No. 728,556. PATENTED MAY 19, 1903.

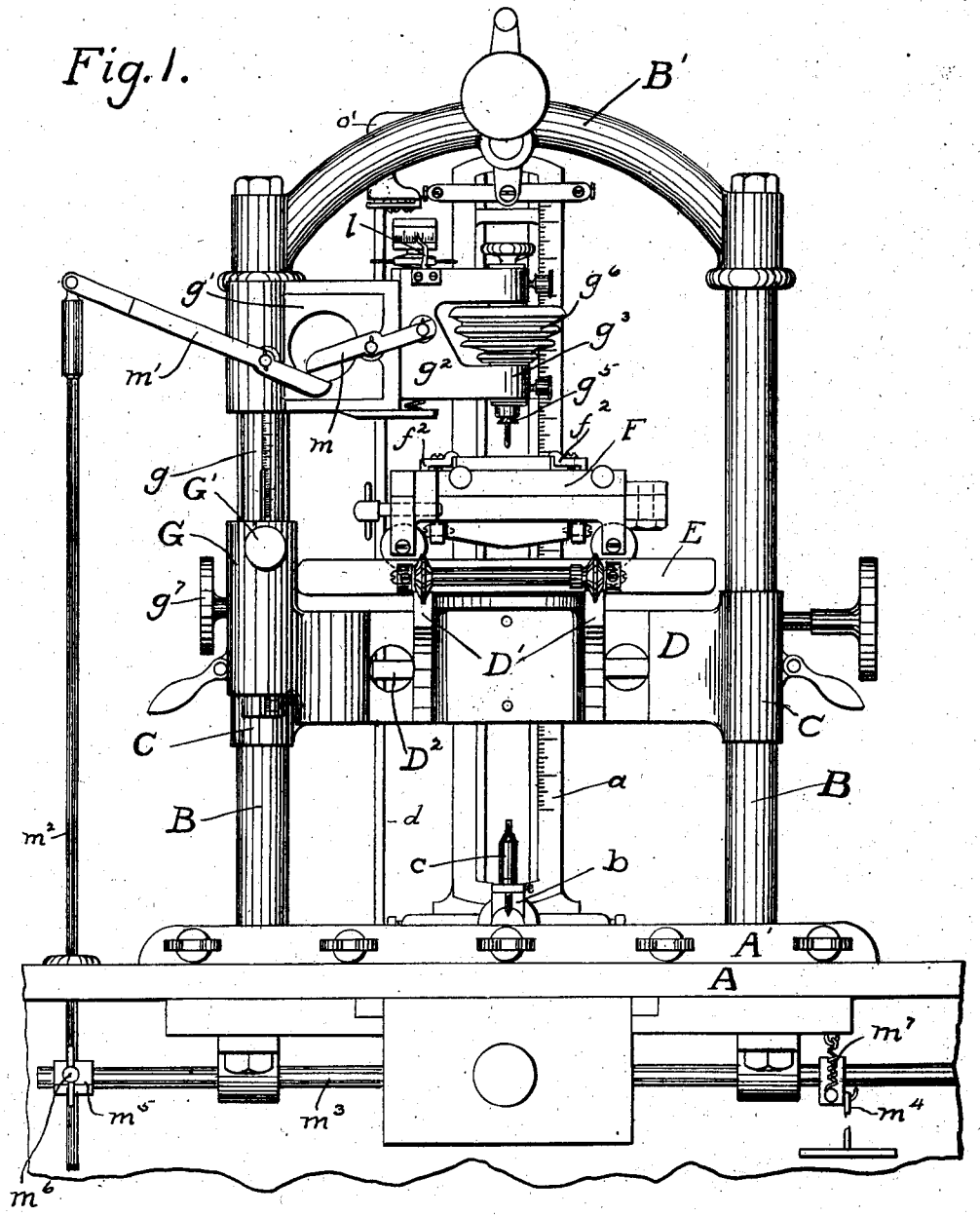
W. S. EATON.

ENGRAVING MACHINE.

APPLICATION FILED JULY 29, 1902.

NO MODEL. 10 SHEETS—SHEET 1.

Fig. 1.



WITNESSES:

Herbert L. Towle

Walter Mann

INVENTOR

William S. Eaton

BY Jno. S. Barker

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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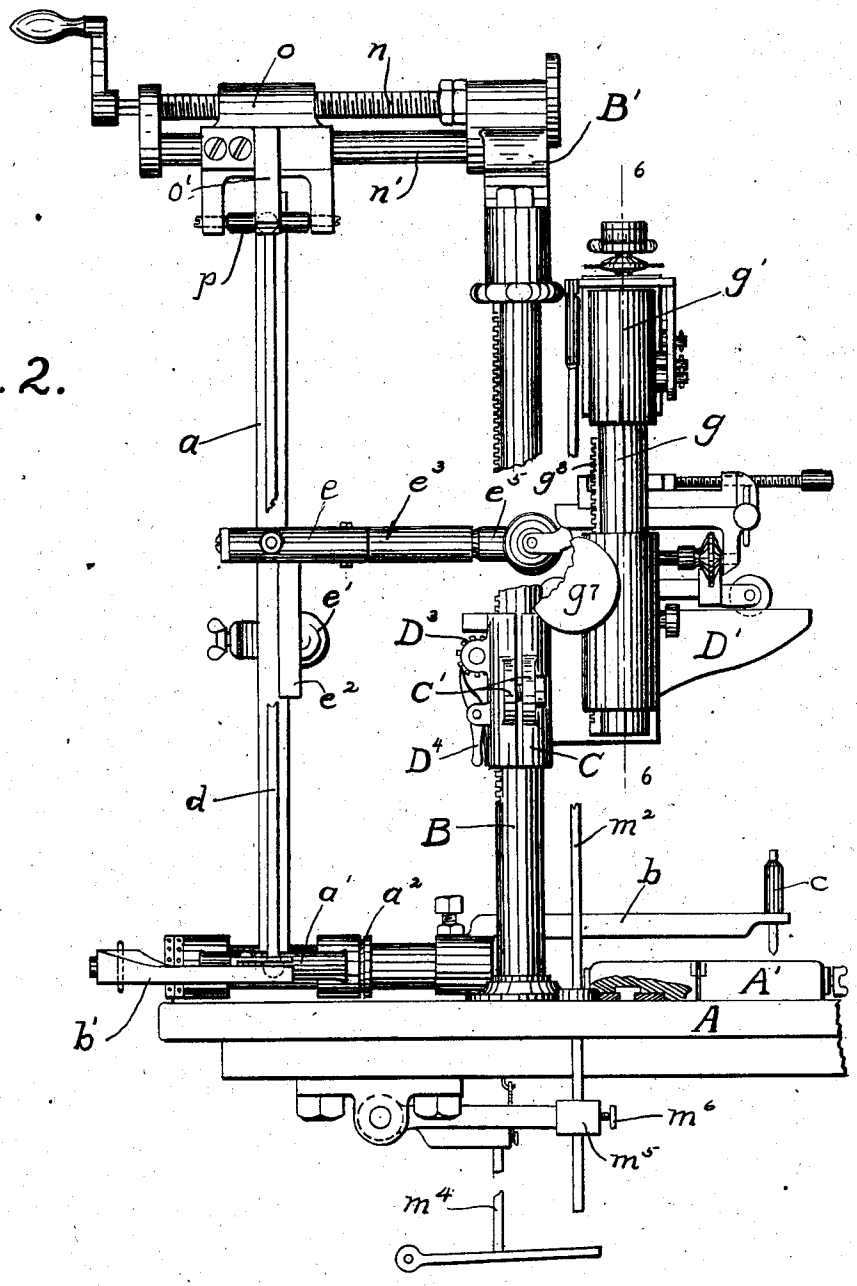
W. S. EATON.

ENGRAVING MACHINE.

APPLICATION FILED JULY 29, 1902.

NO MODEL. 10 SHEETS—SHEET 2.

Fig. 2.



WITNESSES:

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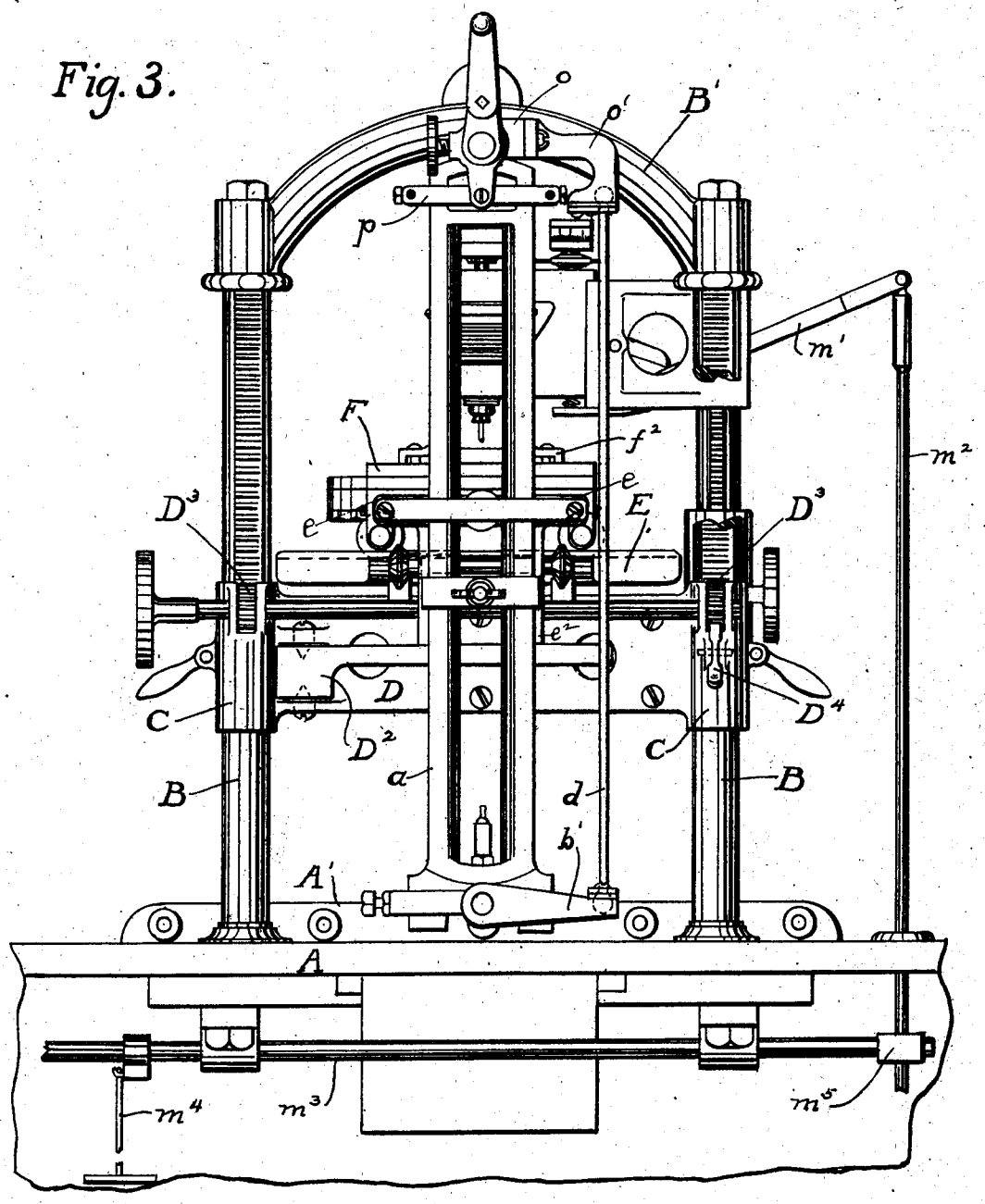
W. S. EATON.

ENGRAVING MACHINE.

APPLICATION FILED JULY 29, 1902.

NO MODEL. 10 SHEETS—SHEET 3.

Fig. 3.



WITNESSES:

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No. 728,556. PATENTED MAY 19, 1903.

W. S. EATON.

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APPLICATION FILED JULY 29, 1902.

NO MODEL 10 SHEETS—SHEET 4.

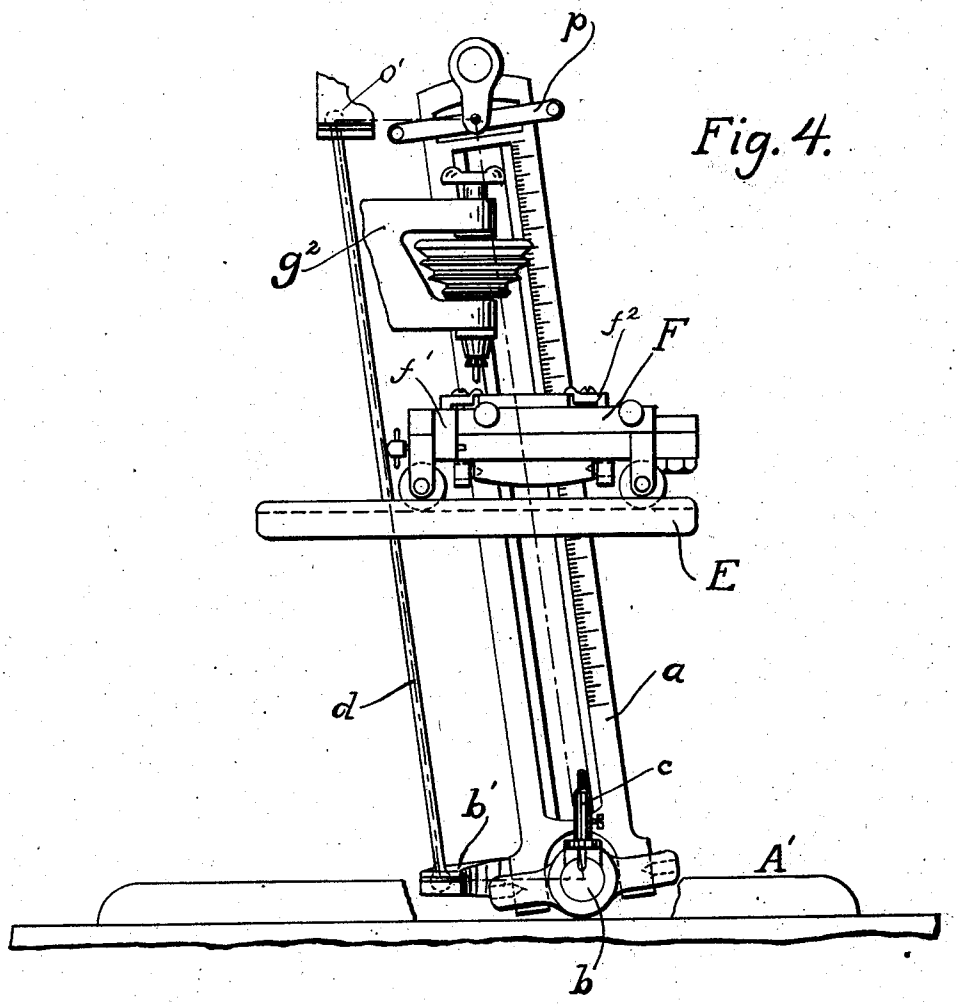


Fig. 4.

WITNESSES:

Herbert L. Towle

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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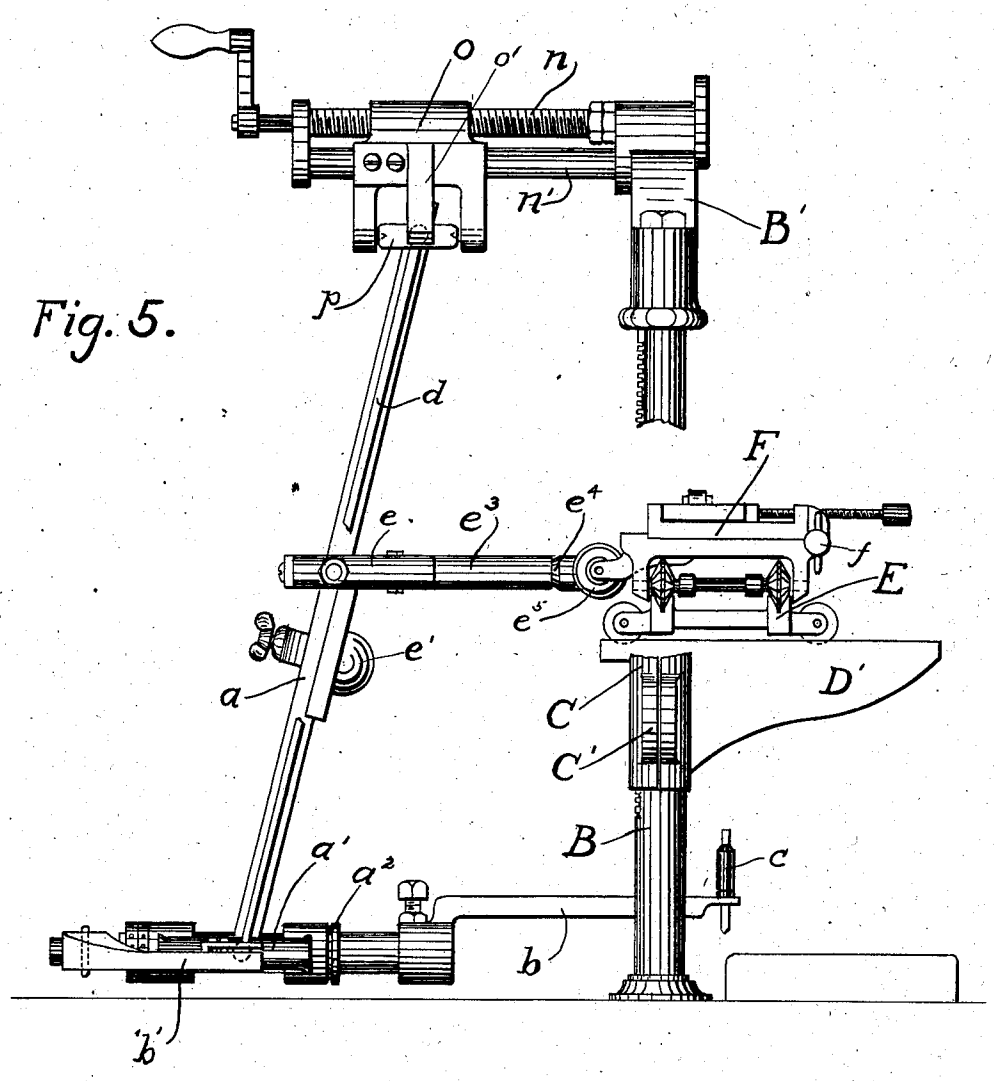
W. S. EATON.

ENGRAVING MACHINE.

APPLICATION FILED JULY 29, 1902.

NO MODEL. 10 SHEETS—SHEET 5.

Fig. 5.



WITNESSES:

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No. 728,556. PATENTED MAY 19, 1903.

W. S. EATON.

ENGRAVING MACHINE.

APPLICATION FILED JULY 29, 1902.

NO MODEL. 10 SHEETS—SHEET 6.

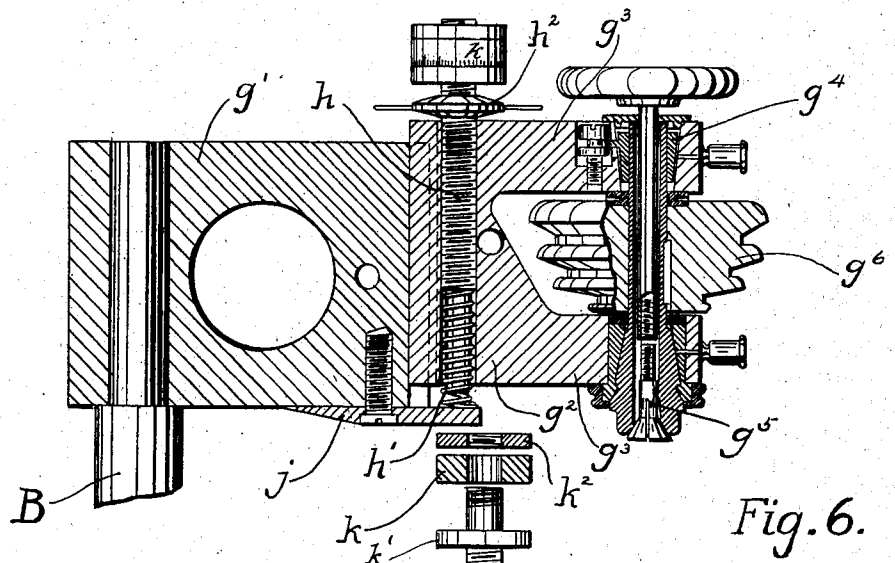


Fig. 6.

Fig. 8.

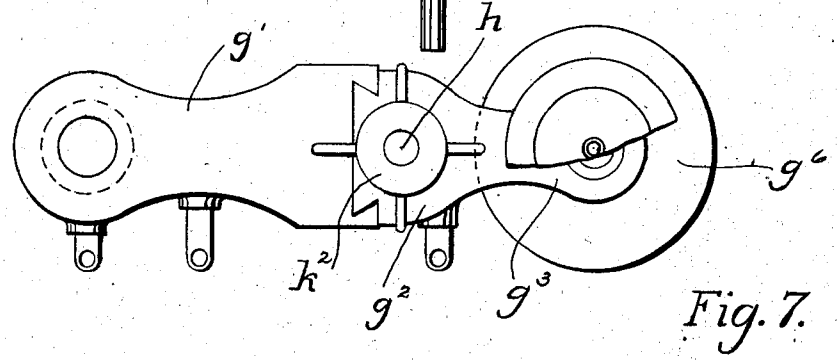


Fig. 7.

WITNESSES:

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 728,556. PATENTED MAY 19, 1903.

W. S. EATON.

ENGRAVING MACHINE.

APPLICATION FILED JULY 29, 1902.

NO MODEL. 10 SHEETS—SHEET 7.

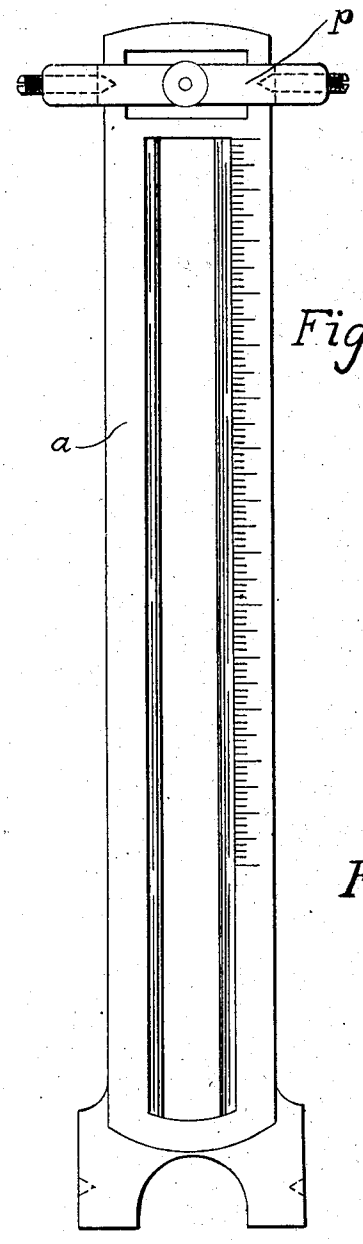


Fig. 9.

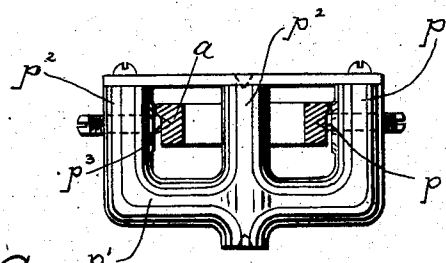
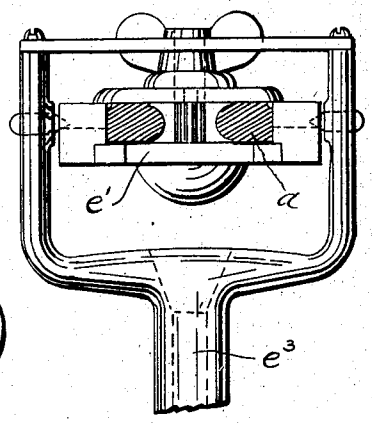


Fig. 10.

Fig. 11.



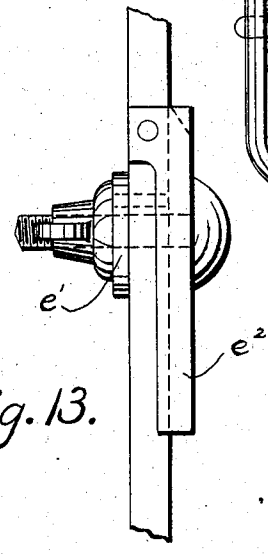


Fig. 13.

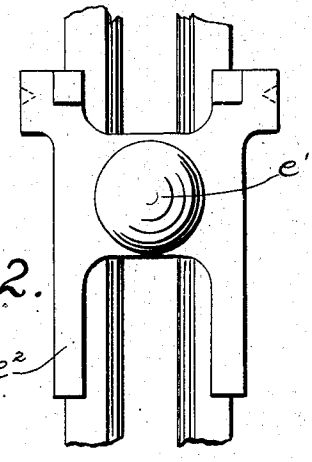


Fig. 12.

WITNESSES:

Herbert L. Towle

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 728,556. PATENTED MAY 19, 1903.

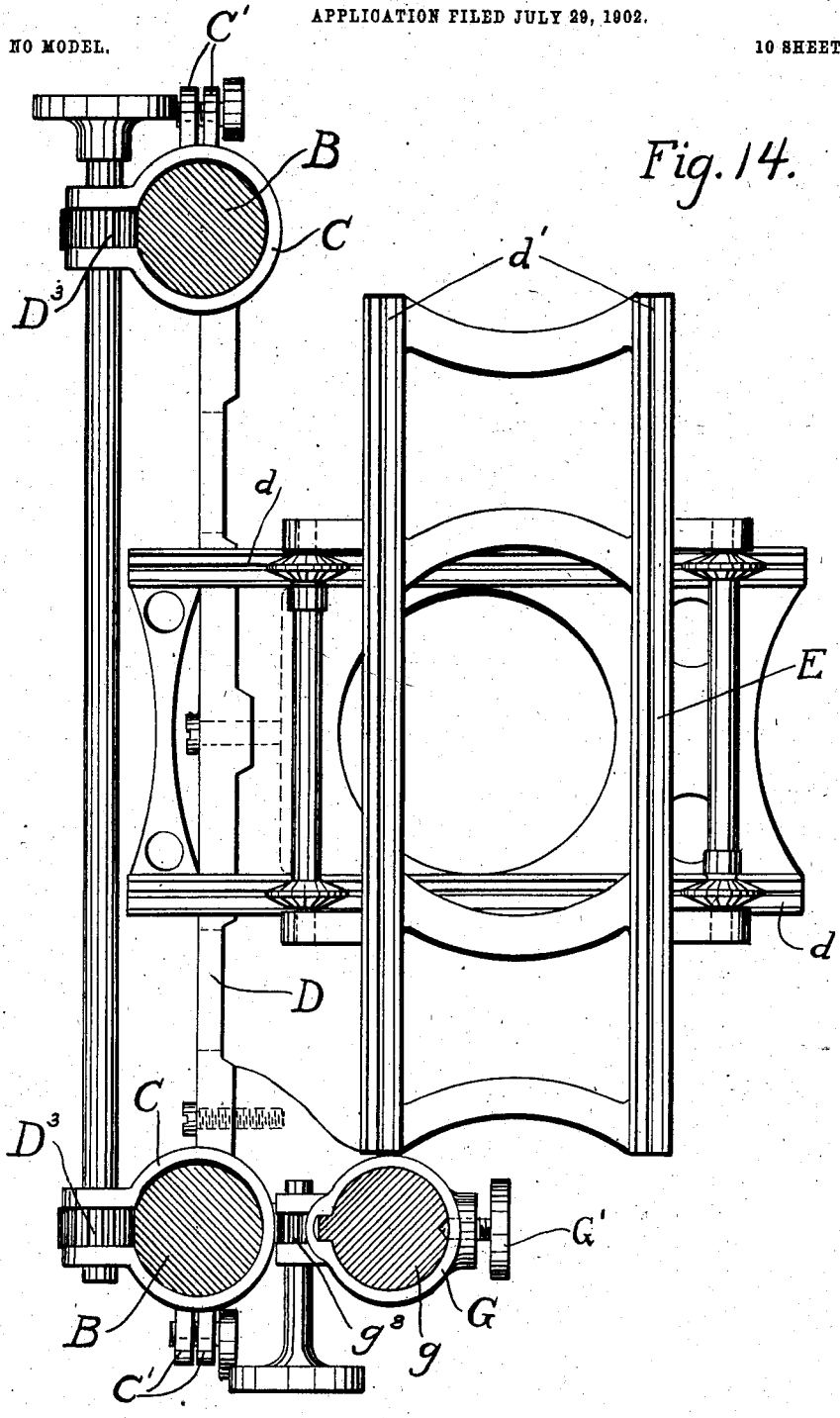
W. S. EATON.

ENGRAVING MACHINE.

APPLICATION FILED JULY 29, 1902.

NO MODEL. 10 SHEETS—SHEET 8.

Fig. 14.



WITNESSES:

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No. 728,556. PATENTED MAY 19, 1903.

W. S. EATON.

ENGRAVING MACHINE.

APPLICATION FILED JULY 29, 1902.

NO MODEL. 10 SHEETS—SHEET 9.

Fig. 15.

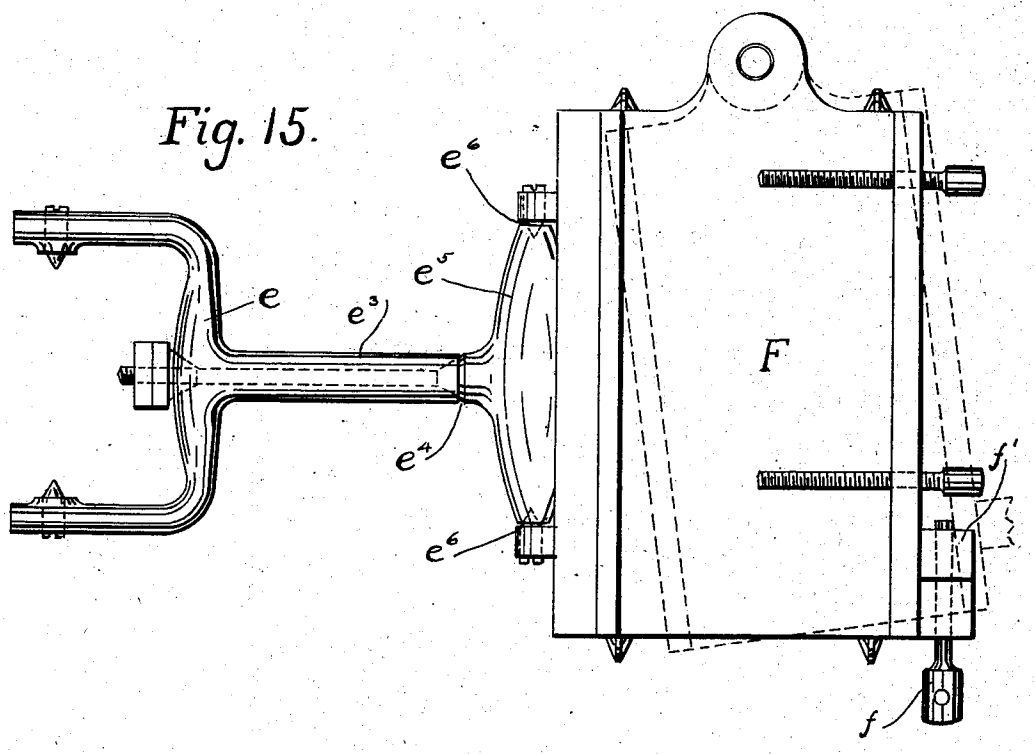
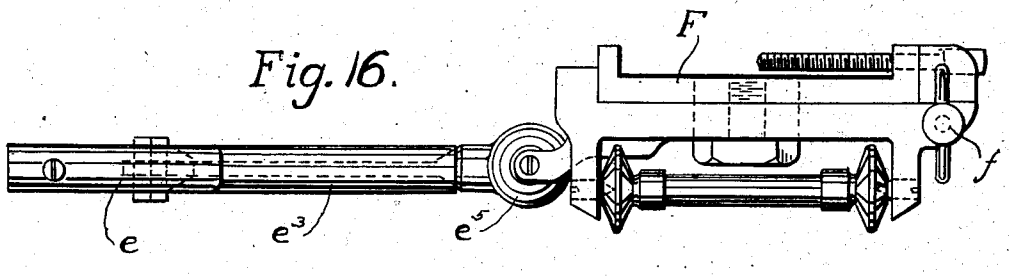


Fig. 16.



WITNESSES:

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 728,556. PATENTED MAY 19, 1903.

W. S. EATON.

ENGRAVING MACHINE.

APPLICATION FILED JULY 29, 1902.

NO MODEL. 10 SHEETS—SHEET 10.

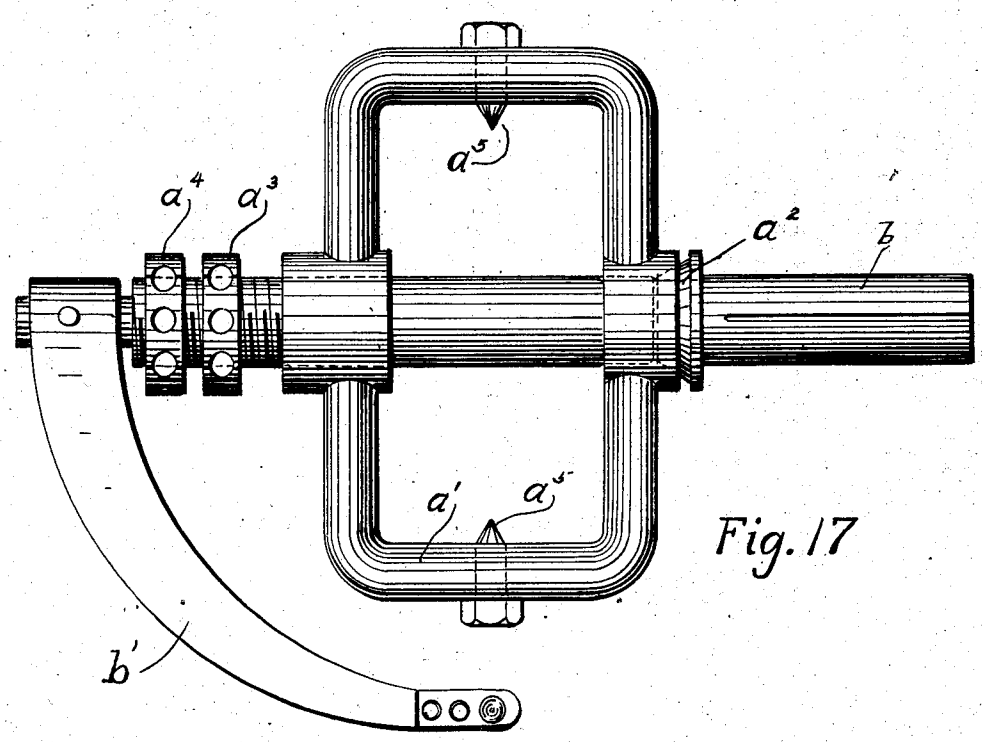
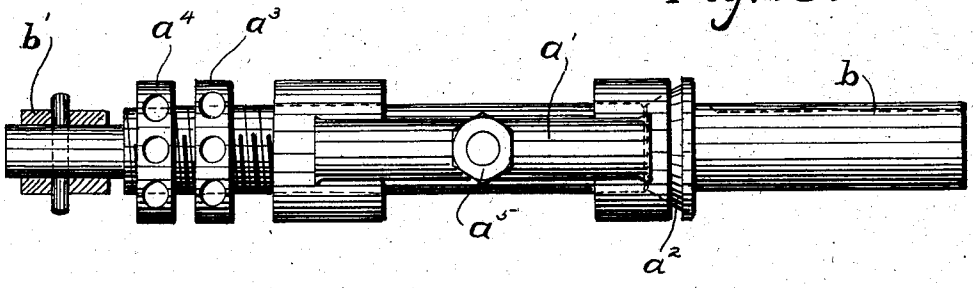


Fig. 17

Fig. 18.



WITNESSES.

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ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 728,556. Patented May 19, 1903.

UNITED STATES PATENT OFFICE.

WILLIAM S. EATON, OF SAG HARBOR, NEW YORK, ASSIGNOR TO ENGRAVING COMPANY OF AMERICA, OF NEW YORK, N. Y.

ENGRAVING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 728,556, dated May 19, 1903.

Application filed July 29, 1902. Serial No. 117,448. (No model.)

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 a new and useful Improvement in Engraving-Machines, of which the following is a specification.

My invention relates to improvements in engraving-machines, and more particularly to a class of such machines especially designed for reproducing work on any desired scale (within certain limits) from an original or pattern.

The invention consists in the novel features of construction and combination of parts hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

Referring to the accompanying drawings, Figure 1 is a front elevation of my machine. Fig. 2 is a side elevation, partly broken away. Fig. 3 is a rear elevation. Fig. 4 is a front elevation of transmitting mechanism and routing-tool, illustrating the operation of same. Fig. 5 is a partial side elevation, partly broken away. Fig. 6 is an enlarged detail view of the spindle, its carrier, and adjustable stop on line 6 6, Fig. 2. Fig. 7 is a plan view of same. Fig. 8 is a detail view of adjustable stop. Fig. 9 is a detail view of the transmitter. Fig. 10 is a detail plan view of the upper support for said transmitter. Fig. 11 is a detail plan view of the connection between said transmitter and the link between it and the movable work-bed. Fig. 12 is a front elevation of the clamp carried by the transmitter. Fig. 13 is a side elevation of same. Fig. 14 is a horizontal section showing in detail the construction of the support for the work-bed. Fig. 15 is a plan view of the work-bed and link connecting it with the transmitting mechanism. Fig. 16 is a side elevation of same. Fig. 17 is a detail view of the outer end of the stylus-arm and lower connection for the transmitter, and Fig. 18 is a side elevation of same.

Like letters refer to like parts throughout the several views.

In the practice of my invention I use a table A, which carries the support, as A', for the original or pattern to be reproduced. Carried by the table A are the parallel vertical guides B, connected by the cross-bar B'. Vertically movable upon these guides are sleeves C C, connected by a cross-head D, which forms a support for the movable work-bed. The sleeves C C are provided with lugs C', by means of which they may be clamped in any desired position relative to said guides. The cross-head D is provided with brackets D', the upper faces of which form V-ways, as *d*.

Movable longitudinally of the machine in the ways *d* is a carriage E, supported upon wheels the peripheries of which are beveled to conform to said ways. This carriage supports a frame carrying similar ways *d'*, arranged in a horizontal plane parallel to that occupied by the ways *d* and perpendicular to said ways.

Movable laterally of the machine in the ways *d'* is a second carriage the wheels of which are similar to those above described. This carriage supports the work-bed of the machine F, which is secured thereto, as shown in Fig. 13, by a pivot disposed adjacent to the perimeter of said work-bed to permit the withdrawal of the work from beneath the routing-tool for the purpose of inspection. Said bed-plate is normally maintained upon said carriage by means of the movable stop *f*, which is adapted to engage a lug, as *f'*, on said work-bed. The carriage is provided on its upper face with suitable means whereby work may be firmly attached thereto, as adjustable clamps f^2, although work may be secured thereto by means of dogs, as in ordinary drills or milling-machines.

Carried by the cross-head D and preferably integral therewith is a guide-sleeve G, in which is mounted a vertically-disposed bar *g*, which carries a support *g'* for the spindle-carrier g^2. The bar *g* is provided with a rack-and-pinion mechanism, as g^3, by means of which said carrier is rendered adjustable vertically independently of the movement of the cross-head D and the work-bed carried thereby. The spindle-carrier g^2 is vertically movable within the ways in support *g'* and is provided with arms, as g^3, within which is mounted a vertical spindle, as g^4, provided with a chuck g^5 or other desired means of securing a routing-

tool therein. Mounted upon the spindle within the arms g^3 is a stepped pulley g^6, by means of which said spindle is driven from any desired source of power.

Mounted in the carrier g^2 is a vertically-adjustable stop, as h, which is seated in a screw-threaded cavity extended through said carrier. The lower portion of this stop is reduced, and a spiral spring h' surrounds said reduced portion and bears against a shoulder j to normally maintain said carrier from engagement with said shoulder. A lock-nut h^2 is employed to secure said stop against movement except when desired. The upper portion of the stop h is turned perfectly smooth, and rotatably mounted thereon is a micrometer-cylinder k, the scale on which conforms to the pitch of the screw-threads of said stop. A suitable annular flange or seat k' and second lock-nut k^2 serve to maintain said micrometer-cylinder in the desired relation and permit its free rotation to operate in a manner to be more fully described hereinafter. A detail description of the arrangement of the vertical spindle g^4 is not entered into, inasmuch as any desired form of spindle may be employed, and the details of construction of same form no part of this invention. An indicator-finger l is mounted on the carrier g^2 in close proximity to said micrometer-cylinder k.

Fulcrumed upon the support g' is a short lever m, one end of which is pivoted to the carrier g^2 and the other end of which is acted upon by the lever m', which by means of the link m^2, shaft m^3, and link m^4 is connected to a treadle the depression of which serves to reciprocate the spindle-carrier g^2 to bring the routing-tool into engagement with the work. Normally the spring h' serves to hold said routing-tool free of the work irrespective of the extent to which said tool is desired to penetrate, which latter is regulated solely by the adjustable stop h and insures a uniform movement of said carrier under the influence of said compound-lever system. To provide for the vertical movement of the support g', the lower end of the link m^2 is seated in an opening in the block m^5 and is secured in this position by means of the set-screw m^6. A spring m^7 insures the return of the treadle to its normal position instantly upon the release of said treadle.

Supported by the cross-bar B' is a screw-feed mechanism, as n, and a guide n', parallel therewith. Movable upon the guide n' and under control of the mechanism n is a traveler o, from which is suspended, by means of a universal bearing p, to be more fully described hereinafter, an oscillating transmitter, as a. The lower end of said transmitter is similarly connected to the arm b, carrying the stylus or tracing-tool c, which is adapted to follow the lines of the original or pattern. The transmitter a is provided with a central slot to facilitate the ready adjustment of the link connecting it with the work-bed to enable speedy regulation as to the scale of the reproduction of the said original or pattern. The arm b extends forwardly of the transmitter and is provided with a forwardly-projected side arm b', which is rigidly fastened thereto. This side arm b' is provided with a socket in which is journaled to form a ball-and-socket joint the lower end of a rod d, the upper end of which is similarly journaled in a bracket o', which comprises a curved arm extending from and carried by the traveler o, the object of the rod being to serve in conjunction with the transmitter to prevent the rotation of the said arm b and so prevent any lateral tilting of the stylus c.

Mounted upon the arm b adjacent to the arm b' thereof is a swiveling frame a', which is held in the proper position by means of a cone-bearing a^2, thrust-bearing a^3, and set-nut a^4. The opposite sides of this frame are provided with point-bearings a^5, the axes of which are perpendicular to the axis of the entire frame. Mounted between these bearings and in substantial alinement with the bearing in the side arm b' is the lower portion of the transmitter a. The upper bearing p of said transmitter comprises a frame p', mounted between point-bearings in the traveler o, said frame p' comprising three parallel arms p^2, adapted, respectively, to pass on each side of and through the slot of said transmitter. The outside arms of said frame p' are provided with point-bearings p^3, between which is mounted the upper end of said transmitter. By means of said bearings it will be observed that a universal movement of said transmitter is secured, which motion is transferred to the work-bed by the following mechanism: A yoke e is pivotally connected to the transmitter a by means of an adjustable clamp e', capable of and adapted to be secured firmly to said transmitter a, which is journaled in point-bearings carried by said yoke. The clamp e' is provided with a downwardly-presented shoulder e^2, which is adapted by engagement with the swinging arm D^2, carried by the cross-head D, to cause a uniform movement of said clamp and said cross-head when adjusting the machine. The arm D^2 is pivotally connected to the cross-head D and is adapted to swing laterally into engagement with the lower face of the shoulder e^2 of said clamp e'. Normally said arm rests against said cross-head to avoid interference with the transmitter when the machine is being operated. The stem e^3 of the yoke e is by means of a swivel connection e^4 secured to the T-bar e^5, which in turn is pivoted between point-bearings e^6, mounted in lugs carried by the work-bed F. The axes of said bearings are perpendicular to the axes of the connection between the yoke e and said bar.

To facilitate the vertical adjustment of the cross-head D, I provide a rack-and-pinion mechanism D^3, the rack being carried by the

guides B and the pinions by the sleeves C. To prevent said cross-head from dropping of its own weight when said sleeves are not securely clamped, I provide one of the pinions with a dog D^4.

To maintain the bar g in a desired relation to its supporting-sleeve, I provide a set-screw, as G', which is carried by the sleeve G and adapted to engage said bar.

In the operation of my improved engraving-machine the original or pattern is firmly secured to the table A beneath the stylus c by any desired means. A blank plate is then securely clamped to the work-bed F by means of the clamps f^2 or their equivalent. It having been determined on what scale the original or pattern is to be reproduced, the lugs C' C' are released and the sleeves C C thus permitted to move on the guides B B. The arm D^2 is then swung outwardly to engage the shoulders e^2 and the clamp e' released to permit its adjustment longitudinally of the transmitter a, the said arm holding the said clamp so that the connection between it and the work-bed F will be substantially horizontally disposed. The rack-and-pinion mechanism D^3 is then actuated to raise or lower the cross-head D, the work-bed F, and the supporting mechanism therefor to reduce or increase the scale of reproduction, as desired. The transmitter a is provided with a scale by means of which it may be determined when the correct position of the clamp e' has been secured. The clamps C' C' and e' are then reset to maintain this position and the arm D^2 returned to insure a clear field for the transmitter. The set-screw h^2 is then released and the stop h screwed down until it protrudes to a slight degree below the bottom of the carrier g^2. This operation tends to compress the spring h'; but said spring being free to act against the abutment j merely raises said carrier so that the space between the contact-point of said carrier and said abutment, whether said point be the flush face of said carrier or the stop carried thereby, will always remain the same, and hence the extent of movement of said carrier will be substantially uniform under all conditions. The treadle is then pressed, which through the link m^4, shaft m^3, link m^2, and levers m' and m forces the carrier g^2 downward until the stop h contacts with the abutment j. If the routing-tool by this action is brought so as to merely touch the blank plate on the work-bed, no further adjustment is necessary except to regulate the depth of the cut. If, however, owing to the variance in the thickness of these plates or other reasons it is found that said tool is entirely free of said plate or that it prevents the engagement of the stop h with the abutment j by premature contact therewith, the entire carrier is lowered or raised by means of the support g', the rack and the pinion mechanism g^3 being utilized to accomplish this adjustment. The set-screw G' must of course be released and reset before and after the operation. In order not to interfere with the treadle arrangement by this adjustment, the set-screw m^6 is released and the rod m^2 permitted to move through the block m^5 to the required extent. After the proper adjustment has been reached this screw is reset to permit the use of the treadle. The routing-tool having been brought so as to merely touch the plate (and to permit a fine adjustment the stop h may be manipulated in addition to the bar g) the treadle is released and the micrometer-cylinder k is rotated until zero registers with the finger l, in which position the said micrometer is set so as to move only with the stop h. The said stop is then withdrawn by means of its screw-threads until the micrometer registers the desired depth of cut, at which point the set-screw h^2 is used to prevent a variation from this adjustment. Everything is now in readiness to proceed with the reproduction of the original or pattern. The stylus c, as with the ordinary pantograph, is caused to follow precisely the line of the original or pattern, which causes a similar movement of the arm b throughout, said arm being suspended by means of the transmitter a. The upper and lower ends of said transmitter being mounted in universal bearings, movement in all directions is possible. The operation of bearings of this type is well known in the arts and will not be repeated. The rod d being hung by its upper end with a ball-and-socket connection from the bracket o', which is carried by the traveler o, and the transmitter a being hung by its upper end from the universal bearings in frame p, also carried by the traveler o, while the lower ends of said rod d and transmitter a, respectively, are supported by the corresponding bearings carried by the arms b and b', said rod d and transmitter a are thus permitted to move in constant parallel relation with each other under all conditions of operation of the machine. Thus the turning of the said arm b' on its longitudinal axis and any lateral tilting of the rod d occasioned thereby independently of the transmitter is prevented.

The movement of the transmitter a induces similar motion of the work-bed F, through the yoke e^3 and its stem and the T-bar e^5. The connection between the transmitter and the yoke, between said yoke and said T-bar, and between said T-bar and said work-bed compels a direct transmission of the movement of the stylus, while permitting the slight vertical or rotary movement due to the independent oscillation of said transmitter in following said stylus. Under this influence the carriage E and work-bed F are reciprocated in perpendicular lines, the wheels thereof moving, respectively, in the V-ways in the brackets D' D' and in the similar ways in the carriage E. These ways are employed, together with the V-wheels, to prevent lost motion. This arrangement permits the work-bed to have universal movement in a single plane.

Power may be derived from any desired source; but preferably the stepped pulley, to permit variable drive and ordinary belting, is used.

The traveler *o*, carrying the upper bearings for the transmission mechanism, may be moved toward and from the spindle and routing-tool, which movement increases the operative scope of the entire machine, it being apparent that the design within a certain area having been reproduced such shifting brings the stylus within reach of work not previously accessible. This increased efficiency is proportionate to the length of the screw-feed *n*.

The shifting above referred to is accomplished by simply revolving the screw, which being of well-known construction a description of its operation is unnecessary.

If during any stage of the work it is desired to inspect the plate on the work-bed, it is merely necessary to withdraw the peg *f* and swing said bed entirely free of the carrier g^2 and routing-tool, thus fully exposing the work in a convenient manner without disturbing any of the actuating mechanism, and it may be as quickly restored to and secured in its former position and the work resumed.

It will be observed that the spring *h'* acts to normally hold the tool free of the work, which is deemed preferable to having it normally in engagement therewith, as in an emergency the treadle can be released with greater rapidity than it can be found and depressed. It will also be observed that the various parts being adjustable as to each other the range of the machine is materially increased.

It is not my intention to limit the invention to the precise construction herein shown and discribed, as it is apparent that in many details there may be variations therefrom without departing from the spirit or scope of my invention.

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

1. In an engraving-machine, the combination with a table and vertical guides, of a cross-head carried by said guides, a work-bed supported by said cross-head, means whereby said work-bed is universally movable in a single plane, a vertical spindle, means for driving same, a stylus, a transmitter actuated thereby, means whereby said cross-head may be vertically adjusted, means for securing said cross-head in position, connections between said transmitter and said work-bed, means whereby said connection may be adjusted longitudinally of said transmitter, and means whereby simultaneous, uniform movement of said connections and said cross-head is insured.

2. In an engraving-machine, the combination with a table, a work-bed, and means whereby said work-bed is universally movable in a single plane, of a support, vertical ways thereon, a reciprocating carrier mounted on said ways, means whereby said support is adjusted toward and from said work-bed, a vertical spindle journaled in said carrier, means for driving same, means whereby said carrier may be set in a relation to said support to control the depth of cut, a stylus, a transmitter actuated thereby, and connections between said transmitter and said work-bed.

3. In an engraving-machine, the combination with a table, a work-bed, and means whereby said work-bed is universally movable in a single plane, of a vertically-adjustable support, a vertically-reciprocating carrier mounted therein, a vertical spindle journaled in said carrier, means for driving same, means whereby said carrier is normally sustained to keep the tool free of the work, a stylus, a transmitter actuated thereby, and connections between said transmitter and said work-bed.

4. In an engraving-machine, the combination with a table, a work-bed, and means whereby said work-bed is universally movable in a single plane, of a vertically-movable carrier, a vertical spindle journaled therein, means for driving same, an adjustable screw-threaded stop mounted in said carrier, a spring acting on said stop as described whereby said carrier is sustained to keep the tool free of the work, means whereby said carrier may be depressed against the tension of said spring, a stylus, a transmitter actuated thereby, and connections between said transmitter and said work-bed.

5. In an engraving-machine, the combination with a table, a work-bed, and means whereby said work-bed is universally movable in a single plane, of a vertically-movable carrier, a vertical spindle journaled therein, means for driving same, an adjustable screw-threaded stop mounted in said carrier, a spring acting on said stop as described whereby said carrier is sustained to keep the tool free of the work, means comprising a compound-lever system and a treadle actuating same whereby said carrier may be depressed against the tension of said spring, a stylus, a transmitter actuated thereby, and connections between said transmitter and said work-bed.

6. In an engraving-machine, the combination with a table and vertical guides, of sleeves mounted on said guides, a cross-head carried by said sleeves, a rack-and-pinion mechanism, the elements of which are respectively carried by said guides and said sleeves whereby said cross-head may be adjusted vertically of said guides, means whereby said sleeves may be clamped about said guides to maintain said cross-head stationary, a work-bed supported by said cross-head, means whereby said work-bed is universally movable in a single plane, a vertical spindle, means for driving same, a stylus, a transmitter actuated thereby, con-

nections between said transmitter and said work-bed, and means whereby said connections may be adjusted longitudinally of said transmitter.

7. In an engraving-machine, the combination with a table, and vertical guides, of a cross-head carried by said guides and vertically adjustable thereon, means for securing said cross-head in a stationary position, a work-bed, means whereby said work-bed is universally movable in a single plane carried by said cross-head, a support movable with said cross-head and vertically adjustable independently thereof, a vertically-movable carrier mounted on said support, a vertical spindle journaled in said carrier, means for driving same, means whereby said carrier may be reciprocated independently of said support, a stylus, a transmitter actuated thereby, and connections between said transmitter and said work-bed.

8. In an engraving-machine, the combination with a table, and vertical guides, of a cross-head carried by said guides and vertically adjustable thereon, means for securing said cross-head in a stationary position, a work-bed, means whereby said work-bed is universally movable in a single plane carried by said cross-head, a vertically-disposed sleeve rigidly connected to said cross-head, a bar parallel to said guides and movable vertically in said sleeve, means for securing said bar in a stationary position, a support mounted on said bar, a vertically-movable carrier mounted on said support, a vertical spindle journaled in said carrier, means for driving same, means whereby said carrier may be reciprocated independently of said support, a stylus, a transmitter actuated thereby, and connections between said transmitter and said work-bed.

9. In an engraving-machine, the combination with a table and vertical guides, of a cross-head carried by said guides and vertically adjustable thereon, means for securing said cross-head in position, a work-bed supported by said cross-head, means whereby said work-bed is universally movable in a single plane, a support carried by said cross-head and adjustable independently thereof, a vertical spindle carried thereby, means for driving same, a stylus, a transmitter actuated thereby, means whereby said cross-head may be vertically adjusted, connections between said transmitter and said work-bed, and means whereby said connections may be adjusted longitudinally of said transmitter.

10. In an engraving-machine, the combination with a table, and vertical guides, of a cross-head carried by said guides and vertically adjustable thereon, means for securing said cross-head in position, a work-bed supported by said cross-head, means whereby said work-bed is universally movable in a single plane comprising V-ways on said cross-head, a carriage, beveled wheels thereon moving in said ways, V-ways on said carriage extending on a line perpendicular to said first-mentioned ways, a superposed carriage, and beveled wheels thereon moving in said last-mentioned ways, said work-bed being carried by said last-mentioned carriage, a support carried by said cross-head and adjustable independently thereof, a vertical spindle carried thereby, means for driving same, a stylus, a transmitter actuated thereby, means whereby said cross-head may be vertically adjusted, connections between said transmitter and said work-bed, and means whereby said connections may be adjusted longitudinally of said transmitter.

11. In an engraving-machine, the combination with a table, a work-bed, means whereby said work-bed is universally movable in a single plane, a vertical spindle and means whereby said spindle is actuated, of a traveler supported by the main frame of the machine, a transmitter, an arm projected forwardly of said transmitter, universal connections between the opposite ends of said transmitter and said traveler, and said arm respectively, a stylus carried by the forward end of said arm, means whereby said traveler may be moved toward and from said spindle whereby the scope of the machine is increased, and connections between said transmitter and said work-bed.

12. In an engraving-machine, the combination with a table, a work-bed, means whereby said work-bed is universally movable in a single plane, a vertical spindle and means whereby said spindle is actuated, of a guide carried by the main frame of the machine, a screw-feed mechanism, a traveler supported by said guide and actuated by said screw-feed, whereby said traveler may be moved toward and from said spindle, to increase the scope of the machine, a transmitter, an arm projected forwardly of said transmitter, universal connections between the opposite ends of said transmitter and said traveler and said arm respectively, a stylus carried by the forward end of said arm, and connections between said transmitter and said work-bed.

13. In an engraving-machine, the combination with a table, a vertical spindle, a stylus, and a transmitter actuated thereby, of a work-bed support, means whereby said support is universally movable in a single plane, connections between said support and said transmitter, a work-bed mounted on said support, and a pivotal connection between said work-bed and said support adjacent to the perimeter of said work-bed disposed at right angles to the plane of movement of said support, whereby said work-bed may be swung out from under the spindle to facilitate inspection of the work thereon.

14. In an engraving-machine, the combination with a table, a vertical spindle, a stylus, and a transmitter actuated thereby, of a work-bed support, means whereby said support is universally movable in a single plane, connections between said support and said

transmitter, a work-bed mounted on said support, a pivotal connection between said work-bed and said support adjacent to the perimeter of said work-bed disposed at right angles to the plane of movement of said support, whereby said work-bed may be swung out from under the spindle to facilitate inspection of the work thereon, and means for securing said work-bed against movement upon said pivotal connection.

15. In an engraving-machine, the combination with a table, a work-bed, means whereby said work-bed is universally movable in a single plane, and a vertical spindle, of a traveler supported by the main frame of the machine, a bracket carried thereby, means whereby said traveler may be moved toward and from said spindle, a transmitter, an arm projected forwardly of said transmitter, a forwardly-projected side arm rigidly connected to said arm, a rigid rod parallel to said transmitter, universal connections between the opposite ends of said transmitter and said traveler and said arm respectively and between the opposite ends of said rod and said bracket and said side arm respectively, and connections between said transmitter and said work-bed.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM S. EATON.

Witnesses:
G. HYMAN,
F. B. GLOVER.