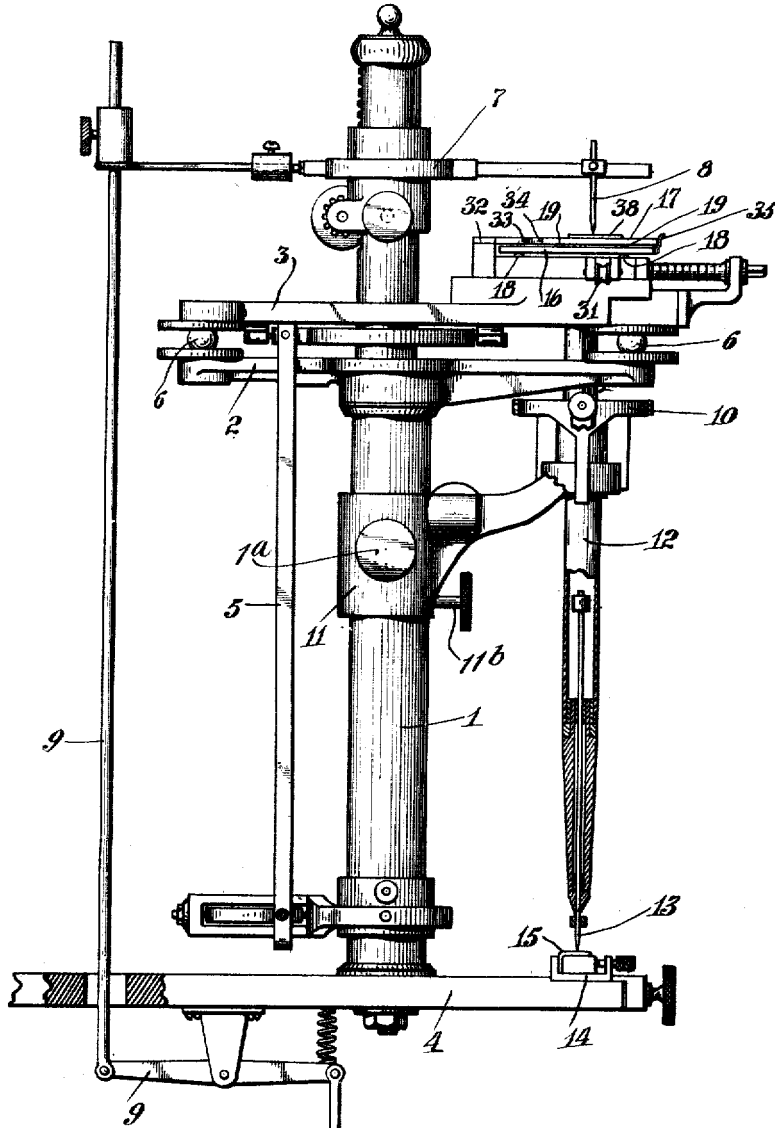


W. S. EATON.  
GEOMETRICAL MACHINE.  
APPLICATION FILED OCT. 23, 1913.

1,241,722.

Patented Oct. 2, 1917.  
3 SHEETS—SHEET 1.

Fig. 1.



Attest:  
*E. Mitchell*  
*E. Eugene Spring*

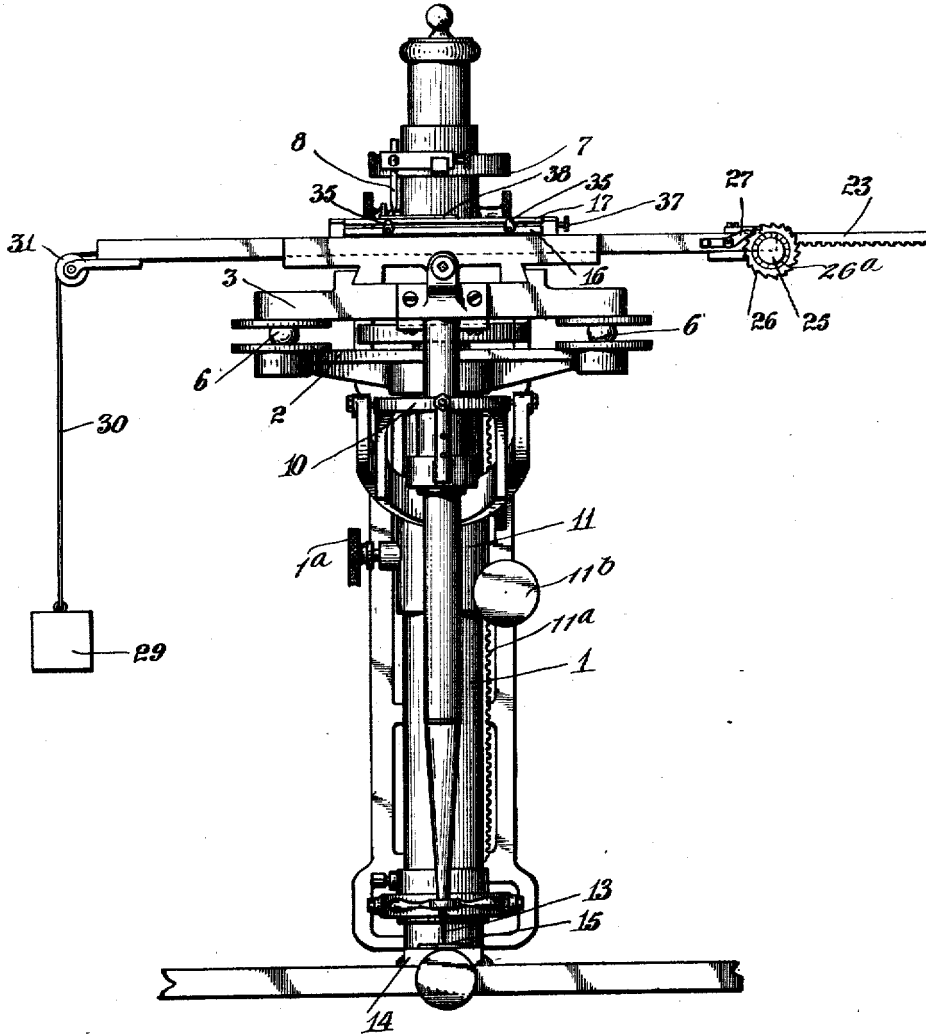
*William S. Eaton* Inventor:  
by *Charles T. Wentworth*  
his Atty.

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3 SHEETS—SHEET 2.

Fig. 2.



Attest:  
*E. J. Mitchell*  
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 3 SHEETS—SHEET 3.

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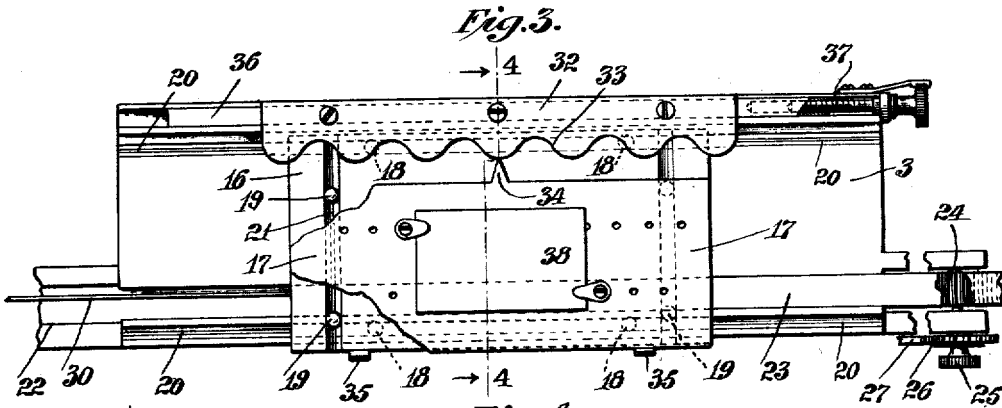


Fig. 4.

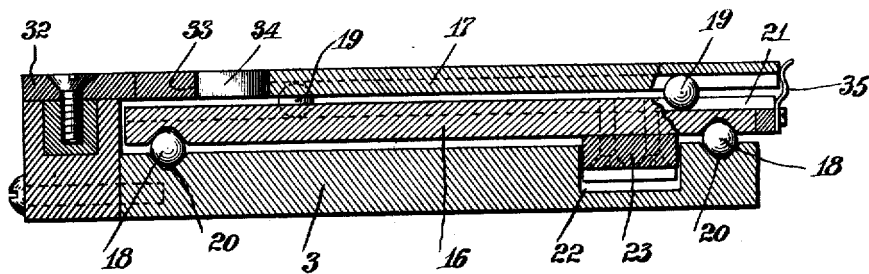


Fig. 5.

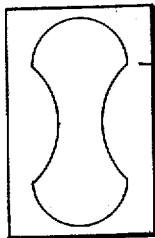
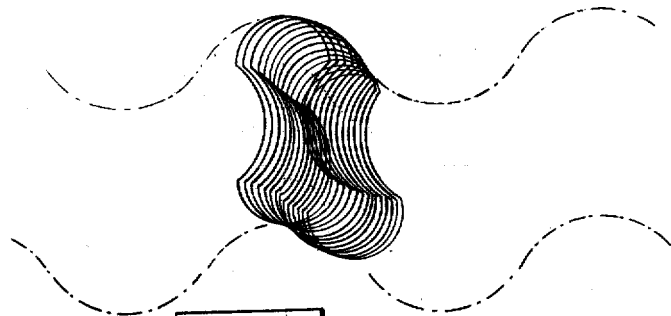


Fig. 6.

Attest:  
*Edmitche*  
*E. J. W. W. W.*

William S. Eaton Inventor:  
 by *Paul P. Wentworth*  
 his Atty.

# UNITED STATES PATENT OFFICE.

WILLIAM S. EATON, OF SAG HARBOR, NEW YORK, ASSIGNOR TO AMERICAN BANK NOTE COMPANY, A CORPORATION OF NEW YORK.

## GEOMETRICAL MACHINE.

1,241,722.

Specification of Letters Patent.

Patented Oct. 2, 1917.

Application filed October 23, 1913. Serial No. 796,812.

*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 my invention is to provide a geometrical machine capable of producing a continuous elongated design composed of a plurality of similar outlines, characters or bases, superimposed one upon the other but spaced apart to create a line design, the outlines of which design will be irregular. A further object is to provide a machine of this character capable of producing a complex lineal design, the opposite borders of which may be similar or dissimilar, and the dissimilarity may be varied by means of certain adjustments of the machine. A still further object is to provide a machine of this character, adapted to create a complex line design through the reproductions of an elementary outline, character or base upon a work plate or sheet, wherein the relative position of the means bearing the elementary outline, character or base, and the work plate or sheet, will be varied lineally and perpendicularly to such lineal variation, thus spacing the succeeding reproductions of the elementary outline, character or base, and varying the relative position thereof in the created design in a manner to secure an irregular outline in such design. A still further object is to provide a machine of this character, wherein the variance in the relative position of the work plate or sheet and the means bearing the elementary outline, character or base may be determined by a controlling or cam plate, the operative position of which may be changed so as to permit one design to be superimposed upon another in a manner to

make the body of the design more intricate through a multiplicity of intersecting lines, and at the same time cause the opposite borders of the lineally extended design to be dissimilar. A still further object is to provide a machine wherein the general outline of a created design while determined by the contour of the operative portion of the controlling or cam plate, will be dissimilar to the said controlling or cam plate through the modification of said outline by the character of the elementary outline, character or base. A still further object is to provide a machine wherein the character of the outline may be varied by the substitution of controlling or cam plates having dissimilar operative surfaces. A still further object is to provide a machine of this character wherein the intricacy of the design may be increased by superimposing the design created by one master upon a design created by another master, as well as by the adjustment of the controlling or cam plate, or the substitution of one cam plate for another. A still further object is to provide means whereby accurate lineal spacing of the reproductions of the elementary outline, character or base, may be secured, and such spacing may be varied to secure different tone values. And a still further object is to provide a machine capable of the accurate reproduction of the elementary outline, character or base, and repeated reproductions thereof, with accuracy, in the spacing, so as to insure a clean, sharp line design.

The invention consists primarily in a geometrical machine embodying therein a fixed support for an elementary outline, character or base, a movable support for a work plate or sheet, a work point, means adapted to follow said elementary outline, character or base and cause relative movement of said movable support and said work point whereby a reproduction of said elementary outline, character or base, may be described upon a work plate or sheet, and a plurality of means whereby simultaneous movement in different directions may be imparted to said movable support to space succeeding reproductions of said outline, character or base apart and create an elongated design having an irregular outline; 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.

Referring to the drawings:—

5 Figure 1 is a side elevation of a machine embodying my invention;

Fig. 2 is a front elevation thereof;

10 Fig. 3 is a plan view of a portion of the work table and the support for the work plate or sheet;

Fig. 4 is a section on the line 4—4 of Fig. 3;

15 Fig. 5 is a fragmentary showing of a portion of a design created by means of the controlling plate or cam shown in Fig. 3; and

Fig. 6 is a view of the elementary outline, character or base used in creating this design.

20 Like letters 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.

25 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 machine, adapted for special purposes and uses, may be constructed so as to embody the essential characteristics of my invention.

30 In the following description, I have referred more particularly to the specific 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 mechanism for transmitting movement as defined by the elementary outline, character or base, to the mechanism by which the design is produced.

35 My invention is especially adapted for use in creating designs for or upon printing plates and plates or matrices for use in developing printing plates, which designs are in the form of continuous or interrupted borders, to be used in connection with the production of "safety" paper such as is used in bank note or other negotiable papers or instruments.

40 Heretofore, these border designs have been made in the same manner as the rosette designs, in part by the use of a rose engine or engine lathe, and in part by hand, portions only of the completed design being used and the design being completed by hand. Owing to the well known and well defined operative effect of such engines or lathes, the border designs have not been widely diversified, and the labor of producing same has, as with rosettes, been extensive and has required a high degree of skill.

By my improved mechanism, I am enabled to secure complex designs susceptible of wide variations, each of which designs will be complete in itself, and when a plate is made upon a machine, will require no hand finishing.

45 I am also enabled to incorporate in a design two similar designs, superimposed one upon the other in a manner to change the entire character of the completed design by reason of the variances in the angles and points of intersection of the lines of the superimposed design and of the primary design; or I may superimpose upon a design developed from one elementary outline, character or base, a design developed from a different elementary outline, character or base, so as to obscure the character of the elementary outline, character or base used in either instance, and vary the tone values throughout the design; or I may insert a number or word design in the body of any portion of the scroll work of the design. Furthermore, I am enabled to make a proof design and a completed design in a shorter time than is possible by the old rose engine and hand work method.

50 In the form of the invention shown in the accompanying drawings, 1 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 oscillatory arm 7, for a work point 8 which in the form of the invention shown is an ordinary graver. The oscillatory work point carrying arm is controlled by the link, treadle and lever mechanism 9, this point being adapted to be brought into contact with the work surface through gravity only.

55 Mounted by means of a universal joint 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 collar 11 is slidable upon the column 1, and may be adjusted by means of the rack 11<sup>a</sup> upon said column and a gear in mesh with said rack and carried by the spindle 11<sup>b</sup>

mounted upon collar 11. The universal joint 10 is supported by and movable with the collar 11. The set screw 1<sup>a</sup> carried by the collar 11 is for holding said collar in any adjusted position.

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.

The mechanism above described has been heretofore patented to me by Letters Patent #1,039,714, dated October 1, 1912 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 or 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 produce 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 stationary support 14, carried by the main table 4, which support is adapted to have immovably secured thereto a plate 15, having indicated thereon as by a sunken line, an elementary outline, character or base, in a position where it will be within the operative range of the stylus 13.

The reproducing mechanism which includes the transmitter 12, the members interposed between same and the work table 3, and the parts appurtenant thereto, respectively, is adapted to impart such a movement to the said table 3 as will cause the reproduction of said elementary outline, character or base upon the plate or sheet by the agency of said work point 8, upon any desired scale, and with exactitude or distortion, as determined by the adjustment of the transmitting mechanism.

In order to secure the development of a complex line design of the character contemplated by my invention, from the repeated reproduction of said elementary outline, character or base, it is necessary to secure variance in the relative position of the outline, character or base and the work plate or sheet upon which the same is being reproduced, by a movement of one of these parts relative to the other in at least two directions, in one direction for securing spacing of the lines, and in the other direction to secure irregularity in the outline of the completed design.

The extent of successive movements for varying the outline, may vary to secure curved effects, as shown in the accompanying drawings, or be made uniform to secure angular effects. Furthermore, the degree of

angularity may be varied at will, or angular and curved sections may be provided upon the controlling or cam plate as will more fully appear hereinafter.

Mounted upon the work table 3 within the operative range of the point 8 is a support for the work plate or sheet, comprising a plurality of superposed members, 16 and 17, mounted upon suitable bearings, 18 and 19, to have movement along lines perpendicular to each other to insure simultaneous movement of said work plate or sheet in two directions, independently of the universal movement of the table 3.

The bearings 18 are mounted upon the tracks or ways 20 upon the table 3, and the bearings 19 track in ways 21 upon the member 16. I prefer to use ball bearing mounts as such have been found in machines of this type to be less subject to wear, with resultant lost motion, than wheels. The table 3 has formed therein a channel 22 in which a rack 23 carried by the member 16 has a close sliding fit to preclude any possibility of the displacement of said member in relation to the table 3, excepting under the control of said rack. Cooperating with the rack 23 is a gear 24, actuated by means of the knurled handle or stem 25. To insure the desired step by step movement of the work plate or sheet support, I mount upon the shaft of the gear 24, a ratchet wheel 26, carrying an index plate 26<sup>a</sup> so that the extent of rotation of said gear may be accurately determined. The graduations upon the plate 26<sup>a</sup> are all spaced an equal distance apart so that the operator by watching this index may determine the starting point of the member 16 and the extent of the travel of said plate between succeeding reproductions of the master. This index plate is merely to afford visual means for determining the operative effect of the gear 24 in much the same manner as the dial upon the permutation lock is used. The index will also indicate whether or not there has been exactitude in this feeding movement since one of the lines thereon will always extend vertically. Acting upon the ratchet 26 is a spring pressed pawl 27, mounted upon the table 3. This pawl is provided with a release grip 28 so as to permit its disengagement from said ratchet for the purpose of returning the support to any desired position upon the table 3.

To prevent overrunning of the work plate or sheet support, or to insure the operative engagement of the pawl 27 with the teeth of the ratchet 26, I provide a resistance device, acting upon the work plate or sheet support, which in the form of the invention shown comprises a weight 29, connected to the member 16, or rack 23, by means of the flexible cord 30, passing over the pulley 31.

The mechanism last above described is for the purpose of securing such a movement of

the work plate or sheet support as will insure the spacing of succeeding reproductions of the elementary outline, character or base upon said plate or sheet through a step by step movement of the said support.

The variance in the outline of the developed design is secured through a movement of the member 17 at right angles to that of the member 16, the extent of this movement being determined by a controlling or cam plate 32 having an operative surface 33 extending in the same direction as the rack 23. The operative surface 33 of the controlling or cam plate 32 may take any desired form, that in the drawing being an undulatory surface or a series of reverse curves or ogees.

The member 17 is provided with an extended reduced contact 34, adapted to engage the operative surface 33 of the controlling or cam plate 32. The member 17 is normally projected toward the controlling or cam plate 32, as by the springs 35 so as to hold the contact 34 in constant engagement with said surface 33. By this construction, the member 17 will have during each step of the lineal traverse thereof, a component of motion, as determined by the controlling or cam plate, at right angles to its line of traverse, although, if desired, the operative surface 33 may be of a contour which will impart such a component of motion to said member 17 only intermittently, there being no such movement during other portions of the lineal traverse of said member 17.

When it is desired to make a simple design, the opposite borders of which will be parallel, a single series of overlapping reproductions of the elementary outline, character or base is made, but when it is desired to make a design more complicated or more complex, without changing the elementary outline, character or base, or by merely superimposing the same design upon the design originally made, the operative effect of the reproducing mechanism may be modified by changing the position of the controlling or cam plate so as to change the direction of movement of the plate 17 at different points of the original design. To secure this result, I mount the controlling or cam plate 32 upon a slide 36, which slide is acted upon by a feed screw 37, mounted upon the table 3. By this construction, the position of the controlling or cam plate 32 may be changed at will, thus permitting the adjustment of this plate at any stage in the creation of the design in a manner to interrupt the regularity in the design being created.

The controlling or cam plate 32 is detachably mounted upon the slide 36, in any desired manner as by means of screws as shown in Fig. 3 of the accompanying drawings, so that any such plate may be re-

moved and a plate of dissimilar design substituted therefor in order to increase the operative range of the machine or multiply the number of different designs which may be reproduced thereon.

The work plate or sheet is indicated at 38.

The operation of the herein described machine is substantially as follows:—

The plate 15, bearing the elementary outline, character or base, such as is indicated in Fig. 6 of the drawings, having been mounted upon the holder 14, the transmitter 12 is actuated by moving the stylus 13 over said elementary outline, character or base, thus causing similar movement of the work table 3, the degree of relative movement of the stylus and the work table being controlled by the adjustment of the transmitter mechanism for determining the scale of the reproduction.

Prior to the actuation of the stylus 13, the work point 8 is brought into engagement with the work plate or sheet 38, mounted upon the member 17.

After the elementary outline, character or base has been completely traced, so as to secure the desired reproduction thereof, the gear 24 is turned to an extent determined by the length of one or more teeth of the ratchet 26, the pawl 27 preventing a return movement of said gear under the control of the weight 29, which will prevent any overrunning of the gear and insure uniformity in the quantity of lineal traverse of the support for the work plate or sheet. With the lineal movement of the member 16, the member 17 will, under the springs 35, have a slight movement as defined by the operative surface 33 of the controlling or cam plate 32.

When this operative surface is curvilinear, the extent of this right angular movement with succeeding step by step lineal movements of the member 16 will vary, but where the rises and falls in said controlling plate are angular, this movement will be uniform with rises or falls of the same angularity and having the same direction.

In combining in a single controlling or cam plate, rises and falls some of which are curvilinear and others of which are angular, a most eccentric outline to the design created is secured. Inasmuch as the design created by means of a given controlling or cam plate does not have an outline which conforms with any degree of exactitude to the contour of the said plate, and inasmuch as any movement of the member 17 at right angles to the line of traverse of the member 16 will not only change the outline, but will change the tone qualities throughout that portion of the design affected by such movement, it is apparent that a design of great intricacy may be secured through a repetition of the reproduction of the elementary outline, character or base, and the successive

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step by step movements of the support for the work plate or sheet after each such reproduction.

After a design of the desired length has been secured, it will be noted that the opposite outlines of the design are, in their general character, parallel, although not entirely so, if there be dissimilarity in the opposite ends of the elementary outline, character or base.

If it be desired to make a design more complex, the gear 24 may be used to restore the work plate or sheet to its former starting position, and the controlling or cam plate 32 may be shifted so as to change the position of the member 17 as compared with its position when starting to produce the original design.

By repeating the process above referred to, it will be observed that the resultant movements of the member 17 under the control of the plate 32 will superimpose upon the original design, a design dissimilar thereto to an extent to change the outline of the created design and vary the entire tone qualities throughout the entire design because of the increased number of lines and the variance in the angle of intersection of the lines of the superimposed designs. If desired, in superimposing this design, the elementary outline, character or base may be changed, the scale of the reproduction may be changed, or the controlling or cam plate 32 may be changed, or any or all of these changes may be made. In fact, the range of variances in designs is so great that an infinite number of dissimilar designs may be created, each of which will have distinctive properties and none of which will, when completed, disclose the exact contour of the elementary outline, character or base from which it was developed.

The design created will be such that it cannot be reproduced by any machine of a type other than that herein shown and described.

In Fig. 5 of the drawings I have shown a portion of a border design produced by a machine made in accordance with my invention, illustrating the general effect secured. In this figure, the difficulties of hand reproduction, even on an enlarged scale, are apparent.

If desired, the supporting means for the work plate or sheet having a compound movement as herein described may be incorporated in and used in conjunction with the machine described in my application for Letters Patent, Serial No. 749,616, filed February 20, 1913, so as to permit rosettes and border sections to be alternately reproduced by one and the same machine in a continuous design, or to permit the machine to be used either for making rosettes or for making borders.

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, will create, form or constitute a complete, complex geometrical design.

By the term work plate or sheet, as used in this 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 matter adapted to receive in any manner whatsoever, a design.

By the term work point is to be included any implement or instrument for marking, cutting or scratching upon any material.

It is not my intention to limit myself to the precise details of construction shown in the accompanying drawings, it being apparent that such may be varied without departing from the spirit and scope of my invention.

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

1. A geometrical machine embodying a support for an elementary outline, character or base, a movable support for a work plate or sheet, a work point, means adapted to follow said elementary outline, character or base, and cause relative movement of said movable support and said work point whereby a reproduction of said elementary outline, character or base, may be described upon a work plate or sheet, means whereby a step by step traverse in one direction may be imparted to said movable support to space succeeding reproductions of said elementary outline, character or base apart, and means for simultaneously imparting movement to said movable support in another direction whereby an irregular outline is imparted to the created design.

2. A geometrical machine embodying a support for an elementary outline, character or base, a movable support for a work plate or sheet, a work point, means adapted to follow said elementary outline, character or base, and cause relative movement of said movable support and said work point whereby a reproduction of said elementary outline, character or base may be described upon a work plate or sheet, and a plurality of means whereby simultaneous movement in different directions may be imparted to said movable support to space succeeding reproductions of said outline, character or base.



apart and create an elongated design having an irregular outline.

3. A geometrical machine embodying a support for an elementary outline, character or base, a movable support for a work plate or sheet, a work point, means adapted to follow said elementary outline, character or base and cause relative movement of said movable support and said work point whereby a reproduction of said elementary outline, character or base may be described upon a work plate or sheet, means whereby a step by step traverse in one direction may be imparted to said movable support to space succeeding reproductions of said outline, character or base apart and a controlling or cam plate having an irregular operative surface adapted to impart movement in another direction to said movable support whereby an irregular outline is imparted to the created design.

4. A geometrical machine embodying a support for an elementary outline, character or base, a movable support for a work plate or sheet, a work point, means adapted to follow said elementary outline, character or base and cause relative movement of said movable support and said work point whereby a reproduction of said elementary outline, character or base may be described upon a work plate or sheet, means whereby a step by step traverse in one direction may be imparted to said movable support to space succeeding reproductions of said outline, character or base apart, a controlling or cam plate having an irregular operative surface adapted to impart movement in another direction to said movable support whereby an irregular outline is imparted to the created design, and means whereby said controlling or cam plate may be removably mounted in the operative relation to said movable support to permit the substitution of a plate of one contour for one of another contour.

5. A geometrical machine embodying a support for an elementary outline, character or base, a movable support for a work plate or sheet, a work point, means adapted to follow said elementary outline, character or base, and cause relative movement of said movable support and said work point whereby a reproduction of said elementary outline, character or base may be described upon a work plate or sheet, means whereby a step by step traverse in one direction may be imparted to said movable support to space succeeding reproductions of said outline, character or base apart, a controlling or cam plate having an irregular operative surface adapted to impart movement in another direction to said movable support whereby an irregular outline is imparted to the created design, and means whereby said controlling or cam plate may be adjusted in the

direction of said step by step traverse to superimpose a plurality of similar designs, one upon the other, in a manner to vary the outline of the completed design and the tone values therein.

6. A geometrical machine embodying a support for an elementary outline, character or base, a movable support for a work plate or sheet, a work point, means adapted to follow said elementary outline, character or base and cause relative movement of said movable support and said work point whereby a reproduction of said elementary outline, character or base may be described upon a work plate or sheet, means whereby a step by step traverse in one direction may be imparted to said movable support to space succeeding reproductions of said outline, character or base apart, a slide mounted adjacent said movable support, means whereby movement may be imparted to said slide in parallelism with the traverse of said support, and a controlling or cam plate mounted upon said slide and having an irregular operative surface adapted to impart movement in another direction to said movable support, whereby an irregular outline is imparted to the created design.

7. A geometrical machine embodying a support for an elementary outline, character or base, a movable support for a work plate or sheet, a work point, means adapted to follow said elementary outline, character or base and cause relative movement of said movable support and said work point whereby a reproduction of said elementary outline, character or base may be described upon a work plate or sheet, means whereby a step by step traverse in one direction may be imparted to said movable support to space succeeding reproductions of said outline, character or base apart, a slide mounted adjacent said movable support, means whereby movement may be imparted to said slide in parallelism with the traverse of said support, a controlling or cam plate mounted upon said slide and having an irregular operative surface adapted to impart movement in another direction to said movable support whereby an irregular outline is imparted to the created design, and means whereby said controlling or cam plate may be removably mounted upon said slide in the operative relation to said movable support to permit substitution of a plate of one contour for one of another contour.

8. A geometrical machine embodying, a fixed support for an elementary outline, character or base, a movable support for a work plate or sheet comprising two superimposed members, supporting means for said members respectively whereby they are adapted to have movement in directions perpendicular to each other, a work point, means adapted to follow said elementary

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outline, character or base and impart relative movement to said movable support and said work point as determined by said elementary outline, character or base, whereby a reproduction of said elementary outline, character or base, may be described upon a work plate or sheet, means adapted to impart a step by step traverse to both of said members in one direction, and means adapted to simultaneously impart movement to the upper of said members at right angles to the direction of traverse of both members whereby an elongated design having irregular outlines is created.

9. A geometrical machine embodying a fixed support for an elementary outline, character or base, a movable support for a work plate or sheet comprising two superimposed members, supporting means for said members respectively whereby they are adapted to have movement in directions perpendicular to each other, a work point, means adapted to follow said elementary outline, character or base, and impart relative movement to said movable support and said work point, as determined by said elementary outline, character or base, whereby a reproduction of said elementary outline, character or base may be described upon a work plate or sheet, means acting upon the lower of said members whereby traverse in one direction is imparted to both said members, a controlling or cam plate in the operative relation to the upper of said members and adapted to simultaneously impart movement to the upper of said members at right angles to the direction of traverse of both members, and means acting upon the upper of said members to normally force it toward and into engagement with said controlling or cam plate.

10. A geometrical machine embodying a fixed support for an elementary outline, character or base, a movable support for a work plate or sheet comprising two superimposed members, supporting means for said members respectively whereby they are adapted to have movement in directions perpendicular to each other, a work point, means adapted to follow said elementary outline, character or base and impart relative movement to said movable support and said work point as determined by said elementary outline, character or base, whereby a reproduction of said elementary outline, character or base may be described upon a work plate or sheet, means acting upon the lower of said members whereby traverse in one direction is imparted to both of said members, a controlling or cam plate in the operative relation to the upper of said members and adapted to simultaneously impart movement to the upper of said members at right angles to the direction of traverse of

both members, means acting upon the upper member to normally force it toward and into engagement with said controlling or cam plate, and means whereby said controlling or cam plate may be removably mounted in the operative relation to the upper of said members to permit the substitution of a plate of one contour for a plate of another contour.

11. A geometrical machine embodying a fixed support for an elementary outline, character or base, a movable support for a work plate or sheet comprising two superimposed members, supporting means for said members respectively whereby they are adapted to have movement in directions perpendicular to each other, a work point, means adapted to follow said elementary outline, character or base and impart relative movement to said movable support and said work point as determined by said elementary outline, character or base, whereby a reproduction of said elementary outline, character or base, may be described upon a work plate or sheet, means acting upon the lower of said members whereby traverse in one direction is imparted to both of said members, a slide mounted adjacent said members, means whereby movement may be imparted to said slide in parallelism with the movement of both of said members, a controlling or cam plate, mounted upon and movable with said slide, in operative relation to the upper of said members and adapted to impart movement to said upper member in a direction at right angle to, and simultaneously with, the traverse of both of said members, and means acting upon said upper member to normally force it toward and into engagement with said controlling or cam plate.

12. A geometrical machine embodying a fixed support for an elementary outline, character or base, a movable support for a work plate or sheet comprising two superimposed members, supporting means for said members respectively whereby they are adapted to have movement in directions perpendicular to each other, a work point, means adapted to follow said elementary outline, character or base and impart relative movement to said movable support and said work point as determined by said elementary outline, character or base, whereby a reproduction of said elementary outline, character or base may be described upon a work plate or sheet, means acting upon the lower of said members whereby traverse in one direction is imparted both of said members, a slide mounted adjacent said members, means whereby movement may be imparted to said slide in parallelism with the movement of both of said members, a controlling or cam plate, mounted upon and movable with said slide, in operative rela-

tion to the upper of said members and adapted to impart movement to said upper member in a direction at right angle to, and simultaneously with, the traverse of both  
 5 said members, means acting upon said upper member to normally force it toward and into engagement with said controlling or cam plate, and means whereby said controlling or cam plate may be removably mounted  
 10 upon said slide to permit the substitution of a plate of one contour for a plate of another contour.

13. A geometrical machine embodying a fixed support for an elementary outline, character or base, a movable support for a  
 15 work plate or sheet comprising two superimposed members, supporting means for said members respectively whereby they are adapted to have movement in directions perpendicular to each other, a work point,  
 20 means adapted to follow said elementary outline, character or base and impart relative movement to said movable support and said work point as determined by said elementary outline, character or base, whereby  
 25 a reproduction of said elementary outline, character or base, may be described upon a work plate or sheet, means adapted to impart a step by step traverse to both of said  
 30 members in one direction, means adapted to simultaneously impart movement to the upper of said members at right angles to the direction of traverse of both members whereby  
 35 an elongated design having irregular outlines is created and a resistance device acting upon the lower of said members whereby overrunning thereof is prevented.

14. A geometrical machine embodying a fixed support for an elementary outline, character or base, a movable support for a  
 40 work plate or sheet comprising two superimposed members, supporting means for said members respectively whereby they are adapted to have movement in directions perpendicular to each other, a work point,  
 45 means adapted to follow said elementary outline, character or base and impart relative movement to said movable support and said work point as determined by said elementary outline, character or base, whereby  
 50 a reproduction of said elementary outline, character or base may be described upon a work plate or sheet, a rack carried by the lower of said members, a hand operated gear  
 55 in mesh therewith whereby a step by step movement may be imparted to said members, a ratchet wheel carried by said gear, a holding pawl cooperating with said ratchet

wheel, a resistance device acting upon the lower of said members whereby overrunning  
 60 thereof is prevented, and means adapted to simultaneously impart movement to the upper of said members at right angles to the direction of traverse of both members whereby  
 65 an elongated design having irregular outlines is created.

15. A geometrical machine embodying therein a fixed support for an elementary outline, character or base, a work table  
 70 universally movable upon a single plane, a transmitter adapted to support a stylus in operative relation to said fixed support for a work plate or sheet comprising two superimposed members, supporting means for the  
 75 lower member whereby it is slidably mounted on said work table, supporting means for the upper member whereby it is slidably mounted upon the lower member to have movement perpendicularly to the direction  
 80 of movement of said upper member, means adapted to impart a step by step traverse to both of said members in one direction, and means adapted to simultaneously impart movement to the upper of said members at  
 85 right angles to the direction of traverse of both members whereby an elongated design having irregular outlines is created.

16. A geometrical machine embodying a support for an elementary outline, character or base, a support for a work plate or  
 90 sheet, a work point, means adapted to follow said elementary outline, character or base and impart relative movement to said support for a work plate or sheet and said work point as determined by said outline, character or base, whereby a reproduction of  
 95 said elementary outline, character or base is described upon said work plate or sheet, means adapted to vary the relative positions of said supports in one direction whereby  
 100 succeeding reproductions of said outline, character or base are spaced apart and means operative independently of said last named means whereby the relative positions of said supports may be simultaneously varied in a  
 105 direction perpendicular to the variance secured by said last named means, to impart an irregular outline to the created design.

In witness whereof, I have hereunto affixed my signature, in the presence of two  
 110 subscribing witnesses, this 2d day of October, 1913.

WILLIAM S. EATON.

Witnesses:

WM. R. REIMANN,  
 E. P. EATON.