

W. S. EATON.
ETCHING OR LIKE MACHINE.
APPLICATION FILED DEC. 13, 1921.

1,421,426.

Patented July 4, 1922.

2 SHEETS—SHEET 1.

Fig. 4.

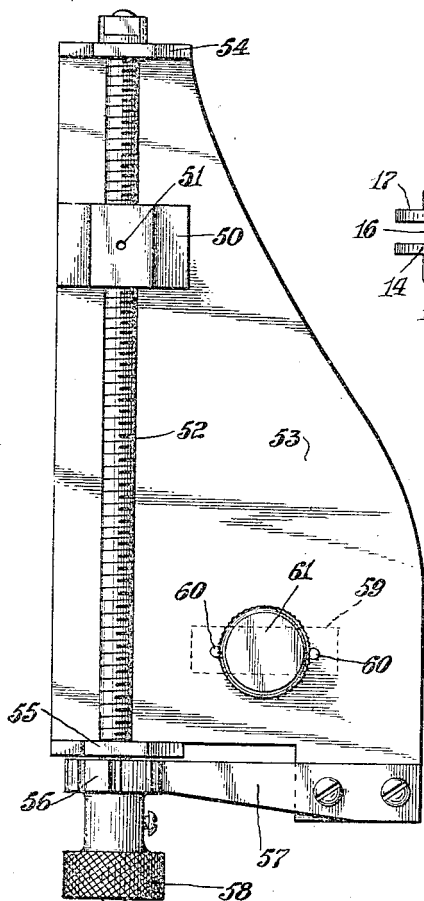


Fig. 1.

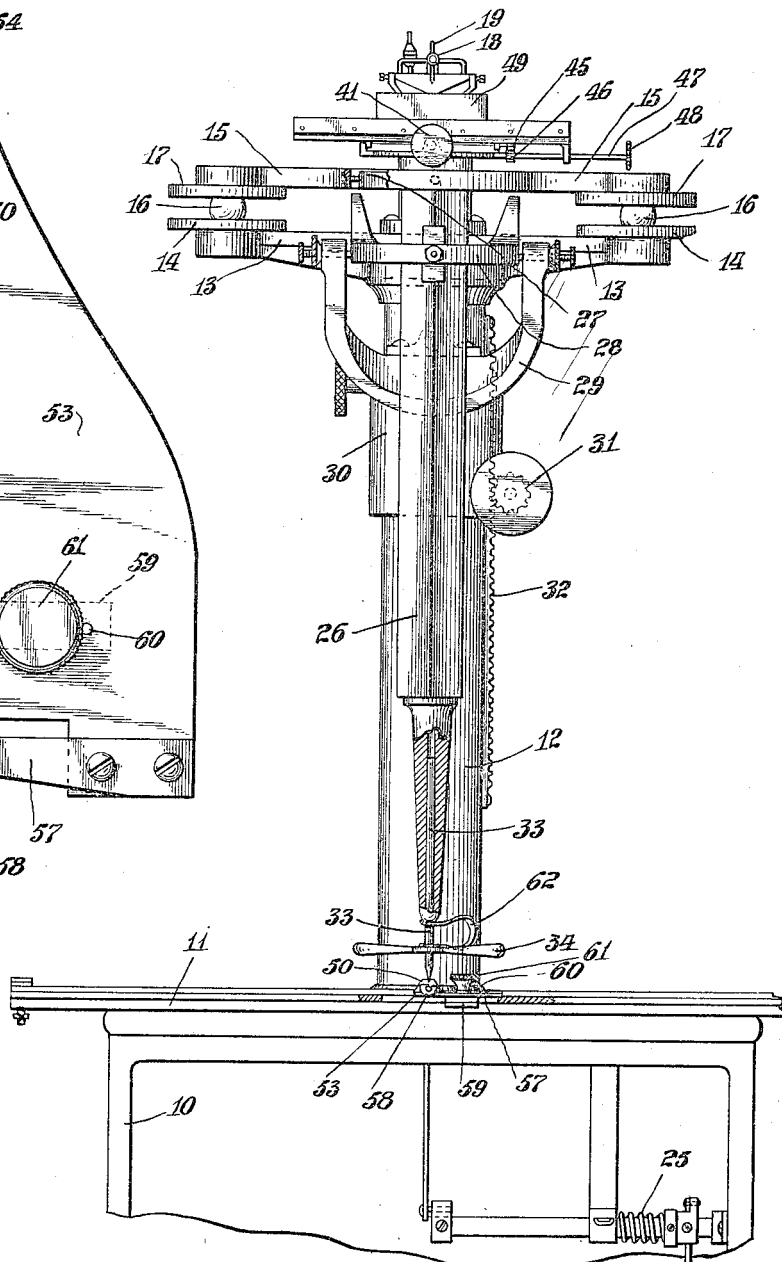
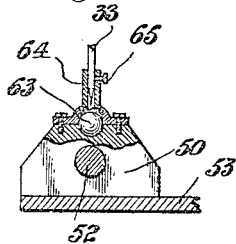


Fig. 5.



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 2 SHEETS—SHEET 2.

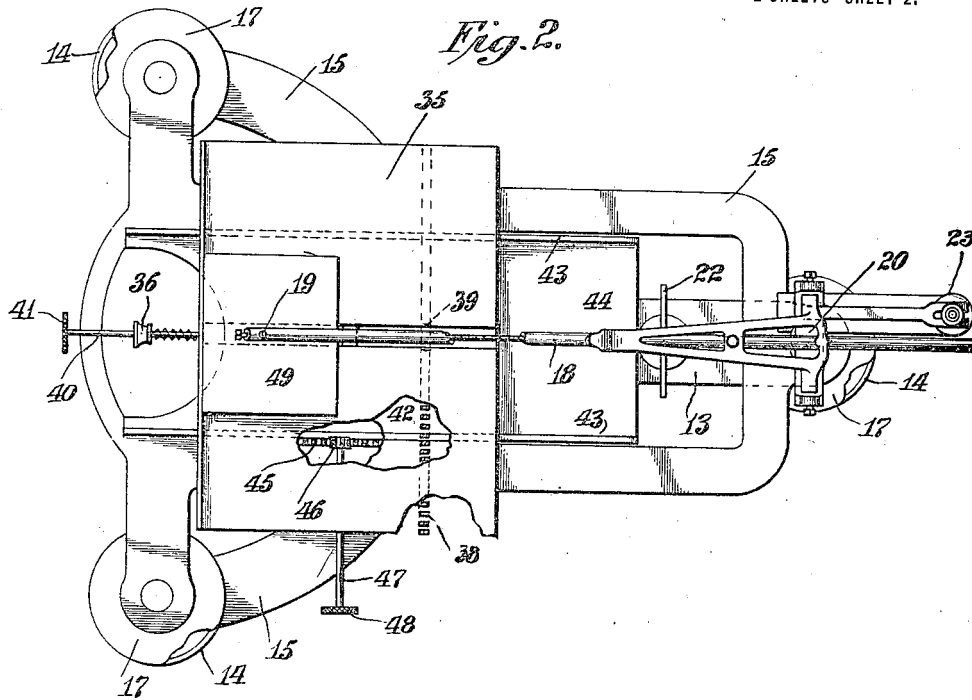
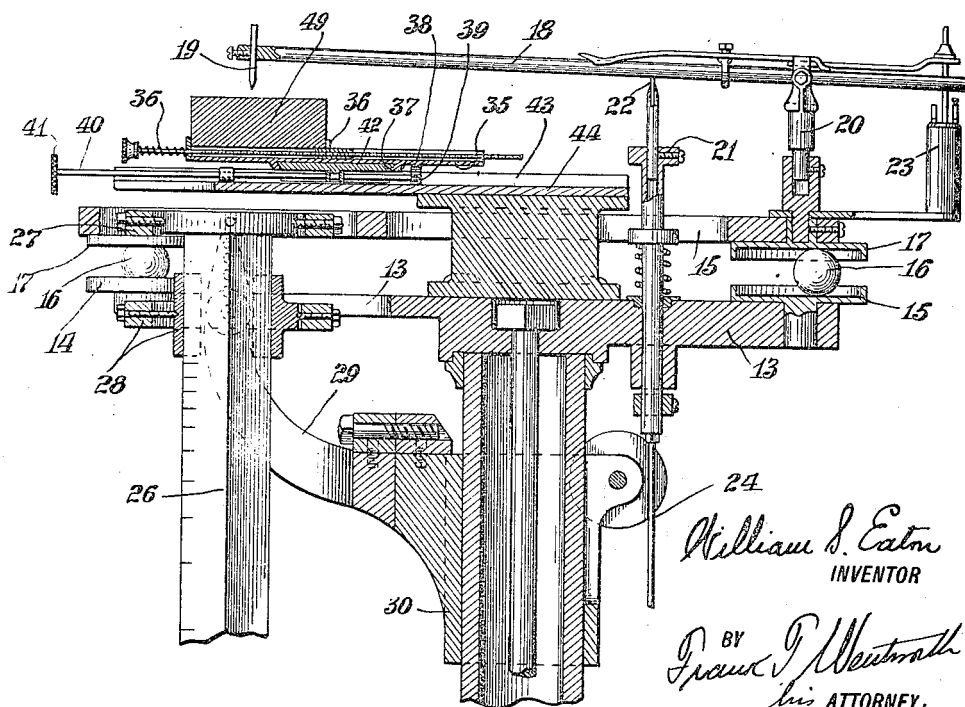


Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM S. EATON, OF SAG HARBOR, NEW YORK.

ETCHING OR LIKE MACHINE.

1,421,426.

Specification of Letters Patent.

Patented July 4, 1922.

Application filed December 13, 1921. Serial No. 522,019.

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 Etching or like 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 etching or like machines of the pantographic type, and more particularly to the provision in such a machine of a mechanism which will permit such machines to be utilized for ruling straight lines upon a printing surface, and to accurately space such lines, for the purpose of producing line shading, outlines, or ordinary guide lines.

Heretofore I have produced pantographic etching machines, as well as pantographic engraving machines, wherein the work holder; during the operation of the machine, has remained stationary, and the printing surface has had a design inscribed thereupon through the medium of a work point, which has had universal movement under the control of a transmitter arm, and as determined by a pattern which the operator followed by means of a tracing stylus carried by said transmitter arm. Ordinarily, with such machines, the reproduction upon the printing plate is upon a reduced scale.

Such machines have a limited range of work, it being essential for line spacing and to produce laterally elongated designs, to adjust the work support with relation to the work point.

While such machines, with the use of a line pattern, could be used for inscribing lines upon a printing plate, great accuracy cannot be secured because of the limited range of movement of the work point, and the necessity for readjusting the work support of the machine, in order to permit lines of a desired length to be produced through the movement of the transmitter arm, particularly as such readjustment results in a slight variance in the thickness of the lines where work upon one portion thereof was stopped and a continuing portion of the line was produced by a succeeding operation. This condition prevailed as to both horizontal lines and lines perpendicular thereto, and so far as I am aware, the practice for using such machines for ruling has never been en-

tirely satisfactory when the machine was allowed to function as a pantograph.

With the above conditions in mind, I have produced a machine whereby the work point may be used for inscribing continuous uninterrupted straight lines, either horizontal or perpendicular to the horizontal, upon the printing plate, by holding the transmitter arm immobile with a resultant immobility of the work point, the relative movement of the printing surface and the work point, either laterally or longitudinally of the machine, being effected by mechanisms operative upon the work support.

To permit the ruling of spaced horizontal lines, I so construct the means operative upon the transmitter arm through its stylus, as to permit successive, accurate rectilinear movements of the transmitter and there-through of the work point. While in this manner accurately spaced horizontal lines may be produced, the spacing of vertical lines is secured by means of adjustments in the work support structure.

By combining with the pantographic machine a mechanism embodying my invention, the range of work of a machine may be increased to include ruling, since the mechanism of my invention includes an attachment adapted to be combined with the pantographic machine by being mounted upon the pattern support, and may be removed at will therefrom so as to permit the machine to be used in a manner to permit the movement of the transmitter arm to impart universal movement to the work point or tool. The various adjustments for determining the scale of reproduction and for distorting the reproduction are not required when the machine is used for ruling, but are included in the combination to adapt the machine for general work.

The invention consists primarily in an etching or like machine embodying therein the combination with a pattern table, a work support including therein a work table, supporting means therefor having laterally extending parallel slideways upon which said work table is mounted, and means for imparting continuous movement to said table along said slideways, a work point supporting carriage capable of universal movement upon a single plane, a work point carrying arm mounted upon said carriage and capable of movement toward and from said work table; means whereby the move-

ment of said work supporting arm may be controlled to engage the work point with, or disengage it from, a work plate, a transmitter arm, a universal connection between
 5 said transmitter arm and said carriage, and a tracing stylus carried by said transmitter arm, of a member adapted to engage said
 10 stylus and hold said transmitter arm and said carriage immobile, and means whereby a step by step movement of said last named
 member longitudinally of the machine may be effected; and in such other novel features of construction and combination of parts as
 15 are hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

Referring to the drawings,

Fig. 1 is a front elevation of the upper portion of a machine embodying my invention;
 20

Fig. 2 is a plan view of the upper portion of the machine with portions thereof broken away;

Fig. 3 is a vertical section of the upper portion of the machine as shown in Fig. 2;

Fig. 4 is a detail view of the mechanism for holding the transmitter arm and the parts actuated thereby, immobile; and

Fig. 5 is a view of a modified form of the member for engaging the stylus point.
 30

Like numerals refer to like parts throughout the several views.

In the embodiment of my invention shown in the drawings, the main frame 10 of the machine has mounted thereon the usual pattern table 11 extending laterally of the machine, and having the usual means for supporting an intaglio pattern thereon. Extending upwardly from the top of said
 40 frame 10 is a column 12 having a top frame 13 provided with a plurality of ball cups 14 from which the universally movable work point supporting carriage 15 is supported by means of the ball bearings 16 of sufficiently small diameter to permit a limited
 45 range of movement of said carriage as defined by the relative difference in diameter of the ball bearings 16, the cups 14 and the cups 17 carried by the carriage 15.

Mounted upon horizontal pivots upon the carriage 15 is the work point supporting arm 18, which projects forwardly of the machine and is adapted to have movement toward or from the work table, to be hereinafter referred to, to engage the work point
 55 19 with, or disengage it from, the work plate. The detailed construction of said work point supporting arm is immaterial to the present invention, it being understood that by means of the mechanisms 20 and 21
 60 the pivots of said arm and the lift bar 22 operative thereon may be raised or lowered to accommodate the machine to printing elements of different thicknesses, the oscillatory movements of said arm being controlled

by a retard device 23 to prevent penetration of the printing surface by the point 19.

To control the movement of the arm 18, the lift bar 22 may be raised or lowered in any desired manner as by means of the rod
 70 24 and mechanism 25, shown more particularly in Fig. 1.

Under normal working conditions, the carriage 15 is adapted to have universal movement upon a single plane imparted
 75 thereto through the medium of a transmitter arm 26 connected with said carriage 15 by means of a universal joint 27, similar to an ordinary compass mount, said transmitter arm being pivotally mounted intermediate
 80 its ends by means of the universal joint 28, upon a bracket 29 carried by a vertically adjustable sleeve 30 slidably mounted upon the column 12 and carrying the clamp screw and the pinion 31 engaging with the ver-
 85 tically extending rack 32 upon said column. This construction permits a setting of the machine for reproduction of the pattern on any desired scale.

Slidably mounted in the lower end of the transmitter arm 26 is a stylus point 33 provided with laterally extending guide handles 34, this slidability of said stylus point with relation to the transmitter arm permitting the stylus point to be held in constant
 90 engagement with the pattern, irrespective of the movement of said transmitter arm.

Supported from the top frame 13 is a work support including therein a work table
 95 35 provided with the usual clamping means 36 for holding a work plate or other printing surface thereon, said table being mounted upon parallel slideways 37 extending laterally of the machine, the under face of said
 100 table being provided with a tooth rack 38 in mesh with a gear 39 carried by the support for said table, and in a fixed relation thereto so as to permit continuous lateral
 105 movement of said table 35 through the actuation of said gear by means of its shaft 40 and a hand wheel 41 carried by said shaft. To permit adjustment of the work table longitudinally of the machine as well as laterally thereof, I form the slideways 37 upon
 110 a carriage 42 mounted upon longitudinally extending slideways 43 carried by the base 44 of the supporting means for the work table. The slideways 37 extend at right angles to the slideways 43, thus not only permitting the work table 35 to be so adjusted
 115 as to bring any portion of the work plate carried thereby within the operative range of the work point 19, but permitting either horizontal or vertical straight lines to be inscribed upon the work plate in the manner
 120 to be more fully described hereinafter.

The underside of the carriage 42 is provided with a tooth rack 45, co-operating with which is a gear wheel 46 on a shaft
 125 47 having a hand wheel 48 for turning same,

said shaft being mounted in a suitable bracket carried by the base 44.

By this construction the table 35 may receive rectilinear movement laterally of the machine or longitudinally thereof, which construction heretofore has been utilized merely for changing the position of the work plate, shown at 49 as a lithographic stone, with relation to the work point 19 to secure the desired positioning of a reproduced design upon said stone or other printing surface, the lines of the design being inscribed upon said work plate as the result of the movement of the work point 19.

In a machine embodying my invention, however, movement of the table 35 either laterally or longitudinally of the machine, and immobility of the transmitter arm 26 and work point 19 are relied upon to secure that relative movement of the work plate 49 and the work point 19 necessary to cause lines to be inscribed upon the former.

The mechanisms above described are those which I have heretofore used in the production of commercial machines to be used solely for reproducing designs as a result of the pantographic action of the transmitter arm and the parts actuated thereby. To adapt a pantographic machine of this character for use in producing parallel lines upon the plate, whether these lines be horizontal or perpendicular to the horizontal, it is essential to provide a member which will destroy the pantographic functions of the machine and cause it to operate without taking advantage of the various universal joints and movements about the machine, while, at the same time, permitting a resumption of the functioning of said parts when, and if, desired.

In the form of the invention shown, I provide a member 50 adapted to engage the tracing stylus 33 and hold it in a fixed position in relation thereto, thus normally holding the transmitter arm 26 and the carriage 15 immobile. Referring to Figs. 1 and 4 of the drawings, this member comprises a traveller block having a socket or depression 51 in the upper face thereof, said block being mounted upon a lead screw 52 and being so formed as to have a close sliding fit upon a base plate 53, the lead screw 52 being mounted in suitable bearing lugs 54 and 55 upon said base plate. It will be apparent that by intermittently turning the lead screw 52, a step by step movement may be imparted to the traveller block 50, thus imparting a rectilinear movement to said block, and a direct oscillation to the transmitter arm 26 longitudinally of the machine.

To permit a definite quantity of movement of the block 50 with each actuation of the lead screw 52, I provide said screw with a star wheel 56 adapted to be engaged by a

spring pawl 57 carried by said base and adapted to enter the notches in said star wheel. The lead screw is provided with a knurled actuated hand wheel 58.

The pattern table 11 is provided with a slot as shown in Fig. 1, adapted to receive a clamp plate 59 carrying a plurality of pins 60 passing through openings in the base plate 53, said pins having a close fit with said openings so as to hold the plate 53 against possible movement while the machine is in operation. The clamp plate 59 is engaged by a clamp screw 61 passing through the plate 53 and thus firmly securing said plate 53 upon the pattern table 11.

When the traveller block is provided with a socket or depression 51, I provide means for firmly holding the stylus point 33 in said socket or depression, consisting of a looped spring 62 adapted to engage the lower end of the transmitter arm 26 and the top of the guide handle 34; thus holding the stylus 33 in constant engagement with the block 50.

If desired, instead of employing a spring 62, the block 50 may be provided with a ball and socket fitting 63, the ball part of said fitting being provided with an extension 64 having a socket thereon adapted to receive the stylus 33, which is firmly clamped in position therein by means of the set screw 65.

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

A machine as shown in the accompanying drawings, when the plate 53 and its appurtenances are not assembled in the machine, may be used as an ordinary pantographic etching machine to produce a design or arrangement of letters as determined by the pattern upon the table 11; the rack and pinion mechanism 38—39 and 45—46 being used to accurately position the design upon the work plate stone or sheet 49, and secure the desired spacing of lines of letters or characters. Normally the work point supporting arm 18 is elevated, and is only brought into engagement with the work plate by means of the mechanism 22, 24 and 25 when it is desired to remove the resist from the plate, the machine shown being essentially an etching machine and the work point 19, a dry point. This is the ordinary functioning of the machine, during which the carriage 15 and the work point 19 have universal movement upon a horizontal plane.

In reproducing a design upon the printing surface 49, particularly if the design be a wide one, it is frequently necessary to use the rack and pinion mechanism 38—39 to move the work support 35 laterally of the machine to increase the range of the work point beyond the normal range of action of the transmitter arm 26, particularly when the reproduction is upon a reduced scale, which is the usual practice in this art.

Reproduced designs frequently require parallel lines for forming outline borders, guide ruling, or tonal background effects, the length of such lines frequently exceeding the normal range of movement of the carriage 15 under the control of the transmitter arm 26, and if the machine be used as a pantograph for inscribing such lines the adjustment of the work support 35 to secure continuity of the line of uniform width, is practically impossible, since such readjustment must be proportioned to the desired length of line, in the same ratio as the scale of the reproduction bears to that of the pattern, as if the work point laps a portion of the line already inscribed upon the plate 49, there is always likelihood of a slight widening of the line throughout the lap and a ragged irregular effect in the completed printing surface when etched.

By assembling in a machine of the above type, a plate 53 and its appurtenances, I may inscribe upon the plate 49, sharp, well-defined, straight, parallel lines of any desired length, and may secure accurate spacing of succeeding lines entirely independent of a pattern which would be reduced in scale through the medium of a reducing pantographic mechanism. By the use of this mechanism a complete design including an outline border, shade lines or ruled guide lines, may be reproduced upon a printing plate without any change in the adjustments of the mechanisms of the machine, other than the movements of the work table.

When it is desired to inscribe straight horizontal lines, or straight lines perpendicular thereto, the base plate 53 is secured to the pattern support table 11 in the manner heretofore described, and the tracing stylus point 33 engaged with the socket or depression 51 in the block 50, the spring 62 being engaged with the lower end of the transmitter arm 26 and the top of the guide handle 34 as shown more particularly in Fig. 1, or in the extension 64 of the ball fitting 63 by means of the set screw 65, so as to maintain the stylus point in such engagement with the block 50 as to prevent accidental displacement thereof as a result of the slight resistance due to the movement of the printing plate 49 with relation to the work point 19.

When the parts are in the relation above referred to, the transmitter arm 26, the work tool support 15 and the arm 18 will be held against any movement. If it be desired to inscribe straight horizontal lines, the shaft 40 and its pinion 39 are turned to impart a lateral movement to the work support 35 until the printing plate 49 is brought to the starting point of a line to be inscribed, whereupon the work point 19 is permitted to descend by gravity into engagement with the plate by the positive

lowering of the lift bar 22. Thereafter said pinion 39 is actuated to impart lateral traverse to said work support 35 along the parallel slideways 37 while the point 19 is permitted to remain in engagement with the work plate. As a result, a straight line of any desired length within the range of lineal movement of the support 35, may be inscribed upon the printing plate 49 without removing the point 19 from the plate, thus ensuring uniform width of the line, and a clear sharp line.

When a line of the desired length has been inscribed upon the plate, the lift bar 22 is released, thus causing it to elevate the arm 18, whereupon the rack and pinion mechanism 38—39 is actuated to impart a return movement to the support 35 to the starting point of a parallel horizontal line to be inscribed. Before the work point is again engaged with the plate 49, the lead screw 52 is turned to the right or left as required, the star wheel 56 and its associated spring ratchet 57 permitting said shaft to be turned in either direction.

If it be desired to inscribe a line below that previously inscribed, the hand wheel 58 will be turned to the right, thus forcing the traveller block 50 toward the column 12, which will move the carriage 15 in the opposite direction, it being understood that in the type of machine shown, where the transmitter arm is pivoted intermediate its end, the reproduction upon the plate 49 is upside down and reversed laterally as compared with the pattern. This operation may be repeated a number of times corresponding with the number of parallel lines to be drawn, a uniform or desired spacing of succeeding lines being ensured by reason of the operative effect of the feed screw 52 and its traveller block 50 upon the transmitter arm 26.

In actual practice, the construction is such that the turning of the screw 52 a distance determined by the distance in arc between the recesses in the wheel 56, will impart movement to the block 50 of approximately one thousandth of an inch, which with fine lines is sufficient to prevent undercutting of the metal of the plate as a result of the acid etching thereof sufficient to break down the metal between lines. If it be desired to secure a wider spacing of the lines, the wheel 56 may be turned with each actuation thereof through two or more notches so that the spacing of the lines will always be a multiple of the unit of movement as determined by the pitch of the screw 52 and the distance in arc between the recesses in the wheel 56.

If it be desired to draw vertical lines, the rack and pinion mechanism 38—39 may be used to secure the proper relative positioning of the work point 19 and the printing

plate 49 before the said point is permitted to engage the plate. Thereafter the rack and pinion mechanism 45—46 is used to impart a longitudinal movement to the work support 35, a lateral spacing of the lines being secured by means of the rack and pinion mechanism 38—39. Vertical lines, however, are not ordinarily used in the kind of work adapted to be produced by a machine embodying my invention.

It will be observed that when the machine is used for ruling straight lines in the manner described, it no longer acts as a pantographic machine, since the work point 19 is held immobile as a result of the engagement of the stylus point 33 with the traveller block 50, which is stationary while a line is being inscribed. Yet the range of work which may be done upon a pantographic machine of the type herein referred to may be increased so as to adapt it for use as a ruling machine, without any modification in the adjustments of the machine, excepting those incidental to the actuation of the work support 35 to impart a necessary movement thereto relative to the stationary work tool or point. By merely removing the plate 53 from the machine, pantographic work may be done with the machine upon the same plate upon which the rulings have been made.

The machine embodying my invention has the advantage that the slideways 37 and 43 upon which the carriage 42 and the work support 35 are adapted to have movement, may be accurately made and fitted to their co-operating parts upon said carriage and said support so as to ensure true unwavering rectilinear movement, while, if a straight line pattern be used, the same degree of accuracy cannot be secured even in patterns of comparatively short length.

It is not my intention to limit the invention 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 the invention.

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

1. An etching or like machine embodying therein the combination with a pattern table, a work support including therein a work table, supporting means therefor having laterally extending parallel slideways upon which said work table is mounted, and means for imparting continuous movement to said table along said slideways, a work point supporting carriage capable of universal movement upon a single plane, a work point carrying arm mounted upon said carriage and capable of movement toward and from said work table, means whereby the movement of said work supporting arm may be controlled

to engage the work point with, or disengage it from, a work plate, a transmitter arm, a universal connection between said transmitter arm and said carriage, and a tracing stylus carried by said transmitter arm, of a member adapted to engage said stylus and hold said transmitter arm and said carriage immobile, and means whereby a step by step movement of said last named member longitudinally of the machine may be effected.

2. An etching or like machine embodying therein the combination with a pattern table, a work support including therein a work table, supporting means therefor having laterally extending parallel slideways upon which said work table is mounted, and means for imparting continuous movement to said table along said slideways, a work point supporting carriage capable of universal movement upon a single plane, a work point carrying arm mounted upon said carriage and capable of movement toward and from said work table, means whereby the movement of said work supporting arm may be controlled to engage the work point with, or disengage it from, a work plate, a transmitter arm, a universal connection between said transmitter arm and said carriage, and a tracing stylus carried by said transmitter arm, of a base plate, means whereby said base plate may be removably mounted upon said pattern plate, a member slidably mounted in relation to said base plate and adapted to receive said stylus, means whereby said stylus is fixedly held in relation to said member, and means whereby a step by step movement longitudinally of the machine is imparted to said member.

3. An etching or like machine embodying therein the combination with a pattern table, a work support including therein a work table, supporting means therefor having laterally extending parallel slideways upon which said work table is mounted, and means for imparting continuous movement to said table along said slideways, a work point supporting carriage capable of universal movement upon a single plane, a work point carrying arm mounted upon said carriage and capable of movement toward and from said work table, means whereby the movement of said work supporting arm may be controlled to engage the work point with, or disengage it from, a work plate, a transmitter arm, a universal connection between said transmitter arm and said carriage, and a tracing stylus slidably mounted in said transmitter arm, of a base plate, means whereby said base plate may be removably mounted upon said pattern plate, a member slidably mounted in relation to said base plate and adapted to receive said stylus, a spring member acting between said transmitter arm and said stylus, whereby said stylus is held in engagement with said member, and means whereby

a step by step movement longitudinally of the machine is imparted to said member.

4. An etching or like machine embodying therein the combination with a pattern table, 5 a work support including therein a work table, supporting means therefor having laterally extending parallel slideways upon which said work table is mounted, and means for imparting continuous movement to said 10 table along said slideways, a work point supporting carriage capable of universal movement upon a single plane, a work point carrying arm mounted upon said carriage and capable of movement toward and from said 15 work table, means whereby the movement of said work supporting arm may be controlled to engage the work point with, or disengage it from, a work plate, a transmitter arm, a universal connection between said 20 transmitter arm and said carriage, and a tracing stylus carried by said transmitter arm, of a base plate, means whereby said base plate may be removably mounted upon said pattern plate, a member slidably mounted 25 in relation to said base plate and adapted to receive said stylus, means whereby said stylus is fixedly held in relation to said member, a lead screw carried by said base and co-operating with said member, and a hand 30 wheel carried by said lead screw, whereby a step by step movement longitudinally of the machine may be imparted to said member through the actuation of said lead screw.

5. An etching or like machine embodying 35 therein the combination with a pattern table, a work support including therein a work table, supporting means therefor having laterally extending parallel slideways upon which said work table is mounted, and 40 means for imparting continuous movement to said table along said slideways, a work point supporting carriage capable of universal movement upon a single plane, a work point carrying arm mounted upon said carriage and capable of movement toward and 45 from said work table, means whereby the movement of said work supporting arm may be controlled to engage the work point with, or disengage it from, a work plate, a transmitter arm, a universal connection between 50 said transmitter arm and said carriage, and a tracing stylus carried by said transmitter arm, of means whereby said base plate may be removably mounted upon said pattern

plate, a member slidably mounted in relation 55 to said base plate and adapted to receive said stylus, means whereby said stylus is fixedly held in relation to said member, a lead screw carried by said base and co-operating with 60 said member, a hand wheel carried by said lead screw, whereby a step by step movement longitudinally of the machine may be imparted to said member through the actuation of said lead screw, and means whereby 65 a definite quantity of rotary movement may be imparted to said lead screw with each actuation thereof.

6. An etching or like machine embodying therein the combination with a pattern table, 70 a work support including therein a work table, supporting means therefor having laterally extending parallel slideways upon which said work table is mounted, and means for imparting continuous movement to 75 said table along said slideways, a work point supporting carriage capable of universal movement upon a single plane, a work point carrying arm mounted upon said carriage and capable of movement toward and from 80 said work table, means whereby the movement of said work supporting arm may be controlled to engage the work point with, or disengage it from, a work plate, a transmitter arm, a universal connection between 85 said transmitter arm and said carriage, and a tracing stylus carried by said transmitter arm, of a base plate, means whereby said base plate may be removably mounted upon 90 said pattern plate, a member slidably mounted in relation to said base plate and adapted to receive said stylus, means whereby said stylus is fixedly held in relation to 95 said member, a lead screw carried by said base and co-operating with said member, a star wheel carried by said lead screw, and a spring pawl co-operating with said star wheel, whereby definite rotary movement may be imparted to said lead screw with each actuation thereof.

In witness whereof I have hereunto affixed 100 my signature, in the presence of two subscribing witnesses, this eighth day of December 1921.

WILLIAM S. EATON.

Witnesses:

ROSALYN O'HALLORAN,
MARY HELLEMANN.