To all whom it may concern:

Be it known that I, William S. Eaton, a citizen of the United States, residing at Sag Harbor, in the county of Suffolk and State of New York, have invented certain new and useful Improvements in Geometrical Machines, of which the following is a specification, reference being had therein to the accompanying drawings, which form a part thereof.

My invention relates to geometrical machines, and more particularly to a machine adapted to create intricate designs, by means of a master bearing a simple outline, character or base, having as a whole no resemblance to the design to be created or produced.

The main object of the invention is to produce mechanically, from an elementary outline, character or base, in itself simple, an intricate design or geometrical figure having as a whole, no similitude to the elementary outline, character or base.

A further object is to provide a machine for creating geometrical designs from a simple elementary outline, character or base, which is capable of such adjustment as to permit a large number of entirely dissimilar geometrical designs to be produced from a single elementary outline, character or base, which machine during a single sequence of operations, will create and superimpose one upon the other, two dissimilar line designs.

A still further object is to provide a machine for creating intricate geometrical designs or figures from a simple elementary outline, character or base, which machine will be so constructed and arranged as to operate with great accuracy and with a certainty which will not require expert knowledge of machinery, nor any skill in drafting or engraving.

A still further object is to provide a machine which may be operated continuously by a sequence of similar operations to create or produce any geometrical design.

A still further object is to provide a machine capable of use to produce metallic plates for engraving purposes, prepare metallic plates for acid etching, or make matrices adapted for use in making cameo or intaglio line safety designs for negotiable instruments.

A still further object is to provide a machine adapted to create intricate rosette designs in which the operation of the machine is variable as determined by a master or element having indicated therein an elementary outline, character or base, the configuration of which and the adjustable relation of the master or element to other cooperating elements of the machine will determine the character of the rosette, thus eliminating the purely mechanical nature of the design and minimizing likelihood of duplication thereof.

A still further object is to provide a machine of this character wherein the operation of the machine, irrespective of the nature of the design to be created, will always be the same, the compelling or controlling means act entirely independent, and without the control, of the operator of the machine.

A still further object is to provide a machine of this character wherein a plurality of different compelling or controlling means may be interchangeably used upon the machine and adjustments may be made in a manner to vary the character of the created design at the will of the operator, thus presenting additional elements of safety and preventing duplication or reproduction of the design, even with a similar machine, unless the exact setting of the compelling or controlling element and other adjustments are known to the operator.

A still further object is to provide a machine wherein the spacing of the lines may be varied, thus not only varying the design, but adapting the machine to different classes of work. And a still further object is to provide a machine which will be simple in its design and mode of operation, and capable of quick and accurate adjustment to secure the creation of any desired design.

The invention consists primarily in a geometrical machine embodying therein an elementary outline, character or base, means adapted to follow said elementary outline, character or base and successively describe a plurality of similar outlines upon a work.
plate or sheet, and means adapted to vary the relative position of said outline, character or base, and said work plate or sheet following each actuation of said first named means; and in such other novel features of construction and combination of parts as are hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

10 Referring to the drawings—Figure 1 is a side elevation of a machine embodying my invention; Fig. 2 is a front elevation thereof; Fig. 3 is a plan view in detail of the controlling or compelling mechanism by means of which the movements of the support for the means carrying the elementary outline, character or base are defined, parts thereof being broken away; Fig. 4 is a section on the line 4—4 of Fig. 3; Fig. 5 is a detail view of one form of the supporting means for the work point, used in making matrices, proofs or plates for etching; Fig. 6 is a detail view, of a different form of support for the work point adapted to actually remove the metal for making cameo or intaglio plates; Figs. 7, 8 and 9 are detail views illustrating some different forms of controlling plates; and Figs. 10, 11 and 12 are detail views illustrating some different elementary outlines, characters or bases which may be used.

Like numerals refer to like parts throughout the several views.

In the accompanying drawings, I have shown an embodiment of my invention which includes therein the essential characteristics of a well known type of pantographic engraving machine, which in actual use I have found to give highly satisfactory results. This machine, however, is merely typical of a large number of machines in which my improvement may be incorporated, and if desired, still other and special designs of machines adapted for special uses may be constructed so as to embody the essential characteristics of my invention.

In the following description, I have referred more particularly to the particular type of machine shown in the drawings, it being expressly understood, however, that it is not my intention to in any way limit myself to any particular mechanisms for transmitting movement as defined by the elementary outline, character or base, to the mechanism by which the design is produced.

My invention is especially adapted for use in creating designs for, or upon printing plates, and matrices, for use in developing printing plates, which designs are in the form of rosettes or other intricate geometrical designs, to be used in connection with the production of safety papers such as are used in bank notes, negotiable papers or instruments. Heretofore, these safety designs have been either made by hand or upon a rose engine or engine lathe, the design resulting from certain predetermined mechanical movements in the machine itself. By this means, a limited number of designs only could be produced, and the safety factor was limited by the known capacity of the machine. Growing out of this condition, it has heretofore been the custom to develop a part of the design by machine and the balance by hand. A rose engine is capable only of producing scroll work, and if it be desired to include in the white line safety elements of a note, paper or instrument, an element other than a scroll, such as is usually found in bank notes, this is always done by hand. The old method of producing safety designs referred to required a period of from two to ten weeks, or more of expensive, high class skilled labor, and as I have heretofore stated, the designs created in most instances were all modifications of one general design.

By my improved mechanism, I am enabled to secure intricate geometrical designs, susceptible of practically infinite variations, each of which designs will be complete in itself and, when a plate is made upon a machine, will require no hand finishing. I am also enabled to mechanically superimpose one design upon another, or insert a number or word design in the body of a scroll work design. I am also enabled to make a proof design and a completed design in a materially shorter time than is possible with the old rose engine and hand work method.

In the form of the invention shown in the accompanying drawings, I indicates a central column carrying a bed plate 2, for a movable table 3 adapted to carry the sheet or plate upon which the design is to be formed. Said column is mounted upon the main table 4 of the machine which may be supported in any desired manner. The table 3 is mounted to have universal movement upon a single plane so as to place no limitation upon the movement thereof, and thus permit the formation of straight or curved lines in any direction. At 5 I have shown a steadying mechanism to insure absolute accuracy in the movement of the work supporting table 3. At 6 are ball bearing mounts for the table 3 which insure absolute freedom of movement. Mounted upon the column 1 above the work table 3 is a supporting means, as the oscillating arm 7, for a work point 8 which in the form of the invention shown is an ordinary graver. The oscillating work point carrying arm is controlled by the link, tr. sl. and lever mechanism 9, this point being adapted to be brought into contact with the work surface through gravity only.
Mounted by means of a universal joint 10 and a vertically adjustable collar 11 upon the column 1, is a transmitter 12, one end of which is adapted to have mounted therein a tracing point or stylus 13, and the other end of which is connected by means of a universal joint, not shown, with the work table 3.

The adjustability of the collar 11 is for the purpose of varying the range of movement of the table as compared with that of the tracing point or stylus. Carried by the work table 3 is a work support 14 having means whereby a plate or sheet may be attached thereto, which means are adapted to be released to permit the adjustment of the plate or sheet on said table to secure the proper placing of the design on said plate or sheet.

In Fig. 6 I have shown a rotary spindle 15, and old and well known means for setting it for a predetermined depth of cut, and a lever mechanism 16, by means of which the work point or routing tool is brought into engagement with the work.

By this means a cameo or an intaglio plate may be accurately produced which plate may be used as a master plate from which transfer rolls may be made, or the plate itself may after hardening, be used for surface printing.

The mechanism above described has been heretofore patented to me and it is not my intention to claim such mechanism broadly at this time. The elements above referred to constitute one type of pantographic engraving machine embodying one character of reproducing means, the mode of operation of which contemplates the exact reproduction of a design or pattern upon any desired scale. By my present invention, however, I do not reproduce a fixed design, but vary the operation of the above described mechanism in a manner whereby a design is created which as a whole bears absolutely no resemblance to the original design or master. This mechanism comprises a support for the master or element having thereon an elementary outline, character or base, which support is capable of movement as defined by an actuating mechanism, and a controlling plate which determines the general character of the outline of the rosette or other design, although by adjustments provided, this outline itself may be varied.

The actuating mechanism comprises a rotary base 17, mounted upon the main bed 4 of the machine and having mounted thereon a slide 18, capable of movement radially of the center of rotation thereof. This base is actuated by the weight 19, through the cord 20 which weight has the function of aiding in that rotary movement of the base which will be hereinafter referred to.

Surrounding the base 17 is a rim 21, adapted to receive a controlling or cam plate 22, having an opening therein defining the extent and direction of movement of the slide 18. The configuration of the opening 70 through the plate 22 may be varied infinitely, (examples of such variations being shown in Figs. 7 to 9), thus making it possible to vary infinitely the general character of the outline of the geometrical design to be created.

The slide 18 carries a contact pin 23 adapted to be forced into engagement with the edge of the opening in the plate 22 by the springs 24 acting upon said slide, thus imparting to said slide with the rotation of the base 17, an eccentric movement due to the simultaneous rotary movement of said slide and its linear traverse under the control of said springs and said controlling plate. To secure the desired movement of the slide 18 means are provided for imparting a rotary movement to said base, which means operate simultaneously with the means imparting linear movement to said slide, that is the springs 24 and the controlling plate 22. This actuating mechanism comprises a ratchet wheel 25 formed on or carried by the base 17, which ratchet is acted upon by the spring pressed detent dog 26 and the actuating dog 27 carried by the oscillating plate 28 rotatably mounted upon a pivot in the base 17.

The function of the dog 26 is to prevent a return movement of the base upon the return oscillation of the plate 28. The dog 26 is provided with a lock pin 29 by means of which this dog may be disengaged from the ratchet to facilitate the restoration of the base 17 to normal. The movement of the plate 28 is guided by a slot therein through which a portion of the rim 21 projects, this plate having movement beneath other portions of said wall.

Adjacent to the operating handle 30 of the plate 28, I provide an adjustable stop comprising a pin 31 adapted to be mounted in any one of a series of graduated openings carried by the stop plate 32.

The controlling plate 22 is detachably mounted upon the rim 21 so that said plate may be removed at any time and another plate having a different design of opening substituted therefor to vary the character of the design to be created, or the position of the plate upon the rim 21 may be changed.

The slide 18 is provided with dogs, gripper jaws or other securing means 33, by means of which the plate or other device carrying the elementary outline, character or base may be firmly mounted upon said slide. This means for securing the element carrying the outline, character or base permits a variance in the positioning thereof relative to the center of rotation of the base.
17, which adjustment, however slight, will have the effect of varying the character of the design created either as to its general outline, or its center design. The bearing pin 23 is also capable of adjustment upon the slide 18, the holes 34 at opposite ends thereof being provided so as to vary the radial position of this pin relative to the center of rotation of the base 17.

By the mechanism heretofore described, I am enabled to vary not only the relative position of the support for the elementary outline, character or base, and the work bed, but also the relative position of the work bed and the work point, thus causing said point to operate upon a different portion of the plate, sheet or body carried by said work bed, this variance causing an outline similar to said elementary outline, character or base to be successively described upon different portions of the work plate or sheet. Hence, variance in the design created from any elementary outline, character or base, may be accomplished either by the substitution of one controlling plate for another having an opening of dissimilar configuration, by a change of position of said outline, character or base upon the slide, or by a change of the position of the slide relative to the center of rotation of the base 17 and to the controlling plate through the adjustment or change in position of the contact pin 23. A further variance in the appearance of the design, however, changing its general character, may be accomplished by means of the stop pin 31, the position of which will control the number of lines entering into the created design and their spacing. The design may be still further modified by accomplishing any of these adjustments during the operation of developing the design.

In Figs. 10 to 12, I have shown three illustrative outlines, characters or bases, other than that shown in Fig. 3, and as these themselves may be varied infinitely, it can be readily understood that the number of designs which may be created is infinite, and yet, whatever the nature of the design created the movements of the operator and of the operative parts of the machine are always the same, varying merely in degree, in some instances.

The eccentricities of the machine are so pronounced that even with a definite outline, character or base, and a definite controlling plate, it is impossible to determine what the character of the created design will be, or what the formation of the center of the design will be, and this uncertainty is also present with every adjustment of the machine, irrespective of a change of the elementary outline, character or base, or of the controlling plate itself. In fact, to duplicate a given design, it is necessary to record not only the elementary outline, character or base, and the controlling plate, but also every adjustment upon the machine, and without such a record, a reproduction of the design even with a similar machine could be secured only by chance.

In the drawings, I have shown the master or element carrying the elementary outline, character or base as consisting of a metallic plate 35 having a single line geometrical figure cut thereinto so as to form a guide for the tracing point or stylus 13, and the work plate 36 upon which the design is to be created as a prepared plate adapted to have portions thereof removed by the graver, although in no sense am I limited to the use of such.

Throughout this specification when referring to an elementary outline, character or base, I contemplate a geometrical figure or an incomplete geometrical figure as distinguished from mere straight or curved lines, the outline of which figure taken as a base and repeatedly reproduced in the manner determined by the controlling or compelling mechanism will create, form or constitute the completed intricate geometrical design.

By the term work plate or sheet as used in the specification, I contemplate a metallic plate from which portions of the metal are to be actually removed; a copper plate coated with resist to be removed preparatory to an acid etching process; proof glass or paper upon which a design may be made to determine the suitability thereof before making a plate; matrices from which a cast is to be made, or any other substance or material adapted to receive in any manner whatsoever, a design. By the term work point it is to be included any instrument or implement for marking, cutting or scratching upon any material.

The operation of the herein described machine is substantially as follows:—Before beginning work with the machine, the controlling or compelling cam plate 22 is first secured upon the rim 21 in the desired position. By providing the rim 21 with regularly spaced screw holes, said cam plate may be shifted around in any desired position upon said rim. The master or element 35 is then mounted upon the slide 18 in the desired relation to the center of rotation of the support 17, said slide 18 being provided with scale marks to facilitate the accurate setting or positioning of this master or element. The stop pin 31 is then set in the desired position on the plate 32 to limit the movement of the lever 28 with each actuation thereof, and the bearing pin 23 is set in the desired hole. These various adjustments having been accomplished, the machine is ready to be placed in operation. The work plate is then mounted upon the
work bed 14, being so placed therein that
the design to be created will appear in the
proper position upon this plate. The posi-
tioning of this plate does not in any way
affect the character of the design produced
or created. The tracing point or stylus 13
is then brought into position relative to any
point of the elementary outline, character
or base, and the treadle mechanism 9 actu-
ted to bring the work point into engage-
ment with the work plate or sheet 36. When
the parts are in this position, the tracing
point or stylus 13 is moved completely
around the elementary outline, character or
base, and brought to rest at its starting
point. Thereafter either with or without
actuating the treadle mechanism 29, the le-
ver 28 is actuated, rotating the support 17
and slide 18, and changing the position of
the slide 18 to an extent defined by the con-
trolling or compelling plate 22. The ac-
tuation of the lever 28, therefore, has the two-
fold function of varying the relative posi-
tion of the elementary outline, character or
base and the work plate or sheet, and of
spacing the successive line reproductions of
said elementary outline, character or base
in the created design. If the work point be
raised from the work plate or sheet, the out-
line of the figure will be interrupted, or
formed of a series of sections the character
of each of which will be defined by the con-
figuration of an end of the elementary out-
line, character or base. If, however, the
work point be held in engagement with the
work plate or sheet, the outline of the cre-
ated design will be defined by a continuous
line connecting the series of sections above
referred to, or a part thereof only, accord-
ing to the setting of the machine. The alter-
nate tracing of the elementary outline, char-
acter or base, and actuation of the lever 28
is repeated until the rotary support 17 and
its slide 18 reach the starting point in op-
terating the machine, or until the desired
depth of cut in the lines of the design is secured,
when the material of the work plate or sheet
itself is to be removed. The controlling
plate 22 has the effect of imparting to the
slide 18 movement toward or from the
center of rotation of the support 17 to an
extent controlled by the contour or configu-
ration of the cut out portion of said plate,
but while this plate 22 will absolutely de-
terminate and control the movements of the
slide 18, the outline of the created design
and its dimensions will not necessarily be
the same as the outlines of the cut out por-
tion of this plate, nor are the dimensions
always the same, as the adjustment of the
elementary master or element 35 upon the
slide 18 will vary both the character of the
outline, body and center design of the
created design, and its dimensions. For in-
stance, if the elementary master or element
35 be set upon the slide 18 close to the bear-
ing pin 23, and entirely upon one side of
the center of rotation of the support 17, the
outline of the created design will be sub-
stantially the same as the outline of the
opening in the plate 22, and the dimensions
of said design will be large. Also when the
said master or element is so set, the lines
upon the design may or may not intersect
the center of the created design, (according
75 to the dimensions of the elementary outline,
character or base), thus producing one
character of center. If, however, the said
master plate or element be set closer to or
with the major portion thereof only upon one
side of the center of rotation of the sup-
port 17, the outline will remain the same as
before but the lines will intersect each other
and the center of the design at different
points, and by extending upon the opposite
sides of this central point, modify this de-
sign about the center, thus creating an en-
tirely different design, although one having
the same general outline.

When the quantity of movement of the 90
slide 18 under the control of the plate 22 is
small, that end of the elementary outline,
character or base most removed from the
center of rotation of the plate 17 and adja-
cent, or toward, the pin 23, will always de-
scribe the outline of the created design. If,
however, the quantity of movement im-
parted by the plate 22 be great, at some
point of the design, one end of the ele-
mentary outline, character or base may be made
by the setting of the plate 35, to describe
an outline dissimilar to any portion of the
controlling plate and at another point the
other end thereof will describe the outline.
This eccentricity will create a design where-
in not only the center will be extremely
complicated, but the outline itself, unless the
master or element bearing the elementary
outline, character or base be set close to the
pin 23, will have absolutely no similarity to
the configuration of the cut out portion of
the controlling plate. If, however, the mas-
ter plate or element be set so as to bring
the elementary outline, character or base,
either wholly or in major part upon that
side of the center of rotation opposite that
of the bearing pin 23, the effect will be an
outline in the created design which will
possess no similarity to the design of the
cut out portion of the controlling plate 22.
Although the center of the figure may bear
some resemblance to the cut out portion of
said plate. The explanation of this is that
the outline of the created design will ordi-
narily be defined by that portion or end of
the elementary outline, character or base
which is closest to the cut out portion of the
plate 22. Hence when the master or ele-
ment 35 is mounted wholly or in major part
upon that side of the center of rotation of
the support 17 toward the bearing pin 28, the
to the elementary outline, character or base
the movements of the slide under the control of
the plate 22. In other words, if the
the master plate or element will also move outwardly or away
from the center of rotation of the support
and to an extent defined by said plate
If, however, the said master or element be upon
the other side of the center of rotation
of the support 17, as the pin 25 and slide
move outwardly or away from the
center of rotation of said support 17, the
control of the plate 22, the portion of
the elementary outline, character or base
form the outline of the created design
instead of moving outwardly from the
center of rotation of the support 17 will move
outside said center of rotation, or vice versa,
and thus not coincide with the configuration
of the cut-out portion of the plate 22.
This difference is further accentuated by the
changes in the point of intersection of the
numerous lines. Under some conditions a
portion of the elementary outline, character or base will form a portion of the center
of the design, and at points of the design it
will project beyond the normal outline of
the created design and thus form a part of the
outline of the design which is particularly noticeable in controlling plates wherein
the cut-out portion is of a configuration to
impart sufficient movement to the slide 18 to
cause the major portion of the elementary
outline, character or base to be first on one
side of the center of rotation of the support
17, and then on the other side thereof. This
will be readily understood from the fact that
that portion of the design which at any time
is closest to the controlling plate 22 will
constitute the outline of the created design
and with a constant shifting of the slide
18, one end of the elementary outline, character or base may at one time be close to
said plate while at other times another portion
of said elementary outline, character or base may be close thereto.

From the foregoing, it becomes apparent
that the created design in outline will coincide or differ with or from the configuration
of the cut-out portion or cam surface
of the plate 22, according to the quantity of
movement of the slide under the control of
said plate and the location of the master
plate or element carrying the elementary
outline, character or base, upon this slide.

Ordinarily if the master or element carry-
ing the elementary outline, character or base is set so that its center coincides with the
center of rotation of the support 17, and
the controlling plate 22 has a symmetrical
opening therein, the resulting figure in outline will coincide with the configuration of
said opening, but the setting of the said
master or element upon either side of the
center will vary its outline to an extent
which may be determined only by the actual
operation of the machine.

Herefore I have referred merely to the
effect of the controlling plate 22 upon the
outline of the created figure, but it must be
understood that with every adjustment of
the machine herefore referred to, even
though the outline of the created figure may
be the same as the configuration of the
opening in the plate 22, the innumerable
intersecting lines in the body of the created
figure will form a large number of minute
figures, which figures constitute the body of
the created design. Each of these figures and the shape of the center of the design will change with every variance in the
adjustment of the machine irrespective of any
change in the general outline. This is due
to the fact that there will be a change of
the angle and point of intersection of the
numerous lines with each adjustment of the
machine. By these adjustments the tone of
the center of the design also may be changed,
an increase in the dimensions of the created
design generally resulting in a dark
center in the design created, and a reduction in
dimensions resulting in a light center.

When the pin 23 is shifted in position to
vary the dimensions of the created design,
or the plate 25 is so adjusted for the same
purpose, the character of the center will always change, while the character of the
outline may or may not change, according to
the extent of the adjustment.

The scale of the created design may be
varied by using a plate 22 having a smaller
similar opening, and a proportionately
smaller elementary outline, character or base, or when my improvements are used
upon a pantographic machine, the scale may
be varied by the ordinary pantographic
adjustments. By either of these methods, any
created design may be reproduced in the
manner herefore described, but on a different
scales; the outline, body design and center being unchanged excepting as to
dimensions.

By setting the master or element carrying
the elementary outline, character or base
entirely upon one side of the center of rotation
of the support 17, a “simple” design will result from the actuation of the ma-
chine. If, however, portions of the elementary
outline, character or base are upon oppo-
site sides of the center of rotation of said
support, a “complex” design is the result,
one design being superimposed upon
the other. These designs will be dissimilar
inasmuch as the movement of the portion of
doing the design upon one side of the center of rotation
will be away therefrom, at the same
time that the portion upon the other side

will be toward said center. The superimposed design may range from two designs substantially of the same dimensions as each other, to a large design, with a dissimilar and smaller design extending about the center of the created figure. When it is desired to superimpose a still different design upon a created design, it is merely necessary to remove one master or element, substitute another therefore and repeat the operations of the machine, or if desired, when a different figure, as a numeral or a word is to be thus superimposed, a master of this numeral or word may be substituted for the elementary outline, character or base, and the machine used as an ordinary pantograph.

If it be desired to vary the spacing of the lines in a design, it is merely necessary to change the location of the pin 81. The pin 29 may be used to disengage the pawl 26 from the ratchet 25 to permit the rewinding of the pull cord 20 upon the support 17. If desired, the pin 23 may be shifted from adjacent one end of the slide 18 to adjacent the other end of said slide, and the springs 24 reversed, thus entirely changing the outline and character of the design without the necessity for shifting the master or element 25.

By the foregoing description, it is apparent that an infinite number of different designs may be created by reason of the different manner in which the machine may be adjusted and the interchangeability of controlling or cam plates, and masters or elements, of different configuration; and that whatever the configuration of the controlling plate, or the master or element, the operation of the machine consists solely in causing the stylus 13 to follow the elementary outline, character or base, and the partial rotation of the support 17 to an extent determined by the mechanism of the machine.

By these two operations practised alternately, the most intricate and complex designs may be created by labor totally unskilled in engraving or drafting, and in a fraction of a day, work may be completed which under the old methods would require weeks.

In the accompanying drawings, I have shown merely one embodiment of my invention, and it is apparent that the structure therein shown may be varied indefinitely without departing from the spirit and scope of the invention.

An essential of the machine is the employment of an elementary outline, character or base, a plate, sheet or body upon which the design is to be created, a reproducing mechanism acting as defined by said elementary outline, character or base, and describing a similar outline upon said plate, sheet or body, and means varying the relative position of the reproducing means and the work plate or sheet so as to make the operative portion of the former act upon successive portions of the latter. Various mechanisms may be employed for accomplishing this result, and in the accompanying drawings I have shown but one such mechanism. The elementary outline, character or base may be a separate part of the machine, or may appear directly upon the support therefor.

I believe it to be broadly new to provide a machine wherein an intricate geometrical design may be created mechanically from a mere simple elementary outline, and I intend to claim such breadth.

Having described my invention, what I claim as new and desire to have protected by Letters Patent, is:

1. A geometrical machine embodying therein an elementary outline, character or base, means adapted to follow said elementary outline, character or base and successively describe a plurality of similar outlines upon a work plate or sheet, and means adapted to vary the relative position of said elementary outline, character or base and said work plate or sheet following each actuation of said first named means.

2. A geometrical machine embodying therein an elementary outline, character or base, a support for the work plate or sheet, supporting means for a work point in operative relation to said support, means adapted to follow said elementary outline, character or base and successively cause a similar relative movement of said supporting means, and means for varying the operative relation of said supporting means and said work plate or sheet to create an intricate geometrical design.

3. A geometrical machine embodying therein a work bed, supporting means for a work point in operative relation to the work surface upon said bed, a support for an elementary outline, character or base, means adapted to impart relative movement of said work bed and the supporting means for said work point, and means whereby the relative position of said support and said work bed may be varied independently of said last named means.

4. A geometrical machine embodying therein a work bed, supporting means for a work point in operative relation to the work surface upon said bed, a support for an elementary outline, character or base, means adapted to impart relative movement of said work bed and the supporting means for said work point, and means acting independently of said last named means adapted to simultaneously vary the relative position of said support and said work bed in two directions.

5. A geometrical machine embodying therein a work bed, supporting means for a work point in operative relation with the
work surface upon said bed, a support for an
elementary outline, character or base, means
carried thereby wherein the elementary out-
line, character or base may be set to define a
"simple" design, a design composed of su-
perimposed designs, or designs of varying
outlines, bodies or centers, means adapted to
impart relative movement of said work bed
and the supporting means for said work
point, and means whereby the relative posi-
tion of said support and said work bed may
be varied independently of said last named
means.

6. A geometrical machine embodying
therein an elementary outline, character or
base, a support for the work plate or sheet,
supporting means for a work point in opera-
tive relation to said support, means adapted
to follow said elementary outline, character
or base and successively cause a similar rela-
tive movement of said support and said sup-
porting means, the means for varying the
operative relation of said supporting means
and said work plate or sheet to create an
intricate geometrical design, including therein
a rotary member, a second member having a
dissimilar movement mounted thereon, and
means defining the operative movement of
said last named member.

7. A geometrical machine embodying
therein a work bed, supporting means for a
work point in operative relation to the work
surface upon said bed, a support for an ele-
mentary outline, character or base, comprises
a rotary member and a sliding member
having movement substantially radially there-
from, means adapted to impart relative
movement to said work bed and the sup-
porting means for said work point, means limit-
ing the movement of said slidable member,
and means whereby said support may be ac-
tuated.

8. A geometrical machine embodying
therein a work bed, supporting means for a
work point in operative relation to the work
surface upon said bed, a support for an ele-
mentary outline, character or base, com-
prising a rotary member and a sliding mem-
ber having movement substantially radially
therefrom, means adapted to impart relative
movement to said work bed and the sup-
porting means for said work point, a con-
trolling or compelling plate having an open-
ing therein defining the movement of said
sliding member, and means whereby said sup-
port may be actuated.

9. A geometrical machine embodying
therein a work bed, supporting means for a
work point in operative relation to the
work surface upon said bed, a support for an
elementary outline, character or base, com-
prising a rotary member and a sliding mem-
ber having movement substantially radially
therefrom, means adapted to impart relative
movement to said work bed and the

10. A geometrical machine embodying
therein a work bed, supporting means for a
work point in operative relation to the work
surface upon said bed, a support for an ele-
mentary outline, character or base, comprises
a rotary member, a sliding member hav-
ing movement substantially radially thereof,
and means upon said sliding member whereby
a plate carrying an elementary outline, character
or base may be adjusted relative to the
axis of said rotary member, means adapted
to impart relative movement to said
work bed and the supporting means for said
work point, a controlling or compelling
plate having an opening therein defining
the movement of said sliding member, and
means whereby said support may be ac-
tuated.

11. A geometrical machine embodying
therein a work bed, supporting means for a
work point in operative relation to the work
surface upon said bed, a support for an ele-
mentary outline, character or base, comprises
a rotary member having on the face thereof
ways extending across its axis, and a
sliding member mounted in said ways,
means adapted to impart relative
movement to said work bed and the sup-
porting means for said work point, means limiting
the movement of said slidable member, and
means whereby said support may be ac-
tuated.

12. A geometrical machine embodying
therein a work bed, supporting means for a
work point in operative relation to the work
surface upon said bed, a support for an ele-
mentary outline, character or base, comprises
a rotary member and a sliding member
having movement substantially radially
therefrom, means adapted to impart relative
movement to said work bed and the sup-
porting means for said work point, a controlling
or compelling plate having an opening
therein about and above said sliding mem-er, a bearing pin carried by said sliding
member adapted to engage the edge of said
opening whereby the movement of said sliding
member is defined by said plate, and means
whereby said support may be actuated.

13. A geometrical machine embodying
therein a work bed, supporting means for a
work point in operative relation to the work
surface upon said bed, a support for an ele-
...
mentary outline, character or base, comprising a rotary member and a sliding member having substantially radially movement to said work bed and the supporting means for said work point, a controlling or compelling plate having an opening therein about and above said sliding member, said plate being removably mounted whereby it is interchangeable with other plates having dissimilar openings, a bearing pin carried by said sliding member and adapted to engage the edge of said opening whereby the movement of said sliding member is defined by said plate, and means whereby said support may be actuated.

14. A geometrical machine embodying therein a work bed, supporting means for a work point in operative relation to the work surface upon said bed, a support for an elementary outline, character or base, comprising a rotary member and a sliding member having movement substantially radially thereof, means adapted to impart relative movement to said work bed and the supporting means for said work point, a controlling or compelling plate having an opening therein about and above said sliding member, a bearing pin carried by said sliding member and adapted to engage the edge of said opening whereby the movement of said sliding member is defined by said plate, means forcing said bearing pin into engagement with the edge of said opening, and an oscillatory member whereby intermittent rotary movement may be imparted to said rotary member.

15. A geometrical machine embodying therein a work bed, supporting means for a work point in operative relation to the work surface upon said bed, a support for an elementary outline, character or base, comprising a rotary member and a sliding member having movement substantially radially thereof, means adapted to impart relative movement to said work bed and the supporting means for said work point, a controlling or compelling plate having an opening therein about and above said sliding member, said plate being removably mounted whereby it is interchangeable with other plates having dissimilar openings, a bearing pin carried by said sliding member and adapted to engage the edge of said opening whereby the movement of said sliding member is defined by said plate, said bearing pin being adjustable upon said sliding member radially of said rotary member, and means whereby said support may be actuated.

16. A geometrical machine embodying therein an elementary outline, character or base, means adapted to follow said elementary outline, character or base and successively describe a plurality of similar outlines upon a work plate or sheet, means adapted to vary the relative position of said elementary outline, character or base and said work plate or sheet following each actuation of said first named means, and means whereby the scale of the outlines described by said first named means relative to said elementary outline, character or base may be varied.

17. A geometrical machine embodying therein an elementary outline, character or base, means adapted to follow said elementary outline, character or base and successively describe a plurality of similar outlines upon a work plate or sheet, means adapted to vary the relative position of said elementary outline, character or base and said work plate or sheet following each actuation of said first named means, and means whereby said last named means may be adjusted to vary the spacing of such successively described outlines.

18. A geometrical machine embodying therein a work bed, supporting means for a work point in operative relation to the work surface upon said bed, a support for an elementary outline, character or base, comprising a rotary member and a sliding member having movement substantially radially thereof, means adapted to impart relative movement to said work bed and the supporting means for said work point, a controlling or compelling plate having an opening therein about and above said sliding member, a bearing pin carried by said sliding member and adapted to engage the edge of said opening whereby the movement of said sliding member is defined by said plate, means forcing said bearing pin into engagement with the edge of said opening, an oscillatory member whereby intermittent rotary movement may be imparted to said rotary member, and adjustable means whereby the operative movement of said oscillatory member may be controlled.

19. A geometrical machine embodying therein an elementary outline, character or base, means adapted to follow said elementary outline, character or base and successively describe a plurality of similar outlines upon a work plate or sheet, means adapted to vary the relative position of said elementary outline, character or base and said work plate or sheet following each actuation of said first named means, and means whereby said first named means may be made operative or inoperative during the operative movement of said last named means.

20. A geometrical machine embodying therein an elementary outline, character or base, a support for the work plate or sheet, supporting means for a work point in operative relation to said support, means adapted to follow said elementary outline, character or base and successively cause a simi-
lar relative movement of said support and said supporting means, means for varying
the operative relation of said supporting means and said work plate or sheet to create
an intricate geometrical design, and means whereby said work point may be held in or
out of contact with said work plate or sheet during the operative movement of said last
named means.
21. A geometrical machine embodying therein a work bed, supporting means for a
work point in operative relation to the work surface upon said bed, a support for an ele-
mentary outline, character or base, comprising a rotary member and a sliding member
having movement substantially radially thereof, means adapted to impart relative
movement to said work bed and the supporting means for said work point, a rim sur-
rounding said sliding member, a controlling or compelling plate having an opening
therein mounted upon said rim, means whereby said plate may be adjusted upon
said rim, a bearing pin carried by said slid-
ing member and adapted to engage the edge of said opening whereby the movement of
said sliding member is defined by said plate, and means whereby said support may be
acted.
22. A geometrical machine embodying therein an elementary outline, character or
base, means whereby said outline, character or base may be reproduced upon a plate or
sheet, and controlling or compelling means whereby successive reproductions will be
erratically positioned so as to create an intricate geometrical design having as a whole
no similitude to the elementary outline, character or base.

In witness whereof, I have hereunto affixed my signature, in the presence of two
subscribing witnesses, this 14th day of February, 1913.

WILLIAM S. EATON.

Witnesses:

Otto Munk,
F. T. Wentworth.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."