengthened, it may be set farther off the Carriage, that an Axel, or sometimes a thin Plate of Brass may be fitted in between the Carriage and the Throat of the Mouth-piece, as shall farther be shewed when I come to justify the Mold.

¶ 7. Of the Register.

Behind the Mold is placed the Register, as at f i h, which I have also placed apart in the aforesaid Plate, as at C, that it may the more perspicuously be discerned, and a more particular account of its parts be given, which are as follows:

C a a b c d e The Register.

a a The Shoulder.

b c The
The Neck.

The Cheek returning square from the Plate of the Regifser, and is about an English thick.

The Screw Hole.

It is made of an Iron Plate about a Brevier thick; its upper Side is straight, but its under Side is not: For at a a projects downwards a small piece of the same Plate, which we may call the Sholders, of the Form you see in the Figure. These Sholders have two small Notches (as at b c) filed in them below the Range on the under side of the Regifser, which we will call the Neck, and is just so wide as the Bottom-Plate is thick. This Neck is set into a square Notch, filed so far into the Bottom-Plate, that the flat inside of the Regifser may stand close against the hind side of the Carriage and Body; and this Notch is filed so wide on the left Hand, that when the side b of the Neck stands close against the left-hand Side of this Notch (as it is poifed in the Figure) the Cheek of the Regifser stands just even with the Edge of the Body. And this Notch is also filed so wide on the right-Hand Side, that when the Neck at c stands close against the right-hand Side of the Notch, the Cheek of the Regifser may remove an m, or an m and an n from the edge of the Body towards the right hand: And the Sholders a a are made so long, that when either Side of the Neck is thrust close against its corresponding side in the Notch of the Bottom-Plate, the upper Edge of the opposite Sholder shall hook or bear against the under side of the Bottom-Plate, and keep the whole Regifser steady, and directly upright to the Surface of the Bottom-Plate.
In the Plate of the Regifter, is made a long square Hole, as at e, just wide enough to receive the Pin of a Male-screw, with a Sholder to it, which is to fit into a Female-screw, made in the Edge of the Carriage, that when the Male-screw is turned about in the Female-screw in the Carriage, it shall draw the Sholder of the said Male-screw hard against the upper and under Sides of the square Hole in the Plate of the Regifter, close to the side of the Carriage and Body.

The reason why the Hole in the Plate of the Regifter is made so long, is that the Cheek of the Regifter may be slid forwards or backwards as occasion requires; as shall be shewn when I come to justifying the Mold.

¶ 8. Of the Nick.

In the upper half of the Mold, at about a Pica distance from the Throat, is fitted into the under side of the Body the Nick: It is made of a piece of Wyer filed flat a little more than half away. This Nick is bigger or less, as the Body the Mold is made for is bigger or less; but its length is about two m's. It is with round Sculptors let exactly into the under side of the Body.

In the under half of the Mold, is made at the same distance from the Throat, on the upper side of the Body, a round Groove, just fit to receive the Nick in the upper half.
§ 9. Of the Bow or Spring.

This is a long piece of hard *Iron Wyer*, whose Diameter is about a *Brevier* thick, and hath one end fastned into the Wood of the under half of the *Mold*, as at $h$; but it is so fastned, that it may turn about in the Hole of the Wood it is put into: For the end of it being batter’d flat, a small Hole is drilled through it, into which small Hole the end of fine *Lute-string Wyer*, or somewhat bigger is put, and fastned by twisting about half an Inch of the end of the *Lute-string* to the rest of the *Lute-string*: For then a considerable Bundle of that *Wyer*, of about the Size of a Doublet Button, being wound behind the Hole, about the end of the *Spring*, will become a *Sholder* to it, and keep the end of the *Spring* from slipping through the Hole in the Wood: But this *Button* or *Sholder* must also be kept on by thrusting another piece of *Wyer* stiff into the Hole made on the end of the *Spring*, and crooking that *Wyer* into the Form of an $S$, that it slip not out of the Hole.

The manner how the *Spring* is bowed, you may see in the Figure: But just without the Wood is twisted upon another *Wyer* about an *English* thick five or six turns of the *Wyer* of the *Spring*, to make the whole *Spring* bear the stronger at its point: For the Office of the *Spring* is with its Point at $g$, to thrust the *Matrice* close against the *Carriage* and *Body*.

§ 10. Of
¶ 10. Of the Hooks, or Haggs.

These are Iron Wyers about a Long Primmer thick: Their Shape you may see in the Figure: They are so fastned into the Wood of the Mold, that they may not hinder the Ladle hitting the Mouth. Their Office is to pick and draw with their Points the Break and Letter out of the Mold when they may chance to stick.

¶ 11. Of the Woods of the Mold.

All the Iron Work aforesaid of the Mold is fitted and fastned on two Woods, viz. each half one, and each Wood about an Inch thick, and of the shape of each respective Bottom-Plate. The Wood hath all its Sides except the hind-side, about a Pica longer than the Bottom-Plate; but the hind-side lies even with the Bottom-Plate. The Bottom-Plate, as afore was said in ¶ 2. of this §. hath an Iron Pin on its under side, about half an Inch long, with a Male-screw on its end, which Pin being let fit into an Hole in the Wood does by a Nut with a Female-screw in it draw, all the Iron Work close and fast to the Wood.

But because the Wood is an Inch thick, and the Pin in the Bottom-Plate but half an Inch long, therefore the outer or under side of the Wood (as posited in the Figure) hath a wide round Hole made in it flat at the Bottom, to reach within an English, or a Great Primmer of the upper side of the Wood. This round Hole is wide enough to receive the Nut with the Fe-
male-screw in it; and the Pin being now long enough to receive the Female-screw at the wide Hole, the Female-screw may with round nosed Plyers be turned about the Male-screw on the Pin aforesaid, till it draw all the Iron Work close to the Wood.

The Wood behind on the upper half is cut away as the Bottom-Plate of that half is; and into the thickness of the Wood, close by the right and left-hand side of this Notch is a small square Wyer-staple driven, which we may call the Matrice-Check; for its Office is only to keep the Shanck of the Matrice from flying out of this Notch of the Mold when the Cafer is at Work. And the Nuts and Screws of the Carriage and Mouth-piece, &c. that lie under the Bottom-Plate, are with small Chisels let into the upper side of the Wood, that the Bottom-plates may lie flat on it.

Sect. XVI. Of justifying the Mold.

Although the Mold be now made; nay, very well and Workman-like made, yet is it not imagin'd to be fit to go to work withal; as well because it will doubtless Rag (as Founders call it; for which Explanation see the Table) as because the Body, Thickness, Straightness, and length of the Shanck must be fini'th with such great Nicety, that without several Proofs and Tryings, it cannot be expected to be perfectly true.

Therefore before the sinking and justifying the Matrices, the Mold must first be justified: And first, he justifies the Body, which to do, he casts about twenty Proofs or Letters, as they are called, though it matters
matters not whether the Shancks have yet Letters on them or no. These Proofs he sets up in a Composing-stick, as is described in § 17. ¶ 2. Plate 19. at G, with all their Nick's towards the right Hand, and then sets up so many Letters of the same Body, (which for Distinction-fake we will call Patterns) that he will justifie his Body too, upon the Proofs, with all their Nick's also to the right Hand, to try if they agree in length with the same Number of Letters that he uses for his Pattern; which if they do not, for very seldom they do, but by the Workman's fore-cast are generally somewhat too big in the Body, that there may be Substance left to justifie the Mold, and clear it from Ragging. Therefore the Proofs may drive out somewhat, either half a Line (which in Founders and Printers Language is half a Body) or a whole Line. (more or les.)

He also tries if the two sides of the Body are parallel, viz. That the Body be no bigger at the Head than at the Foot; and that he tries by taking half the number of his Proofs, and turning the Heads of them lays them upon the other half of his Proofs, so that if then the Heads and Feet be exactly even upon each other, and that the Heads and Feet neither drive out, nor get in, (Founders and Printers Language, for which see the Table) the two sides of the Body are parallel; but if either the Head or Foot drives out, the two sides of the Body are not parallel, and must therefore be mended.

And as he has examin'd the Sides of the Body so also he examines the thickness of the Letter, and tries if the two Sides of the thickness be also parallel, which to
to do, he sets up his Prooves in the Composing-stick with their Nick's upwards. Then taking half of the Prooves, he turns the Heads and lay the Heads upon the Feet of the other half of his Prooves, and if the Heads and Feet lies exactly upon each other and neither drive-out or get-in the two Sides of the thicknesses are parallel. But if either the Head or Foot drive-out the two Sides of the thicknesses are not parallel; and must therefore be mended.

Next, he considers whether the sides of the Body be straight, first by laying two Letters with their Nick's upwards upon one another, and holding them up in his Fingers, between his Eye and the Light, tries if he can see Light between them: For if the least Light appear between them, the Carriage is not straight. Then he lays the Nick's against one another, and holds them also against the Light, as before: Then he lays both the Nick's outward, and examines them that way, that he may find whether either or both of the Carriages are out of straight.

But we will suppose now the Body somewhat too big, and that it drives out at the Head or Foot; and that the thickness drives-out at the Head or Foot and that the Sides of the Body are not straight. These are Faults enough to take the Mold asunder: but yet if there were but one of these Faults it must be taken asunder for that; by unscrewing the Male-Gage, to take the Body off the Carriage, and the Carriage off the Bottom-Plate.

Having found where the Fault of one or both sides of the Body is, he lays the Body down upon the Using File; and if the Fault be extuberant, he rubs the Extu-
Extuberancy down, by pressing his Finger or Fingers hard upon the opposite side of the Body, just over the extuberant part; and so rubbing the Body hard forwards on the Usinf-File, and drawing it lightly backwards, he rubs till he has wrought down the extuberancy, which he examines by applying the Lyner to that side of the Body, and holding it so up between his Eye and the Light, tries whether or not the Lyner ride upon the part that was extuberant; which if it do, the extuberancy is not sufficiently rub’d off, and the former Process must again begin and be continued till the extuberancy be rub’d off. And if the Body were too big, he by this Operation works it down: Because the extuberancy of the Body rid upon the Carriage, and bore it up.

And if the fault be a Dawk, or Hollow in the Body, then he Works the rest of that side of the Body down to the bottom of the Dawk, which by applying the Lyner (as afore) he tryes, and this also lessens the Body.

If the Body drive-out at Head or Foot, he lays the weight of his Fingers heavy at that side or end of the Body which is too thick, and so rubs that down harder.

If the thickness of the Letter, drive-out at Head, or Foot, he Screws the Body into the Vice, and with a flat sharp File, files the Side down at the Head, or Foot. At the same time, if the Shanck of the Letter be not Square, he mends that also, and smooth-files it very well.

Then
Then he puts the Mold together again: And melting, (or laying aside) his first Proofs, left they should make him mistake, he again Casts about twenty New Proofs, and examins by them as before, how well he has mended the Body, and how near he has brought the Body to the size of the Pattern: For he does not expect to do it the First, Second, or Seventh time; but mends on, on, on, by a little at a time, till at last it is so finisht.

If the Body prove too small, it is underlaid with a thick or a thin Affidue; or sometimes a thin Plate of Brass.

Then he examins the Mouth-piece, and sees that the Jaws slide exactly true, upon every part of the Pallat without riding.

If the Throat of the Mouth-piece lie too low, as most commonly it is designed so to do; Then a Plate of Brass of a proper thickness is laid under it to raise it higher.

He also Justifies the Registers, making their Cheeks truly Square. And Screwing them about an n from the Corner of the Body.

He tries that the Male and Female-Gages fit each other exactly, and lie directly straight along, and parallel to both the Sides of the Carriage.

All this thus performed he needs not (perhaps) take the Mold asunder again. But not having yet consider'd, or examin'd the length of the Shank of the Letter, he now does; and if it be somwhat too long (as we will suppose by forecast it is) then the Body and Carriage being Screwed together, and both the Halves fitted in their Gages, the Edges of the Carri-
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Carriage and Body are thus together rub'd upon the Using-File, till the Carriage be brought to an exact length.

Having thus (as he hopes) finish'd the justifying of the Mold; and put it together, and Screwed it fast up, he puts the two Halves together, and then Rubs or Slides them hard against one another, to try if he can perceive any little part of the Body Ride upon the Carriage, or Carriage ride upon the Body: To know which of them it is that Rides, or is extuberant, he uses the Liner; applying it to both the Places, as well of the Body as the Carriage: where he sees they have Rub'd or bore upon one another: And which of them that is extuberant, the Edge of the Liner will shew, by Riding upon it: And that part he Files upon with a small flat and very fine File, by little and little, taking off the extuberancy, till the Bodies and Carriages lie exactly flat upon, and close to one another: Which if they do not, the Mold will be sure to Rag.

§. XVII. ¶ 1. Of Sinking the Punches into the Matrices.

That the Matrice, and all its parts may be the better understood, as I shall have Occasion to Name them, I have given you a Draft of the Matrice in Plate, 18 at E. and shall here explain its parts.

E The Matrice, wherein is Punched E, the Face of the Letter.

a The Bottom of the Matrice.
b The Top of the Matrice.

c The
The Right Side of the Matrice.

The Left Side of the Matrice.

The Face of the Matrice.

The Leather Grove of the Matrice.

In the Back or Side behind the Matrice, just behind E is filed in athwart the Back, from the right to the left Side a Notch, to settle and hold the point of the Spring or Wyer of the Mold in, that the Matrice fly or start not back when it is at Work.

As I told you (in §. 11. ¶ 1.) that the Punches are to be made of several Thicknesses, for reasons there shewed; and that therefore the Letter-Cutter makes Wooden Patterns for his several Sizes of Thicknesses as well as Heights; so now I am come to the Sinking of the Punches into the Matrices, I must tell you again that the Letter-Cutter or else the Founder, (either of which that Sinks them; for sometimes it is a Task Incumbent on each of them) considers the Thicknesses of all the Punches he has to Sink, though Height he need not consider in Sinking the Matrices: For the Matrices, by reason of their length in Copper upwards and downwards, have Substance enough and to spare, for the longest Letters to be Sunk into them: Therefore I say, he only considers the several Thicknesses of all the Punches, and makes Wooden Patterns for them, marking with a Pen and Inck the number of each size, on the Pattern as before he did for the Steel-Punches: But the Patterns he made for the Steel Punches will be too Thin for the Copper Matrices: Because the Steel Punches by Sinking into the Matrices, stretch and force the Sides of the Copper out, and sometimes crack them for want of Substance.
stance; and at other times carry or force the Substance of the Matrice so low with their Sholder if the Letter be broad, that it creates a great Trouble to rub them Flat, (as it is called) because it is done upon the Ufing-File.

Therefore he makes Wooden Patterns for every of the former siz’d Punches, so thick or rather an n thicker at the least, then he made the Wooden Patterns, that the Steel-Punches were made to be Forged by, that there may be Substance enough on each-side the Copper to bear the dilating that the finking of the Punch into it will make, because the Counter-Puncht-Letters are Thicker by their Stems and Footing or Topping than the Counter-Punches made for them need be.

Therefore (as before) for three sizens of Punches to be Counter-Puncht, he made three several siz’d Patterns; so now for the several siz’d Punches that are to be Sunk into Matrices, he makes three several siz’d Patterns of Wood for the Copper-Smith to draw out Rods of Copper of those several Sizes by, and each of them (as a foresaid) an n, and for the Thick Letters an m (at least) Thicker than the Patterns were made, for the Steel-Punches to be Forged to a size by.

In the Forging of these Copper Rods, he instructs the Copper-Smith to make Choice of the softest Copper he can get, that the Steel-Punches may run the les hazzard of breaking; and sometimes (if too soft Temper’d) battering their Stroaks.

The Rose Copper is commonly accounted the softest:

But
But yet I have many times Sunk Punches indifferently into every sort of Copper. Nay, even cast Copper, which is generally accounted the Hardest: Because Copper, as well (as some other Mettals) Hardens with Melting.

These Rods of Copper are (as I told you in §. III. ¶ 1. to be Cut into small Lengths, each about an Inch and an half long, and a Great-Primmer or Double-Pica deep; and for great Bodyed Letters a Two-lin'd-English deep; But their Thickness not asignable, because of the Different Thicknesses in Letters, both of the same and other Bodies, as in part I shewed, in §. II. and-more fully in this present §. and ¶.

The reason why the Copper-Rods are Forg'd so deep, is, That the more Substance of Copper may lie under the Face of the Punch: For if the Rod have not a convenient depth, the Face of the Punch in Sinking, does the sooner ingage with the Hardness of the Face of the Stake it is Sunk upon: And having with a few Blows of the Hammer, soon hardned the Copper just under the Face of the Punch, as well the hardness of the small (thus hardned) Body of Copper just under the Face of the Punch, as the Hardness of the Face of the Stake contribute a complycated aflfiance to the breaking or battering the Face of the Punch. But if the Rod be deep, the Substance of Copper between the Face of the Punch and the Stake is less hardned, and consequently the Punch will Sink the easier, and deeper with less Violence.

But
Sinking of Punches.

But sometimes it has happ'n'd that for the Sinking one Matrice or two, I have been loath to trouble my self to go to the Copper-Smiths, to get one Forg'd: and therefore I have made shift with such Copper as I have had by me. But when it has not been so deep as I could have wished it, I have just entered the Punch into the Matrice upon the Stake, and to Sink it deep enough, I have laid it upon a good thick piece of Lead, which by reason of its softness has not hardned the Copper just under the Face of the Punch; but suffered the Punch to do its Office with good Success.

Having cut the Copper-Rods, into fit Lengths with a Cold Chisel, He files the end that is to stand upon the Stool of the Mold exactly square, and the Right-side of the Matrice, that stands against the Carriage and Body, also exactly Square and smooth upon the Using-File. Then he places the filed end, or Bottom upon the Stool, with the Face of the Matrice towards the Carriage and Body, and the Right side of the Matrice, close against the Register: Then if the Punch to be sunk be an Ascending Letter. He with a fine pointed Needle, makes a small Race by the upper side of the Carriage upon the Face of the Matrice, and that Race is a mark for him, to set the top of the Ascending Letter at, when he Sinks it into the Matrice: So that then placing the Punch upright upon the middle of the Thickness of the Matrice, the Matrice lying solid on the Stake: He with the Face of an Hammer sizable to the bigness of his Punch, cautiously knocks upon the Hammer-end of the Punch, with reiterated Blows, till he
he have driven the *Punch* deep enough into the *Matrice.*

But if it be a short *Letter,* or a Descending *Letter,* and not Ascending also: Then he elects any *Cašt-Letter* of the Thickness of the *Beard,* (as *Founders* and *Printers* call it) For which Explanation see the Table, and he lays that *Letter* upon the *Surface* of the *Carriage,* and then placing the *Bottom* of the *Matrice* to be *Sunk* as before, on the *Stool,* and against the *Register,* He draws with a *Needle* as before, a race above the *Surface* of that *Letter,* against the *Face* of the *Matrice,* and that race is a *Mark* for him to place the *Head* of the *Letter* by. Then managing the *Punch* and *Hammer* as before was shewed, he *Sinks* the *Punch* into the *Matrice.*

But here arises a Question, *viz.* How deep the *Punches* are to be *Sunk* into the *Matrices?* The *Answer* is, a Thick *Space* deep, though deeper even to an "n" would be yet better: Because the deeper the *Punches* are *Sunk,* the lower does the *Beards* stand below the *Face,* and those *Beards* when the *Cašt Letter* comes into the *Printers Hands* to be used, are the less subject to *Print,* as too oft they do both at *Head* or *Foot* of a *Page,* than when they lie so high that the softness of the *Blankets,* and Hardness of a *Pull,* or else carelesnesse of Running the *Carriage* of the *Press* to a considered Mark they would be. But they are seldom *Sunk* any deeper then a thick *Space:* and the reason is, because the breaking or battering the *Face* of the *Punch* should not be to much hazarded.

The
Numb. XII. **Sinking of Punches.**

The many Punches to be Sunk into Matrices for the same Body, are difficult to be Sunk of an equal depth. Therefore I always make a Beard-Gage, as is described in Plate 19 at F, where a b is a Sholder that rests upon the Face of the Matrice, c is the Point or Gage that measures the depth of the Sunken Punch. So that when the Point c just touches the Bottom, and both the Sholders a b the Face of the Matrice, the Punch may be accounted well Sunk as to depth.

But though it be accounted well Sunk for a first Essay, yet can it not be reasonably imagined it is well Sunk for good and all; as well because in Sinking the Punches it has carried some part of the Surface of the Matrice down below the Face of the Matrice into the Body of the Copper, as because both the Sides are doubtless extorted, and one Side or Part of the Punch Sunk more or less deeper than the other. Wherefore I now come to

\[ 2. \text{Justifying the Matrices.} \]

Justifying of Matrices is, 1. to make the Face of the Sunken Letter, lie an exact designed depth below the Face of the Matrice, and on all its sides equally deep from the Face of the Matrice. 2. It is to set or Justifie the Foot-line of the Letter exactly in Line. 3. It is to Justifie both the sides, viz. the Right and left-sides of a Matrice to an exact thickness.

Therefore to proceed Methodically, he first slightly Files down the Bunchings out that the Punch made
made in the Sides of the Matrice; And then slightly Files down all the Copper, on the Face of the Matrice, till the Hollow the Punch made becomes even with the whole Face of the Matrice.

Then he Casts a Proof-Letter or two, and Rubs them: And with the Edge of a Knife cuts out what may remain in the bottom of the Shanck by reason of the un-even breaking, off of the Break that the square bottom of the Shanck may not be born off the Bottom-Ledge of the Lining-Stick.

But having till now said nothing of the Lining-Stick, it is proper before I proceed, to give a Description of it: It is delineated in Plate 19 at G. Where G is the Plain, a the Side-Ledge, b the Bottom-Ledge, c the Stilt, all made of Brats.

The Plain is exactly Flat, Straight, and Smooth, that the Shancks of the Letter being likewise so, may lie flat and solidly on it. Its depth between the Bottom-Ledge, and the fore edge is about the length of the Shanck of the Letter: But the whole Plain of Brats is yet deeper; Because the Bottom-Ledge is fastned on it. The Lining-Stick is about two Inches long for small Letters; but longer for Big-Bodied Letters.

Both Bottom and Side-Ledge, is a thin piece of Brats, from a Scaboard to a Pica thick, according as the Body whose Face and Foot-line is to be justified in it is bigger or less. These two Ledges is an Inside Square exactly wrought, and with small Rivets fasted on the Side edge, and on the Bottom edge.

The
The *Stilt* is a thin flat piece of *Brass-Plate* about a *Scaboard* thick, and a *Double-Pica* broad: One of its edges is *Soldered* to the under-side of the *Plain*, about a *Double-Pica* within the fore-edge of the *Plain*, that the *Lining-Stick* (when set by with *Proof-Letters* in it) may not lie flat on its *Bottom*; but have its fore edge *Tilted* up, that the *Letters* in it may rest against the *Bottom-Ledge*.

Having cut the *Notch* in the *Break* of the *Letters* as aforesaid, He *Rubs* every side of them on the *Stone*, with two or three hard *Rubs*, to take off the small *Rags* that may happen on the *Shank* of the *Letter*, notwithstanding the *Mold* is imagined to be very truly made and *justified*.

The *Stone* is commonly a whole *Grind-Stone*, about eighteen Inches diameter, having both its sides truly *Rub'd* flat and smooth, by *Jostling* it (as *Masons* call it) upon another broad long and flat Stone with *Sand* and *Water*. It must have a fine, but very sharp *Greet*. Now to return.

He places a Quadrat of the same *Body*, on the *Plain* of the *Lining-stick*, and against the *Side-Ledge* of it He sets up three or four old m's of the same *Body*: Then sets up his *Proof-Letter* or *Letters*, and after his *Proof-Letter* three or four old m's more of the same *Body*; and being very careful that the *Foot* of the *Shank* of the Letter stands full down against the *Bottom-Ledge* of the *Lining-stick*, He applies the edge of the *Liner* to the *Faces* of all these Letters: And if he finds that the edge of the *Liner* just touch (and no more) as well all the parts of his *Proof-Letters*
ters as they do upon his old Letters, He concludes his Matrice is Sunk to a true Height against Paper.

But he seldom hopes for so good luck; but does more likely expect the Matrice is Sunk too deep or too shallow, and awry on the right and left-side, or on the top or bottom of the Line, for all or any of these Faults the Liner will easily discover. Therefore I shall shew you how he justifies a Matrice that is too High against Paper.

We will suppose the Face of the Punch is Sunk flat and straight down into the Matrice; but yet it is a little too deep Sunk. Therefore he considers how much it is too deep: If it be but a little too deep, perhaps when the Face of the Matrice shall be made exactly flat (for yet it is but Rough-Filed) it may be wrought down to be just of an Height against Paper. But if the Punch be Sunk so much too deep that the smoothing the flat of the Face on the Using-File will not work it low enough; then with a Bastard-cut flat-File, he takes off (according to his Discretion) so much Copper from the Face of the Matrice as will make it so much nearer as he thinks it wants to the Face of the Letter. But yet considers that the Face of the Matrice is yet to smoothen on the Using-File, and therefore he is careful not to take too muck off the Face of the Matrice with the Rough-File.

He is also very careful that when he is to File upon the Face of the Matrice, to Screw the Face of it Horizontally flat in the Vice: And that in Filing upon it, he keeps his File directly Horizontal, as was
was shewed, Numb. 1. Fol. 15, 16. Vol. 1. For if he let his right or left-hand dip, the File will in its Natural Progress take too much off the side it dips upon, and consequently the Face of the Letter on that side will lie shallower from the Face of the Matrice then it will on the opposite side. The like caution he makes, in Filing between the Top and Bottom of the Matrice on the Face. For if he Files away too much Copper toward the Top or Bottom, the Face of the Letter on its Top or Bottom-Line, will lie on that end shallower from the Face of the Matrice.

Then he considers by his Proof-Letters how much too thick the right or left side of the Matrice is.

I told you in § 11. ¶ 4. that the Angle the Sholder made with the Face of the Letter, is about 100 Degrees, which is 10 Degrees more than a right Angle or Square. So that if a Letter be Cast and Rub'd just so thick that the Liner when applied to the Shanck of the Letter reaches just to the Sholder, there will be an Angle of 10 Degrees, contained between the edge of the Liner and the Straight Line that proceeds from the Sholder at the Shanck, to the outer-edge of the Face of the Letter. And if two Letters be thus Cast and Rub'd and Set together, the Angle contained between their Shancks, and the outer-edge of the Face of the Letter will be 20 Degrees, which is too wide by half for the Faces of two Letters to stand assunder. Therefore the sides of the Matrice must be so Jusified, that when the Shancks of two Letters stand close together, the Angle between
tween both the Shancks, and the adjacent outer-edges of the Faces of the Letters may both make an Angle of about 10 Degrees as aforesaid, which is a convenient distance for two Letters to stand asunder at the Face. But to do which, If the right-side be too thick, the Regifler of the under-half of the Mold, being (as I said) hard screw'd, so as to stand about an inch off the edge of the Body towards the right hand; He places the Foot of the Matrice on the Stool, and the right-side of the Matrice close against the Regifler, and observes how much too thick that side of the Matrice is: For so much as the right-hand edge of the Orifice of the Matrice stands on the left hand side of the Body, so much is the right side of the Matrice too thick, and must by several offers be Filed away with a Bastard-Cut-File, not all at once, least (ere he be aware) he makes that side of the Matrice too thin, which will be a great damage to the Matrice, and cannot be mended but with a Botch, as shall in proper place be shewed.

Having by several proffers wrought the right-side of the Matrice thus near its thickness, he proceeds to Justifie the left-side also. But this side must be Justified by the upper half of the Mold; By turning the top of the Matrice downwards, and placing the left-side of it (now the right-side) against the Regifler, and works away the left-side in all respects as he did the right-side; still being very cautious he takes not to much Copper away at once.

To Justifie the Letter in Line he examins the Proof-Letter (yet standing in the Lining-Stick) and applies the
the Liner to the Foot-line: And if the Liner touch all the way upon the Foot-line of the Proof-Letter and the Foot-Line of all the old m's, that Matrice is Justified in Line. But this also very rarely happens at first, for by design it is generally made to stand too low in Line: Because the Bottom of the Matrice may by several proffers be Filed away till the Letter stand exactly in Line. But should he take too much off the Bottom of the Matrice, it cannot be made to stand lower without another Botch.

Nor does he reckon that this first Operation, or perhaps several more such, shall Justifie the Matrice in Line. But after bringing both the sides of the Matrice thus near, and also bringing the Matrice thus near the Line. He Casts another Proof-Letter or two, and Rubbing all the sides of their Shancks, as before was shewed, he tries by Rubbing the Letters how near he has brought the thickness of both the sides: For when the sides of the Matrice are brought just to such a thickness, that the Shanck of the Letter (Casts in the Mold) Rubs flat half way up beyond the Beard towards the Face of the Letter, the Matrice is of a convenient thickness, and there the Angle from the Beard of the Shanck, to the outer-edge of two Letters set together, will make an Angle of about 10 degrees as aforesaid, which being about one third part of a thin-Space is a convenient distance for the adjacent edges of two Letters to stand assunder: But yet Founders sometimes to Get in or Drive out, Cast the Letters thinner or thicker, and consequently their Faces stand closer or wider assunder.
der, which is unseemly when the Letter comes to be Printed.

Then he sets the Proof-Letters in the Lining-Stick, between four or five old m's as before, and with the Liner examins again how well these Proof-Letters stand in Line with the old m's, which if they do not, he Reiterates the former Operations so oft, till the sides and Line of the Matrice is Justified, and at every Operation Casts new Proof-Letters to examine the thickness of both the Sides, and how well the Matrice is Justified to Stand in Line.

The Matrice being now Justified, he Files a Leather-Groove round about it, viz a Notch (made proper-est with a three square File) within about a thick Scaboard of the top of the Matrice, to tie the Leather fast to.

He also Files another Notch in the back-side of the Matrice athwart it, to rest the point of the Wyer or Spring in. But this Notch must by no means be made before the Matrice be Justified to its true Height against Paper: Because when this Notch is made, the Punch cannot again be struck in the Matrice; For that the Matrice will not lie solid on the Stake in that place.

¶ 3. Of Botching-Matrices, to make them serve the better.

Matrices are sometimes either through a careless, or sometimes through an unlucky stroak or two of the File made too thin. And sometimes the Foot of the Matrice is too much taken away, and the Letter by
that means stands too high in Line: And sometimes
the Face of the Matrices is too much taken away;
So that the Letter will not stand High enough against
Paper.

To remedy all or any part of these inconvenien-
cies, Founders are forced to make Botches on the Ma-
trice: As first, If the Matrice be too thin on the right
or left side, or both; They prick up that side, by
laying the Matrice flat on the Work-Bench, with the
thin side upwards, and holding the point of a Punch-
Graver aslope upon the thin side, with an Hammer
drive the point into the thin side of the Matrice, and
so raise a Bur upon that side; which Bur (though it
thicken not the Matrice, yet it) makes the side of the
Matrice stand off the Register, and consequently is e-
quevalent to thickning it.

The higher this Bur is raised, the better is the Ma-
trice Botcht; because the thin fine points thus raised
(if not pretty well flattened into the Substance of the
Bur) will quickly either wear off by the pressure of
the Register against them, or else flatten into the Bo-
dy of the Bur, and both ways makes the Matrice again
too thin.

Sometimes they do not Botch the Matrice thus for
this fault; but only Paste a piece of Paper, or a Card,
(according as it may want thickness) against the thin
side of the Matrice and so thicken it.

But to mend the sides I use another Expedient,
viz. by Soldering a piece of Plate-Brafs against its
thin side or sides, which is much better than Botch-
ing it.
Secondly, If the Matrice be filed away too much at the Foot, they knock it up with the Pen of the Hammer; and stretch it between the Foot and the Orifice of the Matrice, and then Jutifie it again in Line. Or a piece may be Soldered under the Foot.

Thirdly, If the Face of the Matrice be too much taken away, and either the Punch spoiled or the Notch in the back of the Matrice made so, as it cannot be Sunken deeper, they raise a Bur on the Face, as they did on the thin sides, to keep the Matrice off the Carriages and Bodies which Lengthens the height of the Letter against Paper so much as is the height of the raised Bur. But of all the Botches this is the worst, because the Beard lies now nearer the Face: And the hollow standing off of the Face of the Matrice from the Carriages and Bodies, subjects the Mettal to run between them, and so pester the Workman to get the Letter out of the Mold and Matrice.

Sect. XVIII, Of setting up the Furnance.

Having Jutified the Mold and Matrice, we come now to Casting of Letters: But yet we have neither Furnance, Mettal, or Ladle. Wherefore it is the Founders care, first to provide these.

The Furnance I have described in Plate 20. It is built of Brick upright, with four square sides and a Stone on the top, in which Stone is a wide round hole for the Pan to stand in.

\( a \ b \ c \ d \) The
Numb. XII.  Sinking of Punches.

...The square Stone at the top, covering the whole Furnance. This is indeed the Furnance.

...The breadth two Foot and one Inch.

...The Length two Foot three Inches. Into the Breadth and Length about the whole Stone, is let in even with the top of the Stone a square Iron Band two Inches deep, and a quarter and half quarter of an Inch thick to preserve the Edges of the Stone from battering.

...The round hole the Pan stands in, which hath an Iron Plate let into it eight Inches diameter, an Inch and half broad and one quarter of an Inch thick.

...This Iron-Plate fits the inside of the Hole so far as it is Circular, and consequently is a Segment of a Circle. But where the Smoak-vent breaks off the Circularity of the Stone, there ends this Plate of Iron, that the Smoak may have the freer vent. Its Office also is to preserve the Edge of the Hole from battering, with the oft taking out and putting in the Iron Pan.

...The Funnel seven Inches high, and five Inches wide.

...The Stoke-Hole four Inches wide, and six Inches long.

...The height of the Furnance two Foot ten Inches.

...The Air-Hole just underneath the Hearth to let in Air that the Fire may burn the freer.

...The Ash-Hole where the Ashes that fall from the Hearth are taken away.
The Bench two Foot broad, three Foot long, and two Foot eight Inches high. The Bench is to empty the Letters out of the Mold upon, as the Founder Casts them.

The Hearth lies seven Inches below the top of the round Hole, and hath under it another round Iron-Ring of the same dimensions with the first, on which straight Iron-Bars are fastened that the Fire is laid on.

In the round Iron-Ring (or rather Segment) on the top of the Furnance is set the Pan, which is either a Plate Ladle, or a small Caft-Iron Kettle that sinks into it within two Inches of the Brims of the Pan.

II. 2. Of making Mettal.

The Mettal Founders make Printing Letters of, is Lead hardned with Iron: Thus they chuse sub-Nails for the best Iron to Melt, as well because they are assure sub-Nails are made of good soft and tough Iron, as because (they being in small pieces of Iron) will Melt the sooner.

To make the Iron Run, they mingle an equal weight of Antimony (beaten in an Iron-Morter into small pieces) and sub-Nails together. And preparing so many Earthen forty or fifty pounds Melt- ing-Pots (made for that purpose to endure the Fire) as they intend to use: They Charge these Pots with the mingled Iron and Antimony as full as they will hold.

Every
Every time they Melt Mettal, they build a new Furnance to melt it in: This Furnance is called an Open Furnance; because the Air blows in through all its sides to Fan the Fire: They make it of Bricks in a broad open place, as well because the Air may have free access to all its sides, as that the Vapours of the Antimony (which are Obnoxious) may the less offend those that officiate at the Making the Mettal: And also because the Violent Fire made in the Furnance should not endanger the Firing any adjacent Houses.

They consider before they make the Furnance how many Pots of Mettal they intend to Melt, and make the Furnance sizable to that number: We will suppose five Pots. Therefore they first make a Circle on the Ground capable to hold these five Pots, and wider yet by three or four Inches round about: Then within this Circle they lay a Course of Bricks close to one another to fill the Plain of that Platform, with their broad or flat sides downwards, and their ends all one way, and on this Course of Bricks they lay another Course of Bricks as before, only the Lengths of this Course of Bricks lies athwart the Breadths of the other Course of Bricks: Then they lay a third Course of Bricks with their lengths cross the Breadth of the second Course of Bricks.

Having thus raised a Platform, they place these five Pots in the middle of it close to one another, and then on the Foundation or Platform raise the Furnance round about by laying the Bricks of the first Lay end to end and flat, close to one another:
On the second Lay, they place the middle of a Brick over a joint (as Brick-layers call it) that is where the ends of two Bricks join together, and so again lay Bricks end to end till they trim round the Platform. Then they lay a third Lay of Bricks, covering the joints of the second Lay of Bricks as before: So is the Foundation finisht.

Then they raise the Walls to the Furnance on this Foundation; But do not lay the ends of their Bricks close together. But lay the ends of each Brick about three Inches off each other, to serve for Wind-holes till they trim round about: Then they lay another Lay of Briks leaving other such Wind-holes over the middle of the last Lay of Bricks, and so trim as they work round either with half Bricks or Bats that the Wind-holes of the last Lay may be covered: And in this manner and order they lay so many Lays till the Walls of the Furnance be raised about three Bricks higher than the Mouths of the Melting-Pots, still observing to leave such Wind-holes over the middle of every Brick that lies under each Lay.

Then they fill the sides of the Furnance round about the Melting-Pots, and over them with Char-coal, and Fire it at several Wind-holes in the bottom till it burn up and all over the Furnance, which a moderate Wind in about an Hours time will do: And about half an Hours time after they lay their Ears near the Ground and listen to hear a Bubling in the Pots; and this they do so often till they do hear it. When they hear this Bubling, they conclude the Iron is melted: But yet they will let it stand, perhaps half an hour longer or more, according as they guess the
the Fire to be Hotter or Cooler, that they may be the more assured it is all thoroughly Melted. And when it is Melted the Melting Pot will not be a quarter full.

And in or against that time they make another small Furnance close to the first, (to set an Iron Pot in, in which they Melt Lead) on that side from whence the Wind blows; Because the Person that Lades the Lead out of the Iron-Pot (as shall be shewed by and by) may be the less annoyed with the Fumes of the Mettal, in both Furnances. This Furnance is made of three or four Course of Bricks open to the windward, and wide enough to contain the designed Iron Pot, with room between it and the sides to hold a convenient quantity of Charcoal under it, and about it.

Into this Iron-Pot they put for every three Pound of Iron, about five and twenty pounds of Lead. And setting Fire to the Coals in this little Furnance they Melt and Heat this Lead Red-hot.

Hitherto a Man (nay, a Boy) might officiate all this Work; But now comes Labour would make Hercules sweat. Now they fall to pulling down so much of the side of the open Furnace as stands above the Mouth of that Melting-Pot next the Iron-Pot, And having a thick strong Iron Ladle, whose Handle is about two Yards long, and the Ladle big enough to hold about ten Pounds of Lead, and this Ladle Red-hot that it chill not the Mettal, they now I say with this Ladle fall to clearing this first Melting-Pot of all the Coals or filth that lie on the top of the Melted Mettal: while another Man at the same time stand
stands provided with a long strong round Iron Stirring Poot; the Handle of which Stirring Poot is also about two Yards long or more, and the Poot itself almost twice the length of the depth of the Melting Pot. This Poot is nothing but a piece of the same Iron turned to a square with the Handle: And this Poot is also in a readiness heated Red-hot.

Now one Man with the Ladle Lades the Lead out of the Iron-Pot into the Melting Pot, while the other Man with the Poot stirs and Labours the Lead and Mettal in the Melting Pot together till they think the Lead and Mettal in the Melting Pot be well incorporated: And thus they continue Lading and Stirring till they have near filled the Melting Pot.

Then they go to another next Melting-Pot, and successively to all, and Lade and stir Lead into them as they did into the first. Which done the Mettal is made: And they pull down the Walls of the Open Furnance, and rake away the Fire that the Mettal may cool in the Pots.

Now (according to Custom) is Half a Pint of Sack mingled with Sallad Oyl, provided for each Workman to Drink; intended for an Antidote against the Poysonous Fumes of the Antimony, and to restore the Spirits that so Violent a Fire and Hard Labour may have exhausted.

Letter-Ladles differ nothing from other common Ladles, save in the size: Yet I have given you a Draft of one in Plate 20 at A. Of these the Caster has many at Hand, and many of several sizes that he may successively chuse one to fit the several sizes of Letters he has to Cast; as well in Bodies as in Thicknesses.

§ XIX. ¶ 1. Of Casting, Breaking, Rubbing, Kerning, and Setting up of Letters.

Before the Caster begins to Cast he must kindle his Fire in the Furnance, to Melt the Mettal in the Pan. Therefore he takes the Pan out of the Hole in the Stone, and there lays in Coals and kindles them. And when it is well kindled, he sets the Pan in again, and puts Mettal into it to Melt. If it be a small Bodyed-Letter he Casts, or a thin Letter of Great Bodies, his Mettal must be very hot; nay, sometimes Red-hot to make the Letter Come. Then having chose a Ladle that will hold about so much as the Letter and Break is, he lays it at the Stoking-hole, where the Flame bursts out to heat. Then he ties a thin Leather cut into such a Figure as is described in Plate 20 at B with its narrow end against the Face to the Leather-Groove of the Matrice, by whipping a Brown Thred twice about the Leather-Groove, and fastning the Thred with a Knot. Then he puts both Halves of the Mold together, and puts the
the Matrice into the Matrice Cheek, and places the Foot of the Matrice on the Stool of the Mold, and the broad end of the Leather upon the Wood of the upper half of the Mold, but not tight up, lest it might hinder the Foot of the Matrice from Sinking close down upon the Stool in a train of Work. Then laying a little Rosin on the upper Wood of the Mold, and having his Casting Ladle hot, he with the boiling side of it Melts the Rosin; and when it is yet Melted presses the broad end of the Leather hard down on the Wood, and so fastens it to the Wood. All this is Preparation.

Now he comes to Casting. Wherefore placing the under-half of the Mold in his left hand, with the Hook or Hag forward, he clutches the ends of its Wood between the lower part of the Ball of his Thumb and his three hind-Fingers. Then he lays the upper half the Mold upon the under half, so as the Male-Gages may fall into the Female-Gages, and at the same time the Foot of the Matrice place itself upon the Stool. And clasping his left-hand Thumb strong over the upper half of the Mold, he nimbly catches hold of the Bow or Spring with his right-hand Fingers at the top of it, and his Thumb under it, and places the point of it against the middle of the Notch in the backside of the Matrice, pressing it as well forwards towards the Mold, as downwards by the Sholder of the Notch close upon the Stool, while at the same time with his hinder-Fingers as aforesaid, he draws the under-half of the Mold towards the Ball of his Thumb, and thrusts by the Ball of his Thumb the upper part towards his Fingers,
gers, that both the Registers of the Mold may press against both sides of the Matrice, and his Thumb and Fingers press both Halves of the Mold close together.

Then he takes the Handle of his Ladle in his right Hand, and with the Boll of it gives a stroke two or three outwards upon the Surface of the Melted Mettal to scum or clear it from the Film or Dust that may swim upon it. Then takes up the Ladle full of Mettal, and having his Mold as aforesaid in his left hand, he a little twists the left-side of his Body from the Furnance, and brings the Geat of his Ladle (full of Mettal) to the Mouth of the Mold, and twists the upper part of his right-hand towards him to turn the Mettal into it, while at the same moment of Time he Jilts the Mold in his left hand forwards to receive the Mettal with a strong Shake (as it is call'd) not only into the Bodies of the Mold, but while the Mettal is yet hot, running swift and strongly into the very Face of the Matrice to receive its perfect Form there, as well as in the Shanck.

Then he takes the upper half of the Mold off the under half, by placing his right-Hand Thumb on the end of the Wood next his left-Hand Thumb, and his two middle Fingers at the other end of the Wood, and finding the Letter and Break lie in the under-Half of the Mold (as most commonly by reason of its weight it does) he throws or tosses the Letter Break and all upon a Sheet of Waste Paper laid for that purpose on the Bench just a little beyond his left-hand, and is then ready to Cast another Letter as before,
fore, and also the whole number that is to be Cast with that Matrice.

But sometimes it happens that by a Shake, or too big a Ladle, the Mettal may spill or flabber over the Mouth of the upper Half of the Mold, so that the spilt Mettal sticking about the out-sides of the Mouth, may lift the Letter off the under half of the Mold, and keep it in the upper half. Therefore he with the point of the Hag in the Wood of the under half of the Mold, picks at the hollow in the fore part of the Break made by the Shaking out of the Mettal, and draws Break and Letter both out. It sometimes sticks in the under Half of the Mold by the same cause, and then he uses the point of the Hag in the upper half of the Mold, to pick or hale it out, as before.

It also sometimes sticks when any of the Joynts of the Mold open never so little, the Mettal thus getting in between those Joynts: But this fault is not to be indured, for before he can Cast any more, this fault must be mended.

But besides Letters, there is to be Cast for a perfect Fount (properly a Fund) Spaces Thick and Thin, n Quadrats, m Quadrats and Quadrats. These are not Cast with Matrices but with Stops (as we may call them) Because when these are Cast they are all shorter than the Shanck of the Letter, that they may not Print. Therefore they take off the Register of the under-Half Mold, and fit a piece of Plate-Brafs about a Brevier Thick and a Brevier longer than to reach to the edge of the Body in the place of the Register, and drill a hole in this Plate-Brafs right against the
the Hole in the Carriage that the Female-Screw lies in: This Hole is made so wide that the Male-Screw which screwed the Register close to the Carriage and Body may enter in at it, and screw this Plate-Brafs close to them, as it did the Register: Then they make a mark with the point of a Needle on the Plate-Brafs just against the side of the Edge of the Body, and at this mark they double down the end of the Plate-Brafs inwards to make a perfect Square with theinside of the whole Plate. This doubling down is called the Stop aforesaid, and must be made just so thick as they design the Thin or Thick Space to be, and must have its Upper and Under-Edges filed so exactly to the Body, that it may lie close upon the Under-Carriage, and just even so high as the upper-side of the Body. So that when the Upper-half of the Mold is placed on the under-Half, and Mettal Cast in at the Mouth (as before) the Mettal shall descend no deeper between the two Bodies then just to his Stop: You must note that this Stop must be filed exactly true as to Body and Thickness: For if it be never so little too big in Body, the Carriage of the Mold will ride upon it and make the Body of the Space bigger. Or if the Body be never so little too little, the Hot Mettal will run beyond the Stop; both which Miscarriages in making the Stop, spoil the Space.

If the Space be too short, they File the end of the Stop shorter.

This Brevier thick Plate will be thick enough for Stops for the Thin or Thick Spaces of any Body though of Great-Cannon, and for the n Quadrat Stop of
of any Body under a Great Primmer. And for the m Quadrat Stop of all to a Brevier and all Bodies under it. But for Stops that require to be Thicker then a Brevier, instead of doubling the Stop inwards on the Plate, I Solder on the in-side of that end of the Plate a Stop full big enough in Body, and big enough in Thickness for the Quadrat I intend to make, and afterwards file and fit the Stop exactly as before.

When they Cast these Spaces or Quadrats, this Stop is always screwd fast upon the Carriage of the under-Half Mold as aforefaid. So that they only fit the upper half Mold on the under, and Cast their Number almost twice as quick as they do the Letters in Matrices.

It is generally observed by Work-men as a Rule, That when they Cast Quadrats they Cast them exactly to the Thickness of a few Number of m's or Body, viz. two m's thick, three m's thick, four m's thick, &c. And therefore the Stops aforefaid must all be filed exactly to their several intended thicknesses, The reason is, that when the Compositor Indents any Number of Lines, he may have Quadrats so exactly Cast that he shall not need to Justifie them either with Spaces or other helps.

2. Some Rules and Circumstances to be observed in Casting.

1. If the Letter be a small Body, it requires a Harder Shake than a great Body does: Or if it be a thin Letter though of a greater Body, especially small
small i, being a thin Letter its Tittle will hardly come; so that sometimes the caster is forced to put a little block-tin into his metal, which makes the metal thinner, and consequently have a freer flux to the face of the matrice.

2. He often examines the registres of the mold, by often rubbing a cast letter: for notwithstanding the registres were carefully justified before, and hard screwed up; yet the constant thrusting of both registres against the sides of the matrice, may and often do force them more or less to drive backwards. or a fall of one half or both halves of the mold, may drive them backwards or forwards: therefore he examines, as I said, how they rub, whether too thick or too thin. and if he see cause, mends the registres, as I shew'd § 5. ¶ 2.

Or if the matrice be botcht, as I shew'd you § 5. ¶ 3. then those botches (being only so many fine points rising out of the body of the copper of the matrice) may with so many reiterated pressures of the registres against them, flatten more and more, and press towards the body of the matrice, and consequently make the letter thinner: which if it do, this must be mended in the matrice by re-raising it to its due thickness.

3. He pretty often examines, as I shew'd in § 5. ¶ 2. how the letters stand in line: for when great numbers are cast with one matrice, partly by pressing the point of the wyer against the bottom-sholder of the notch in the back-side of the matrice, and partly by the softness of the matter of his matrice and hardness of the iron-fistool, the foot of the matrice (if
it wear not) may batter so much as to put the Letter out of Line. This must be mended with a Botch, viz. by knocking up the Foot of the Matrice, as I shew'd § 5. ¶ 3.

A Work-man will Cast about four thousand of these Letters ordinarily in one day.


Breaking off is commonly Boys-work: It is only to Break the Break from the Shanck of the Letter. All the care in it is, that he take up the Letter by its Thickness, not its Body (unless its Thickness be equal to its Body) with the fore Finger and Thumb of his right Hand as close to the Break as he can, left if when the Break be between the fore-Finger and Thumb of his left Hand, the force of Breaking off the Break should bow the Shanck of the Letter.


Rubbing of Letters is also most commonly Boys-work: But when they do it, they provide Finger-flails for the two fore-Fingers of the right-Hand: For else the Skin of their Fingers would quickly rub off with the sharp gret of the Stone. These Finger-flails are made of old Ball-Leather or Pelts that Printers have done with: Then having an heap of one sort of Letters lying upon the Stone before them, with the left-Hand they pick up the Letter to be Rub'd, and lay it down in the Rubbing place with one
one of its sides upwards they clap the Balls of the fore-Finger and middle-Finger upon the fore and hinder-ends of the Letter, and Rubbing the Letter pretty lightly backwards about eight or nine Inches, they bring it forwards again with an hard press-\footnotesize{ing} Rub upon the Stone; where the fore-Finger and Thumb of the left-Hand is ready to receive it, and quickly turn the opposite side of the Letter, to take such a Rub as the other side had.

But in Rubbing they are very careful that they press the Balls of their Fingers equally hard on the Head and Foot of the Letter. For if the Head and Foot be not equally press'd on the Stone, either the Head or Foot will Drive out when the Letters come to be Composed in the Stick; So that without Rubbing over again they cannot be Dust.

\[5. \text{Of Kerning of Letters.}\]

Amongst the Italick-Letters many are to be Kern'd, some only on one side, and some both sides. The Kern'd-Letters are such as have part of their Face hanging over one side or both sides of their Shank: These cannot be Rub'd, because part of the Face would Rub away when the whole side of the Shank is toucht by the Stone: Therefore they must be Kern'd, as Founders call it: Which to do, they provide a small Stick bigger or less, according as the Body of the Letter that is to be Kern'd. This Kerning-Stick is somewhat more than an Handful long, and it matters not whether it be square or round: But if it be square the Edges of it must be pret-
ty well rounded away, left with long usage and hard Cutting they Gall the Hand. The upper side of this Kerning-Stick is flattened away somewhat more than the length of the Letter, and on that flat part is cut away a flat bottom with two square sides like the Sides or Ledges of the Lining-stick to serve for two Sholders. That side to be Kern'd and scrap'd, is laid upwards, and its opposite side on the bottom of the Kerning-stick with the Foot of the Letter against the bottom Sholder, and the side of the Letter against the side Sholder of the Kerning-stick.

He also provides a Kerning-Knife: This is a pretty strong piece of a broken Knife, about three Inches long, which he fits into a Wooden-Handle: But first he breaks off the Back of the Knife towards the Point, so as the whole edge lying in a straight-line the piece broken off from the back to the edge may leave an angle at the point of about 45 Degrees, which irregular breaking (for so we must suppose it) he either Grinds or Rubs off on a Grind-stone. Then he takes a piece of a Broom-stick for his Handle, and splits one end of it about two Inches long towards the other end, and the split part he either Cuts or Rasps away about a Brevier deep round about that end of the Handle. Then he puts about an Inch and an half of his broken blade into the split or slit in the Handle, and ties a four or five doubled Paper a little below the Rasped part of the Handle round about it, to either a Pica or Long-Primmer thick of the slit end of the Handle. This Paper is so ordered that all its sides round about shall stand equally distant from all the
the Rasped part of the Handle: For then setting the other end of the Handle in Clay, or otherwise fastening it upright, when Mettal is poured in between the Rasped part of the Handle and the Paper about it, that Mettal will make a strong Ferril to the Handle of the Knife. The irregularities that may happen in Cafting this Ferril may be Rasped away to make it more handy and Handsome.

Now to return again where I left off. Holding the Handle of the Kerning-stick in his left-Hand, He lays the side of the Letter to be Kern'd upwards with the Face of the Letter towards the end of the Kerning-stick: the side of the Letter against the side Sholder of the Kerning-stick, and the Foot of the Letter against the bottom Sholder of the Kerning-stick, and laying the end of the Ball of his left-Hand Thumb hard upon the Shanck of the Letter to keep its Side and Foot steady against the Sholders of the Kerning-stick, he with the Kerning-Knife in his right-Hand cuts off about one quarter of the Mettal between the Beard of the Shanck and the Face of the Letter. Then turning his Knife so as the back of it may lean towards him, he scrapes towards him with the edge of the Knife about half the length of that upper-side, viz. about so much as his Thumb does not cover: Then he turns the Face of the Letter against the lower Sholder of the Kerning-stick, and scraping fromwards him with a stroak or two of his Knife smoothenes that end of the Letter also.

If the other side of the Letter be not to be Kern'd it
it was before Rub'd on the Stone, as was shewed in the last ¶: But if it be to be Kern'd, then he makes a little hole in his Kerning-stick, close to the lower Sholder of it and full deep enough to receive all that part of the Face of the Letter that hangs over the Shanck, that the Shanck of the Letter may lie flat and solid on the bottom of the Kerning-stick, and that so the Shanck of the Letter bow not when the weight of the Hand presses the edge of the Kerning-Knife hard upon it. Into this hole he puts (as before said) so much of the Face of the Letter as hangs over the side of the Shanck, and so scrapes the lower end of the Letter and Kerns the upper end, as he did the former side of the Letter.

¶ 6. Of Setting up, or Composing Letters.

I described in § 5. ¶ 2. the Lining-stick, But now we are come to Setting up, or Composing of Letters. The Founder must provide many Composing-sticks; five or six dozen at the least. These Composing-sticks are indeed but long Lining-sticks, about seven or eight and twenty Inches long Handle and all: Whereof the Handle is about three Inches and an half long: But as the Lining-stick I described was made of Bras: So these Composing-sticks are made of Beech-Wood.

When the Boy Sets up Letters (for it is commonly Boys Work) The Caser Cas's about an hundred Quadrats of the same Body about half an Inch broad at least, let the Body be what it will, and of
the length of the whole Carriage, only by placing a flat Brass or Iron Plate upon the Stool of the Mold close against the Carriage and Body, to stop the Mettal from running farther.

The Boy (I say) takes the Composing-stick by the Handle in his left-Hand, clasping it about with his four Fingers, and puts the Quadrat first into the Composing-stick, and lays the Ball of his Thumb upon it, and with the fore-Finger and Thumb of his right-Hand, assisted by his middle Finger to turn the Letter to a proper position, with its Nick upwards towards the bottom side of the Composing-stick; while it is coming to the Stick, he at the same time lifts up the Thumb of his left-Hand, and with it receives and holds the Letter against the fore-side of the Quadrat, and after it, all the Letters of the same sort, if the Stick will hold them, If not he Sets them in so many Sticks as will hold them: Observing to Set all the Nick's of them upwards, as aforesaid. And as he Set a Quadrat at the beginning of the Composing-stick, so he fills not his Stick so full, but that he may Set another such Quadrat at the end of it.

¶ 7. Some Rules and Circumstances to be observed in Setting up Letters.

1. If they Drive a little out at Head or Foot, so little as not to require new Rubbing again, then he holds his Thumb harder against the Head or Foot, so as to draw the Driving end inward: For else when they come to Scraping, and Dressing the Hook of the Dref-
Dressing-Hook drawing Square, will endanger the middle or some other part of Letters in the Stick to Spring out: And when they come into the Dressing-block, the Knots of the Blocks drawing also square subject them to the same inconvenience. And if they Drive out at the Head, the Feet will more or less stand off one another: So that when the Tooth of the Plow comes to Dress the Feet, it will more or less job against every Letter, and be apt to make a bowing at the Feet, or at least make a Bur on their sides at the Feet.

2. When Short-Letters are begun to be Set up in a Stick, the whole Stick must be fill'd with Short-Letters: Because when they are Dressing, the Short Letters must be Bearded on both sides the Body: And should Short-Letters or Ascending or Descending or Long stand together, the Short cannot be Bearded because the Stems of the Ascending or Descending or Long-Letters reach upon the Body to the Beard: So that the Short-Letters cannot be Bearded, unless the Stems of the other Letters should be scraped off.

3. When Long-Letters are begun to be Set up in the Stick, none but such must fill it, for the reason aforesaid.

4. If any Letters Kern'd on one side be to be Set up, and the Stems of the same Letters reach not to the opposite Beard as f or f, in Setting up these or such like Letters, every next Letter is turned with its Nick downwards, that the Kern of each Letter may lie over the Beard of its next. But then they must be all Set up again with a Short-Letter.
Letter between each, that they may be Bearded.

As every Stick-full is set up, he sets them by upon the Racks, ready for the Dresser to Dress, as shall be shewed in the next §.

The Racks are described in Plate 21. at A. They are made of Square Deal Battens about seven Inches and an half long, as at a b a b a b, and are at the ends b b b let into two upright Stiles, standing about sixteen Inches and an half affunder, and the fore-ends of the Racks mounting a little, that when Sticks of Letters is Set by on any two parallel Racks, there may be no danger that the Letters in them shall slide off forward; but their Feet rest against the Bottom-Ledges of the Composing-sticks. They set by as many of these Sticks with Letter in them, as will stand upon one another between every two Rails, and then set another pile of Sticks with Letter in them before the first, till the length of the Rail be also filled with Sticks of Letter before one another. They set all the Sticks of Letters with their ends even to one another with the Faces of the Letter forwards.

This Frame of Racks is always placed near the Dressing-Bench, that it may stand convenient to the Letter-Dressers Hand.


Here be several Tools and Machines used to the Dressing of Letters: And unless I should describe them to you first, you might perhaps in my following discourse not well understand me:
me: Wherefore I shall begin with them: They are as follows.
1. The Dressing-Sticks.
2. The Bench, Blocks and its Appurtenances.
3. The Dressing-Hook.
4. The Dressing-Knife.
5. The Plow.
6. The Mallet.
Of each of these in order.

¶ 2. Of the Dressing-Sticks.

I need give no other Description of the Dressing-Sticks, than I did in the last § and ¶ of the Composing-Sticks: Only they are made of hard Wood, and of greater Substance, as well because hard Wood will work smoother than soft Wood, as because greater Substance is less Subject to warp or shake than smaller Substance is. And also because hard Wood is less Subject to be penetrated by the sharpness of the Bur of the Mettal on the Letters than the soft.

¶ 3. Of the Block-Grove, and its Appurtenances.

The Block-Grove is described in Plate 21. a b The Grove in which the Blocks are laid, two Inches deep, and seven Inches and an half wide at one end, and seven Inches wide at the other end: One of the Cheeks as c is three Inches and an half broad at one end, and three Inches broad at the other end, and the other Cheek three Inches broad the whole Length
Length: The Length of these Cheeks are two and twenty Inches.

The Wedge e f is seven and twenty Inches and an half long, two Inches broad at one end, and three Inches and an half broad at the other end; And two Inches deep.

The Bench on which the Dressing-Blocks are placed, are about sixteen Inches broad, and two Foot ten Inches high from the Floor. The Bench hath its farther Side, and both ends, railed about with flat Deal about two Inches high, that the Hook, the Knife, and Plow, &c. fall not off when the Work-man is at Work.

The Blocks are described in Plate 21 at a b: They are made of hard Wood. These Blocks are six and twenty Inches long, and each two Inches square. They are Male and Female, a the Male, b the Female: Through the whole Length of the Male-Block runs a Tongue as at a b, and a Groove as at c d, for the Tongue of the Plow to run in; This Tongue is about half an Inch thick, and stands out square from the upper and under sides of the Block. About three Inches within the ends of the Block is placed a Knot as at c c: These Knots are small square pieces of Box-wood, the one above, and the other below the Tongue.

The Female Block is such another Block as the Male Block, only, instead of a Tongue running through the length of it a Groove is made to receive the Tongue of the Male-Block, and the Knots in this Block are made at the contrary ends, that when the Face of a Stick of Letter is placed on the Tongue
Tongue the Knot in the Male-Block stops the Stick of Letter from sliding forwards, while the other Knot in the Female-Block at the other end, by the knocking of a Mallet on the end of the Block forces the Letter between the Blocks forwards, and so the whole Stick of Letters between these two Knots are screwed together, and by the Wedge e f in Plate 21 (also with the force of a Mallet) Wedges the two Blocks and the Stick of Letter in them also tight, and close between the sides of the two Blocks; that afterwards the Plow may more certainly do its Office upon the Foot of the Letter; as shall be shewed hereafter.

¶ 3 Of the Dressing-Hook.

The Dressing-Hook is described in Plate 21 at c. This is a long square Rod of Iron, about two Foot long and a Great-Primmer square: Its end a is about a two-Lin'd English thick, and hath a small Return piece of Iron made square to the under-side of the Rod, that when the whole Dressing-Hook is laid along a Stick of Letter, this Return piece or Hook may, when the Rod is drawn with the Ball of the Thumb, by the Knot on the upper side of it at c, draw all the Letter in the Stick tight and close up together, that the Stick of Letter may be Scraped, as shall be shewed.

¶ 4 Of
4 Of the Dressing-Knife.

The Dressing-Knife is delineated at d in Plate 21. It is only a short piece of a Knife broken off about two Inches from the Sholder: But its Edge is Basi'd away from the back to the point pretty suddenly to make it the stronger: The Sprig or Pin of the Handle is commonly let into an Hole drilled into a piece of the Tip of an Harts-horn, as in the Figure and is fastned in with Ros'en, as other Knives are into their Handles.

5 Of the Plow.

The Plow is delineated in Plate 21 at e: It is almost a common Plain (which I have already describ'd in Vol. 1. Numb. 4. Plate 4. and § 2 to 9.) only with this distinction, that through the length of the Sole runs such a Tongue, as does through the Male-Block to slide tight and yet easily through the Groove made on the top of the Male-block: Its Blade makes an Angle of 60 Degrees with the Sole of it.


The Letter Desser hath (as I told you before) his Letter Set up in Composing-Sticks, with their Nicks upwards, and those Sticks set upon the Racks: Therefore he takes one Stick off the Racks, and placing the Handle of the Composing-Stick in his left-hand,
he takes the contrary end of the Dressing-stick in his right-hand, and laying the Back of the Dressing-stick even upon or rather a little hanging over the Back of the Composing-stick, that the Feet of the Letter may fall within the Bottom-Ledge of the Dressing-stick; He at the same time fits the Side-Ledge of the Dressing-stick against the farther end of the Line of Letters in the Composing-stick: And holding then both Sticks together, his left-Hand at the Handle-end of the Composing-stick, and his right-Hand within about two Handfuls of the Handle-end of the Dressing-stick, He turns his Hands, Sticks and all, outward from his left-Hand, till the Composing-stick lies flat upon the Dressing-stick, and consequently the Letters in the Composing-stick is turned and laid upon the Dressing-stick.

Then he goes as near the Light as he can with the Letters in his Dressing-stick, and examins what Letters Come not well either in the Face or Shank: So that then holding the Dressing-stick in his left-Hand, and tilting the Bottom-Ledge a little downward, that the Feet of the Letter may rest against the Bottom-Ledge, and laying the Ball of his Thumb upon any certain Number of Letters between his Body and the Letter to be Cast out, He with the Foot of a Space or some thin Letter, lifts up the Letter to be Cast out, and lets it fall upon the Dressing-Bench: and thus he does to all the Letters in that Stick that are to be Thrown out.

Then taking again the Dressing-Stick in his left-Hand at or near the handle of it, he takes the Dressing-Hook at the Knot, between the fore-Finger and Thumb
Thumb of his right-Hand, and laying the Hook over the edge of the Quadrat at the farther end of the Dressing-stick, near the bottom-Ledge of it, he slips his right-Hand to the Handle of the Dressing-stick, and his left-Hand towards the middle of the Dressing-stick, so as the end of the Ball of his Thumb may draw by the farther end of the Knot on the Dressing-Hook the whole Dressing-Hook, and the Hook at the end of it the whole Stick of Letter close together towards him; While at the same time he with his Fingers clutched about the Stick and Letter, and the Thumb-ball of his Hand presses the under flat of the Hooking-stick close against the Letter and Dressing-stick, that the Letter in the Stick may lie fast and manageable.

Then he takes the Handle of the Dressing-Knife in his right-Hand, and inclining the back of it towards his Body, that its Basi-edge may Cut or Scrap the smother, He Scrapes twice or thrice upon so much of the whole Line of Letters as lies between the outer-side of the Dressing-Hook and the Face of the Letter.

But if twice or thrice Scraping, have not taken all the Bur or irregularities off so much of the Letter as he Scraped upon, he Scrapes yet longer and oftener till the whole number of Letters in the Dressing-stick from end to end seems but one intire piece of Mettal.

Thus is that side of the fore-part (viz. that part towards the Face) of the Shank of the Body finish'd.

To Scrape the other end of that side of the Letter
ter, viz. that towards the Feet; He turns the Handle of the Stick from him, and removing the Dressing-Hook towards the Face of the Letter which is already Scraped, he places his Thumb against the Knot of the Dressing-Hook, and presses it hard from him, that the Hook of the Dressing-Hook being now towards him, may force the whole Stick of Letter forwards against the Side-Ledge of the Dressing-stick; that so the whole Line in the Stick may lie again the faster and more manageable: Then he Scrapes with the Dressing-Knife as before, till the end of the Shank of the Letter towards the Feet be also Dress.

Then he lays by his Dressing-Hook, and keeping his Dressing-stick of Letter still in his left-Hand, he takes a second Dressing-stick, with its Handle in his right-Hand, and lays the Side-Ledge of it against the hither side of the Quadrat at the hither end of the Dressing-stick, and the bottom-Ledge of the second Stick hanging a little over the Feet of the Letter, that they may be comprehended within the bottom-Ledge of the second Dressing-stick; and so removing his left-Hand towards the middle of both Dressing-sticks, and clasping them close together, he turns both Hands outwards towards the left, till the Letter in the first Dressing-stick lie upon the second Dressing-stick, and then the Face of the Letter will lie outwards toward the right-Hand, and the Nicks upwards. Then he uses the Dressing-Hook and Dressing-Knife to Scrape this side the Line of Letter, as he did before to the other side of the Line of Letter: So shall both sides be Scraped and Dress.

Having thus Scraped both the sides, He takes the Handle
Handle of the Dressing-stick into his left-Hand, as before, and takes the Male-block into his right-Hand, and placing the Tongue of the Block against the Face of the Letter in the Dressing-stick, he also places the Knot of the Block against the farther side of the Quadrat at the farther end of the Stick, and so placing his right-Hand underneath the middle of the Dressing-stick and Block, he turns his Hand outwards towards the left, as before, and transfers the Letter in the Dressing-stick to the Male-Block: Yet he so holds and manages the Block that the Shanck of the Letter may rest at once upon the side of the Block the Knot is placed in, and the Face of the Letter upon the Tongue.

When his Stick of Letters is thus transfer'd to the Male-Block, He claps the middle of the Male-Block into his left-Hand, tilting the Feet of the Letter a little upwards, that the Face may rest upon the Tongue, and then takes about the middle of the Female-Block in his right-Hand, and lays it so upon the Male-Block, that the Tongue of the Male-Block may fall into the Tongue of the Female-Block, and that the Knot at the hither end of the Female Block may stand against the hither side of the Quadrat at the hither end of the Line of Letters: So that when the Knot of the Male-Block is lightly drawn towards the Knot of the Female-Block, or the Knot of the Female-Block lightly thrust towards the Knot of the Male-Block, both Knots shall squeeze the Letter close between them.

Then he grasps both Blocks with the Letter between them in both his Hands, and lays them in the
the Block-Groove, with the Feet of the Letter upwards, and the hither side of the hither Block against the hither Cheek of the Block-Groove. And putting the Wedge into the vacant space between the Blocks and the further Cheek of the Block-Groove, he lightly with his right-Hand thrusts up the Wedge to force the Blocks close together, and pinch the Letter close between the Blocks.

Then with the Balls of the Fingers of both his Hands, he Patts gently upon the Feet of the Letter, to press all their Faces down upon the Tongue; which having done, he takes the Mallet in his right-Hand, and with it knocks gently upon the head of the Wedge to pinch the Letter yet closer to the insides of the Blocks. Then he Knocks lightly and successively upon the Knot-ends of both the Blocks, to force the Letters yet closer together. And then again knocks now pretty hard upon the head of the Wedge, and also pretty hard upon the Knot-ends of the Blocks, to Lock the Letter tight and close up.

Then he places the Tongue of the Plow in the upper Groove of the Block; And having the Tooth of the Iron fitted in the Plow, so as to fall just upon the middle of the Feet of the Letter, he grasps the Plow in his right-Hand, placing his Wrist-Ball against the Britch of it, and guiding the fore-end with his left-Hand, slides the Plow gently along the whole length of the Blocks; so as the Tooth of the Iron bears upon the Feet of the Letter: And if it be a small Letter he Plows upon, the Tooth of the Iron will have cut a Groove deep enough through the length of the whole Block of Letters:
letters: But if the Body of the Letter be great, he re-iterate his Travertes two three or four times according to the Bigness of the Body of the Letter, till he have made a Groove about a Space deep in the Feet of the Shancks of the whole Blocks of Letter, and have cut off all the irregularities of the Break.

Then with a small piece of Buff or some other soft Leather, he rubs a little upon the Feet of the Letter to smoothen them.

Then he unlocks the Blocks of Letter, by knocking with the Mallet upon the small end of the Wedge, and first takes the Wedge from between the Blocks and Cheeks, and lays it upon the farther Cheek, and afterwards takes the Blocks with Letter in it near both ends of the Blocks between the Fingers and Thumbs of both his Hands, and turns the hitherto Block upon the hitherto Cheek, and with his Fingers and Thumbs again lifts off the upper Block, leaving the Letter on the undermost Block with its Face against the Tongue.

Then taking the Block with Letter in it in his left-Hand, he places the Knot-end from him, and takes the Handle of the Dreffing-stick in his right-Hand, and lays the Side-Ledge of it against the hither side of the Quadrat at the hither end, and the Bottom-ledge against the Feet of the Letter, he grasps the Handle of the Dreffing-stick Block and all in his left-Hand, and lays his right-Hand Thumb along the under side of the Dreffing-stick about the middle, and with the Fingers of the same Hand grasps the Block, and turning his Hands, Block, and Dreffing-stick to the right, transfers the Letter in the Block upon the Dreffing-stick. Then
Then grasping the *Dressing-stick* by the *Handle* with his left-Hand, he with his right-Hand takes the *Dressing-Hook* by the *Knot*, and lays the insides of the *Hook* of it against the farther side of the *Quadrat* at the farther end of the *Stick*, and drawing the *Hook* and *Letter* in the *Dressing-stick* with his left Thumb by the *Knot* close up toward him, he resting the *Stick* upon the *Dressing-bench* that he may *Scrape* the harder upon the *Beard* with the Edge of the *Dressing-Knife*, *Scrapes* off the *Beard* as near the *Face* as he dares for fear of spoiling it, and about a Thick *Space* deep at least into the *Shank*.

If the Bottom and Top are both to be *Bearded*, He transfers the *Letter* into another *Dressing-stick*, as hath been shewed, and *Beards* it also as before.

2. *Some Rules and Circumstances to be observed in Dressing of Letters.*

1. The *Letter-Dresser* ought to be furnish'd with three or four sorts of *Dressing-sticks*, which differ nothing from one another save in the Height of their *Ledges*. The *Ledges* of one pair no higher than a *Scaboard*. This pair of *Sticks* may serve to *Dress*, *Pearl*, *Nomparel*, and *Brevier*. Another pair whose *Ledges* may be a *Nomparel* high. And this pair of *Dressing-sticks* will serve to *Dress* *Brevier*, *Long-Primmer*, and *Pica*: Another pair whose *Ledges* may be a *Long-Primmer* high: And these *Dressing-sticks* may serve to *Dress* *Pica*, *English*, *Great-Primmer*, and *Double-Pica*. And if you will another pair of *Dress-
Dressing-sticks, whose Ledges may be an English High: And these Dressing-sticks may serve to Dress all big Bodyed Letters, even to the Greatest.

2. As he ought to be furnish'd with several sorts of Dressing-sticks as aforesaid: So ought he also to be furnish'd with several Blocks, whose Knots are to correspond with the Sizes of the Ledges of the Dressing-sticks, for the Dressing of several Bodies as aforesaid.

3. He ought to be furnish'd with three or four Dressing-Hooks, whose Hooks ought to be of the several Depths aforesaid, to fit and suit with the several Bodied-Letters.

4. He must have two Dressing-Knives, one to lie before the Blocks to Scrape and Beard the Letter in the Sticks, and the other behind the Dressing-blocks to use when occasion serves to Scrape off a small Bur, the Tooth of the Plow may have left upon the Feet of the Letter. And though one Dressing-Knife may serve to both these uses: Yet when Work-men are in a Train of Work they begrutch the very turning the Body about, or stepping one step forward or backward; accounting that it puts them out of their Train, and hinders their riddance of Work.

5. For every Body of Letter he is to have a particular Plow, and the Tooth of the Iron of each Plow is to be made exactly to a set bigness, the measure of which bigness is to be taken from the size of the Break that is to be Plowed away. For Example, If it be a Pearl Body to be Plowed, the breadth of the Tooth ought not to be above a thin Scaboard: Because the Break of that Body cannot be bigger, for Reasons I have
have given before; But the Tooth must be full broad enough, and rather broader than the Break, lest any of the irregularity of the Break should be left upon the Foot of the Letter. And so for every Body he fits the Tooth of the Iron, full broad enough and a little broader than the size of the Break. This is one reason why for every particular Body he ought to have a particular Plow. Another reason is.

The Tooth of this Plow must be exactly set to a punctual distance from the Tongue of the Plow: For if they should often shift Irons to the several Stocks of the Plow, they would create themselves by shifting more trouble than the price of a Stock would compensate.

A Fount of Letter being new Cast and Drest, the Boy Papers up each sort in a Cartridge by itself, and puts about an hundred Pounds weight, viz. a Porters Burthen into a Basket to be sent to the Master-Printers.

The Steel-Punches being now Cut, the Molds made, the Matrices Sunk, the Letters Cast, and Drest, the application of these Letters falls now to the task of the Compositer; whose Trade shall be (God willing) the Subject of the next Exercises.

FINIS.
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THE FIRST EDITION PUBLISHED IN THE YEAR 1683

WITH PREFACE AND NOTES BY
THEO. L. DE VINNE

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