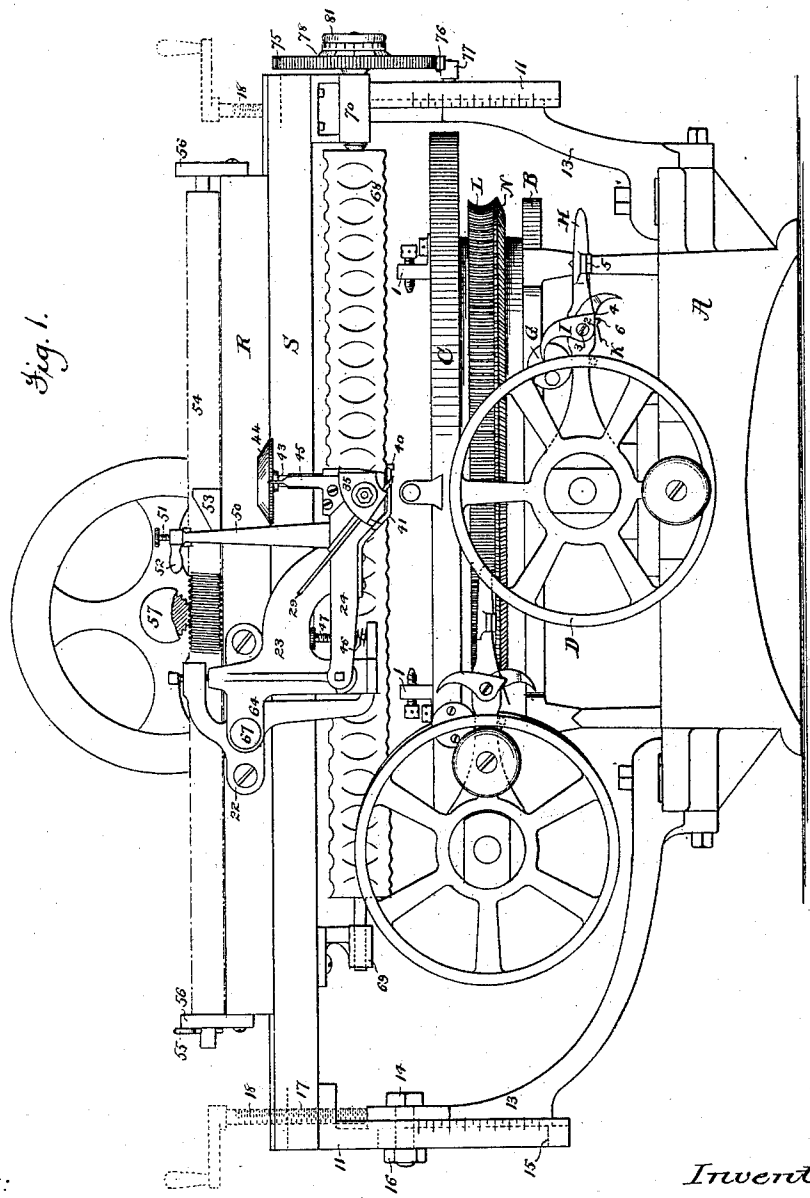
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T. A. RICHARDS.

ENGRAVER'S RULING MACHINE.

No. 342,464. Patented May 25, 1886.

Fig. 1.



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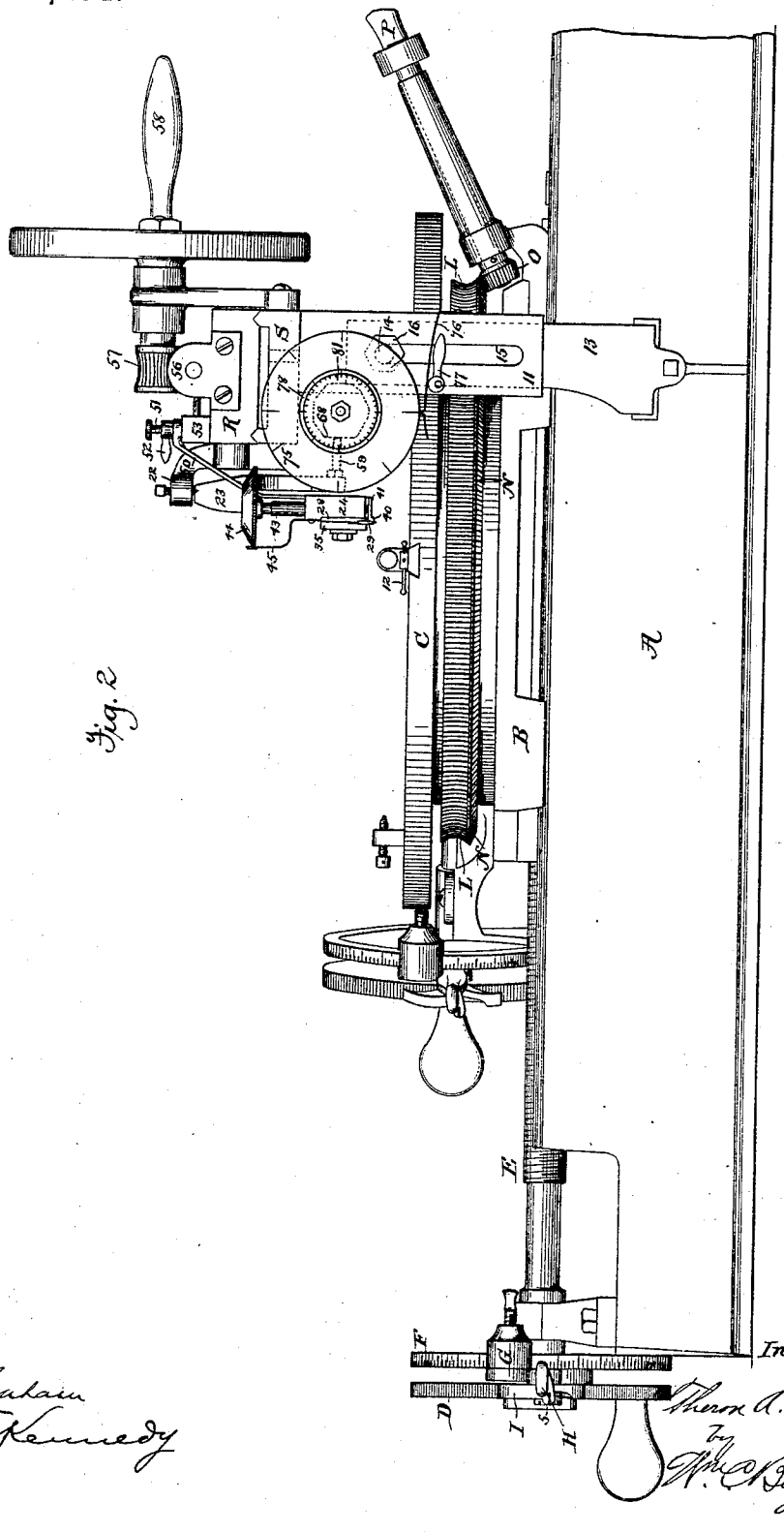


Fig. 2.

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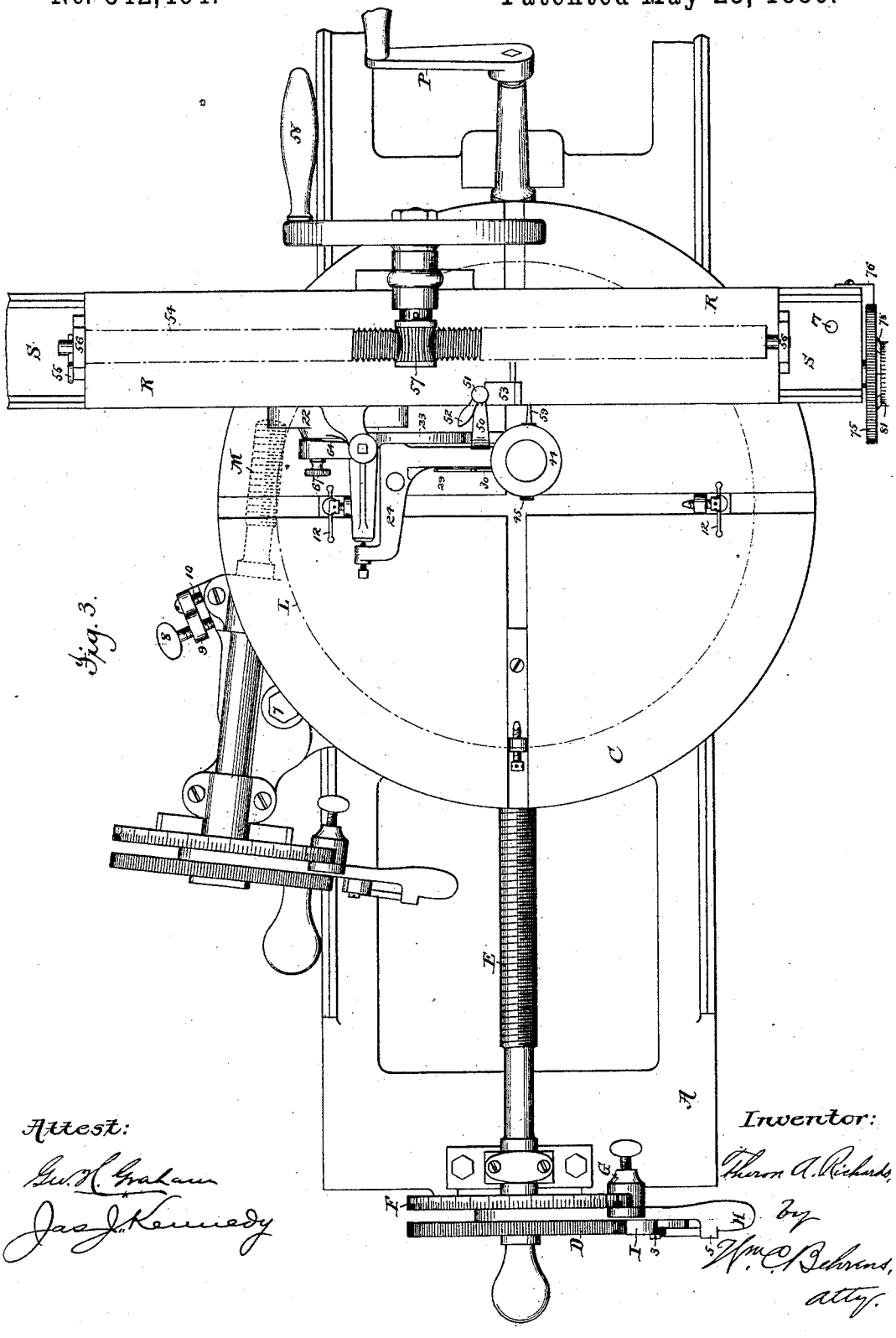


Fig. 3.

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T. A. RICHARDS.

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Fig. 4.

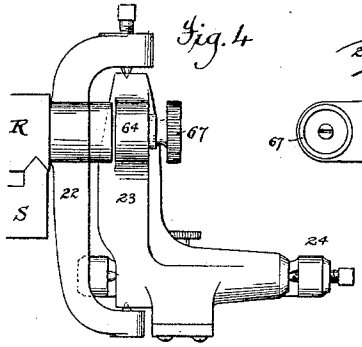


Fig. 5.

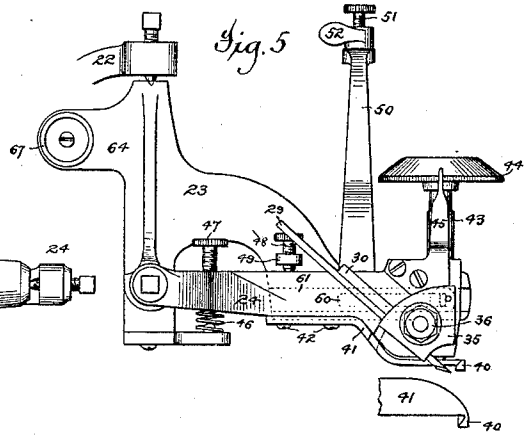


Fig. 6.

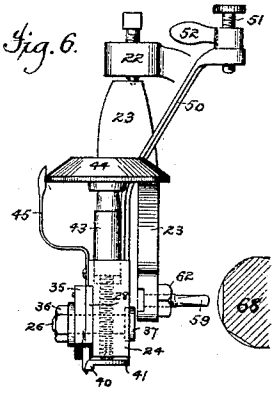


Fig. 7.

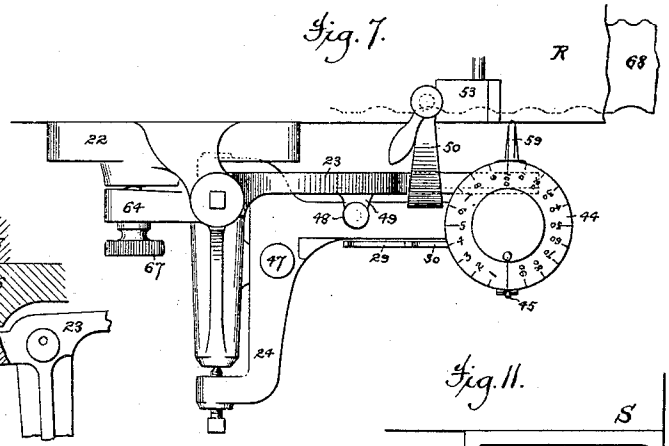


Fig. 10.

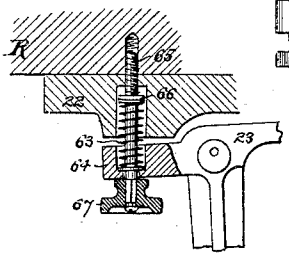


Fig. 11.

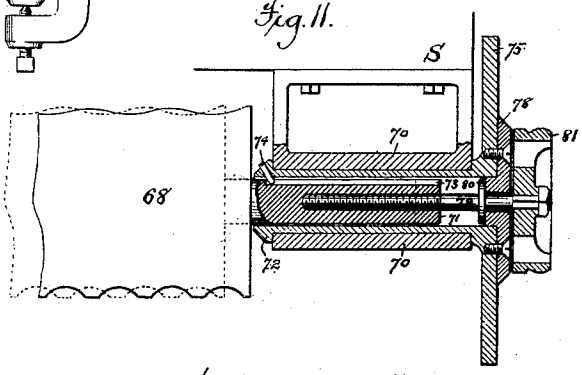


Fig. 8.

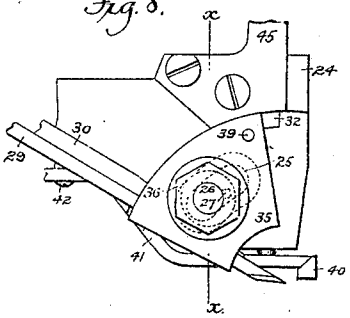


Fig. 9.

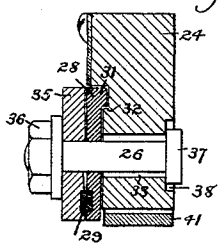
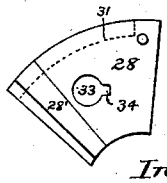


Fig. 12.



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T. A. RICHARDS.

ENGRAVER'S RULING MACHINE.

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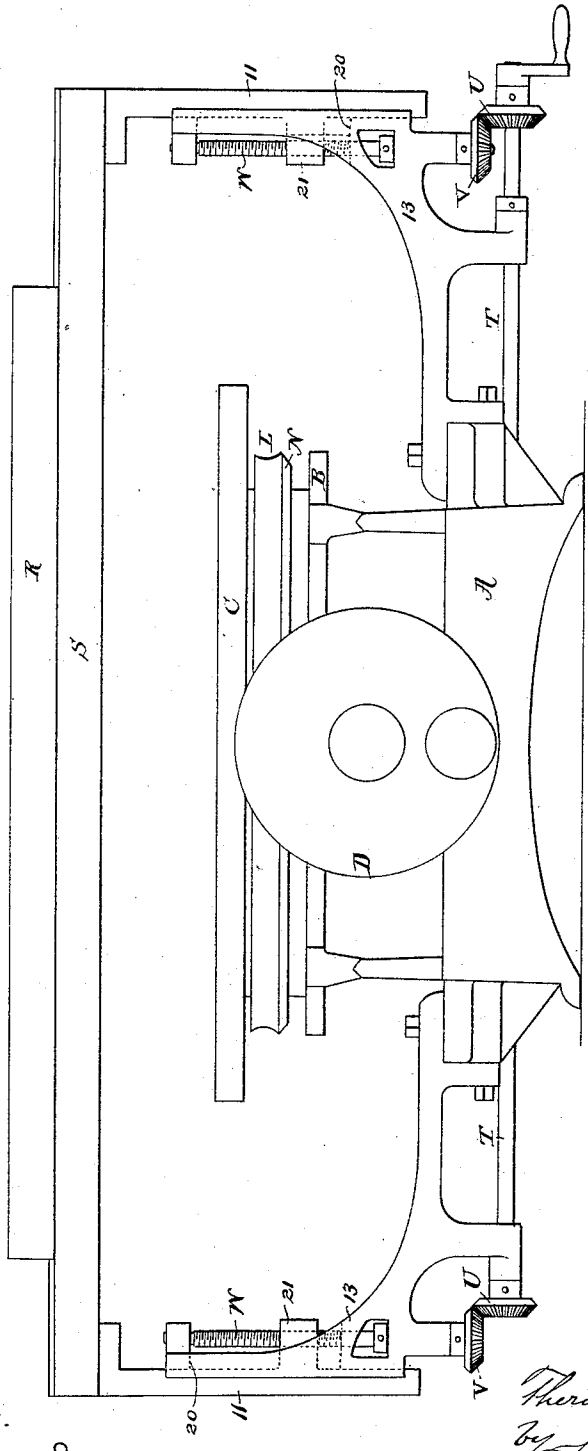


Fig. 13.

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UNITED STATES PATENT OFFICE.

THERON A. RICHARDS, OF BROOKLYN, NEW YORK.

ENGRAVER'S RULING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 342,464, dated May 25, 1886.

Application filed March 10, 1885. Serial No. 158,296. (No model.)

To all whom it may concern:

Be it known that I, THERON A. RICHARDS, a citizen of the United States, residing in the city of Brooklyn, Kings county, New York, have invented a new and useful Improvement in Engravers' Ruling-Machines, of which the following is a specification.

The object of my invention is to construct a ruling-machine which is adapted for use on wood, metal, or stone, which does not require the removal of any part or parts when changing from wood to metal or stone, or from one kind of work or operation to another, and in which each change can be made substantially without any loss of time, which can engrave a block close to either edge thereof, can be adjusted to automatically lift the tool, permits the tool to be adjusted at a greater or less angle from the vertical, permits a quick rotary adjustment of the wave-roll, a longitudinal adjustment of the same, and an adjustment of the tracer; also to improve the machine in other respects and in its details of construction. I accomplish these objects by the several combinations of parts hereinafter described and claimed.

In the accompanying drawings, which form a part of this specification, Figure 1 represents a front elevation of a machine embodying my invention; Fig. 2, a side elevation of the same, in which some of the parts are omitted for the sake of clearness; Fig. 3, a plan view thereof. Figs. 4, 5, 6, and 7 are detail views of the tool-bracket and the parts carried by the same; Figs. 8 and 9, enlarged detail views of the tool-holder, in which Fig. 9 is a cross-section on line *x x* of Fig. 8. Fig. 10 represents a detail view of the rear extension of the tool-bracket and its connection with the carriage-bracket. Fig. 11 is an enlarged detail view, in cross-section, of the mechanism for longitudinally shifting the wave-roll. Fig. 12 represents the tool holding plate, and Fig. 13 illustrates the preferred construction for elevating the carriage-track.

Referring to the drawings, A designates the foundation, on the tracks or ways of which the bed-plate B slides. Said bed-plate carries the revolving plate C, on which the block or plate to be ruled is firmly held by the screw-clamps 1. The vertical screws of said clamps are provided with handles 12, loosely passing through the heads thereof, and enlarged at their ends, so that they cannot slip out, and will therefore always be in place for use in tightening or loosening the said clamps. The bed-plate is moved backward and forward by the feed-wheel D and screw-shaft E in the ordinary well-known manner.

The stationary graduated ring F and adjustable stop G are of the usual construction.

The lever H, for operating the feed-wheel, is provided with a double-ender pawl, I. Said pawl is formed with a cam, 2, which co-operates with spring K, fastened to lever H at 5, and formed with notch 6. Said cam is located near the pivot 3 of the pawl, so that the spring shall cause the latter to bear as lightly as possible upon the ratchet-wheel, to prevent wear thereof, and also of the said spring. The spring K holds the pawl locked in either of its two operative positions, and when the point 4 of the cam engages notch 6 of the spring the pawl is locked in its intermediate or inoperative position. By means of this double-ender pawl the machine can be run equally well in either direction.

The perspective device or the mechanism for intermittently rotating the revolving plate any desired distance, is connected with the worm-gear L of said plate by the worm-shaft M. Said perspective device is pivoted to the frame of the machine at 7, and is held in engagement with the worm-gear by the screw 8, which is threaded through lug 9 of the frame and abuts against said device. The screw-stop 10 passes through a slot in lug 9, and screws into the frame of the perspective device, the head of said screw limiting the inward movement of the latter.

When it is desired to disengage the perspective device from the revolving plate, the screw 8 is withdrawn a sufficient distance, and the said device is then shifted on its pivot so as to abut against lug 9.

For giving a quick rotation to the revolving plate, I provide the following means: I cast a circular rack, N, on the under side or lower edge of the piece which carries the worm-gear L on its periphery, and gear said rack with a pinion, O, on the inner end of the shaft of handle P. When the perspective device is

disengaged, the said plate can be rotated for circle-work by operating the handle P.

By casting the circular rack on the same piece or ring on which the worm-gear is cut I greatly simplify and also cheapen the construction.

The tool-carriage R moves on track or way S, rendered adjustable by means of its depending arms 11, sliding on the vertical part of the stationary arms 13, formed on or connected with the foundation or frame of the machine. A threaded bolt, 14, projects from arm 13 through a slot, 15, in arm 11, and receives nut 16 on its outer end, which holds the parts firmly in place after they have been properly adjusted.

I have illustrated the clamping-bolt at one end only; but it is to be understood that both ends of the machine are so provided.

To elevate or lower and adjust the track S in the desired position, I provide the following means: Near each end of the said track I form therein a screw-threaded aperture, 17, for the reception of a screw-rod, 18, provided with an operating-handle, 19, the end of said screw-rod abutting against the upper end of arm 13. Upon loosening the nuts 16 and simultaneously turning both handles of the screw-rods 18 the track will be elevated or lowered, according to the direction in which said handles are turned.

To determine whether both ends of the track have been equally elevated or depressed, I graduate the arms 11 and 13, as illustrated in the drawings. After the parts have been adjusted and clamped the screw-rods are removed, so as not to interfere with the movement of the carriage.

Instead of attaching the screw-rods to handles, short screw-rods could be used which would not rise when in their highest position above the track, and would not therefore necessitate removal. Such screw-rods would be provided with a slot for the insertion of a screw-driver, or with an angular aperture or projection for the application of an independent operating-handle.

Instead of the screw-rod abutting against the top of arm 13, a shorter rod, having its lower part screw-threaded to enter a screw-threaded socket or aperture in arm 13, could be used. The upper part of such rod, where it passed through the track, would be provided with a shoulder or collar, or with two collars, one above and one below, so as to swivel the same in the track in a manner well understood, and prevent its longitudinal movement. Above the upper collar the end of the rod would be squared or otherwise suitably formed to permit the application of a handle. In this construction the unscrewing of the rod out of arm 13 would operate to raise the carriage-track.

The preferred construction for vertically adjusting the track S is illustrated in Fig. 13. In this form I mount a transverse shaft, T, in the foundation of the machine, and provide each end thereof with a bevel-gear, U. In each arm 13 I journal a vertical screw-threaded shaft, W, carrying on its lower end a bevel-gear, V, for engagement with said gear U. I further construct each arm 13 with a vertical slot, 20, for the passage of a screw-threaded lug, 21, on track-arm 11, with which lug the threaded shaft W engages. The transverse shaft T is further provided at one end with an operating-handle, by turning which both ends of the track are simultaneously and equally elevated or depressed.

The object in making the carriage-track adjustable is to permit blocks of varying thickness to be operated upon, especially lithographic stones, and to accommodate large angular blocks of this material the arms supporting the track are placed at considerable distance from the revolving plate, as shown in Fig. 13, so that in the rotation of the latter the corners of such stones shall not strike the said arms.

The tool and tracer are mounted and arranged as follows: To the carriage R a bracket, 22, is rigidly secured, in which the tool-bracket, consisting of the tracer-arm 23 and the tool-post 24, is mounted, the former being directly pivoted in the carriage-bracket, while the latter is pivoted to the former at right angles thereto.

The tool-holder is placed near the free end of the tool-post, and is constructed as follows: A curved slot, 25, (see Figs. 8 and 9,) is formed in the tool-post, through which a threaded and headed bolt, 26, provided with a squared part or a lug, 27, projects. Over this bolt is passed the tool-holding plate 28, (see Fig. 12,) having on its front face a recess, 28′, for the tool 29 and wedge 30, and on its rear face a guide flange, 31, which projects into the guide-slot 32 of the post, said slot being curved from the point of the tool as a center. The said plate is further provided with a square hole, or a circular one, 33, having notch 34, for engagement with the corresponding part of bolt 26. The tool-holding plate, by means of said guide slot and flange, can be shifted to place the tool at a greater or less angle from the vertical, without changing the position of the point of the tool, as may be required for the execution of different classes of work. For soft tints, for example, the tool is held at a greater angle from the vertical than ordinarily.

To fasten the tool, tool-holding plate, and bolt in place, I use the clamping-plate 35 and nut 36. The former, provided with an aperture for the passage of the bolt, is passed over said bolt so as to lie on the tool and the tool-holding plate, and the nut is then screwed down to firmly clamp the several parts in their adjusted position.

The object in providing the projection 27 on the bolt and the notch 34 in the plate is to prevent the rotation of the bolt when the nut

is applied thereto. This same object can be accomplished by omitting said projection and notch and in lieu thereof constructing the bolt-head 37 of a form to prevent its rotation in the groove 38, in which it rests, instead of making said head circular, as illustrated.

To keep the clamping-plate always in alignment with the tool-holding plate, I provide the latter with a pin, 39, projecting into a hole in the former. The same end is served by making the bolt square where the clamping-plate surrounds it, and squaring the aperture in said plate to correspond. The guide or bearing foot 40 is formed on the end of spring-bar 41, secured to the under side of the tool-post by screws 42. Said foot projects laterally from said bar and directly in front of the tool, whereby a perfectly even tint on an uneven block is secured, and the block can be engraved close to either edge.

The guide or bearing foot is adjusted vertically, to regulate the depth of cut, by means of the screw-rod 43, which works in the tool-post and presses against the spring-bar of the guide-foot. The upper end of said rod carries a graduated and notched plate or disk, 44, by turning which the depth of cut can be adjusted with the greatest nicety and exactness. The stout spring-pawl 45, fastened to the tool-post, locks the disk in place and prevents its accidental displacement. The tool 29 is lifted from the block, when not in operation, by means of the spring 46, the tension of which can be increased by turning down the adjusting-screw 47. The upward movement of the tool-post is limited by the screw-stop 48, which passes through a lug, 49, projecting from the tracer-arm.

The automatic lifting of the tool-post is effected by the following mechanism: A lifter-rod, 50, is secured to the side of the tool-post, and carries on its outer end, extending over the carriage R, a vertical screw, 51, held in place by a handled lock-nut, 52. The said vertical screw may be considered as the adjustable end of said lifter-rod, the same cooperating with the inclined block or cam 53, fixed to the rack-bar 54 of the carriage. The said rack-bar, when locking pin 55 is removed from its left-hand end, is permitted to have a limited longitudinal movement on the carriage, guided by the apertured rack-lugs 56, in which the diminished ends or projections of the rack-bar slide.

The mode of operation of these parts is as follows: The tension on screw 46 is first relieved, so that the tool and bearing-foot will drop upon the block and be in proper position to act. The vertical screw 51 of the lifter-rod is then adjusted or turned down on the incline or cam 53 until the tool is raised to clear the block—say one-sixteenth of an inch. The pin 55 is then withdrawn, and if now the rack is moved on the carriage against the right-hand lug the incline will move a sufficient distance from under screw 51 to allow the tool to again come into contact with the block. When the pinion 57 is rotated by handle 58 so as to move or return the carriage from right to left in Fig. 1, the rack is first shifted on the carriage until its shoulder abuts against the left-hand rack-lug, and thereafter the rack and carriage, of course, move together. This initial and independent movement of the rack, preceding that of the carriage, causes its attached incline or cam to pass under the adjustable end or screw of the lifter-rod, so as to elevate the tool-post and lift the tool from the block. When the pinion 57 is operated to move the carriage forward—*i. e.*, from left to right—the rack is shifted on the carriage until its shoulder brings up against the right-hand rack-lug, and thereafter the carriage and rack will move together; but this initial movement of the rack, of which the incline or cam partakes, causes the latter to recede from under the adjustable end of the lifter-rod, permitting the tool-post to descend, so that the tool may be in proper position to act on the block or plate when the carriage begins to move forward. This automatic arrangement for lowering and elevating the tool in advance of the forward and return movements of the carriage effects a great saving in time, as the operator is relieved from the trouble of moving his left hand from the ratchet-wheel to the tool at each operation, and also lessens the liability of accidental cuts. It is especially useful in work requiring much repetition.

The tracer or tracer-point 59, which co-operates with the wave-roll 68, is adjustably secured to the tracer-arm 23 of the tool-carrier. The said tracer arm is provided with a slot, 60, and a groove, 61, (see Fig. 5,) the former for the passage of the shank of the tracer, and the latter for holding the head thereof, said head being so shaped as to prevent rotation of the tracer. The said tracer can be adjusted nearer to or farther from the pivot of the tool-carrier, so as to increase or decrease the lateral movement of the tool, and is retained in its adjusted position by the lock-nut 62. By means of this adjustability of the tracer any pattern on the wave-roll may be reproduced with more or less modification, determined solely by the position the tracer occupies on the tracer-arm. The said tracer is held in contact with the wave-roll by means of a spring, 63, which presses against the lateral extension 64 of the tracer-arm, forcing the same outward, and therefore the tracer inward against the said roll.

The tension of said spring is varied by the following means: A bolt, 65, with a screw-threaded end, is screwed into the carriage-bracket, the latter being provided with a cavity for holding the spring surrounding said bolt. Said bolt is provided with a flange, 66, against which the inner end of the spring abuts, while its outer end presses against the bottom of the cavity in the tracer-arm exten-

sion. Outside thereof the said bolt is provided with an operating handle or knob, 67. When the said knob is operated to unscrew the said bolt, the spring will force the extension outward, and after the tracer is thus pressed in contact with the wave-roll any further movement to unscrew the bolt will increase the tension of the spring. By screwing the bolt into the bracket the tension of the spring is decreased, and by continuing this movement the tracer-arm can be clamped between the carriage-bracket and the operating-knob, so as to hold it in a fixed position. The tracer-arm of the tool-bracket is locked by said means to prevent lateral movement of the tool when it is desired to cut or mark straight or circular lines.

The wave-roll 68 is mounted in the bearings 69 and 70, and is capable of being shifted longitudinally to a certain extent, as illustrated in Figs. 1 and 11. It is so shifted and also rotated on its axis by the following means: The right-hand journal, 71, of said roll is splined to a surrounding sleeve, 72, by means of groove 73 and pin 74, so that the sleeve and journal may slide on each other, but must revolve together. The bearing 70 is let into the sleeve, so as to prevent longitudinal movement of the latter while permitting its rotation. A graduated disk, 75, is formed on or secured to the outer end of said sleeve, which disk may be termed the "graduated wave-disk," and by turning which the wave-roll may be quickly rotated to any position desired. The wave-disk is retained in its adjusted position by means of the spring-pawl 76, which also performs the function of an indicator in connection with the graduation-marks on said disk, and may be locked thereto by the cam-lever 77, pivoted under the same. To the face of the graduated wave-disk I fasten a graduated beveled plate, 78, through which a threaded shaft, 79, passes and engages a longitudinal screw-threaded cavity in the wave-roll journal 71. Said threaded shaft is provided with a flange, 80, which lies against the inner side of plate 78, and also with a graduated knob, 81, fastened to the outer end of said shaft 79, said knob being placed adjacent to said beveled plate. By turning the graduated knob on the graduated beveled plate while it and the wave-disk are held stationary by the pawl the threaded shaft will be rotated, and will force out or draw into the sleeve the said journal of the wave-roll, thus altering the longitudinal position of the latter. The graduated wave-disk and the graduated knob enable an operator to take a record of his adjustments, both rotary and longitudinal, and at a future time, if desired, to readjust the wave-roll to the exact position it had previously occupied. By means of said wave-disk the operator is also enabled to turn instantly to either wave on the roll.

I am aware of Patent No. 215,259, granted to F. L. Bailey, and what is therein shown and described I do not claim.

Having thus described my invention, what I desire to claim and secure by Letters Patent is—

1. The combination, with the tool-carriage and revolving plate, of a transverse shaft provided with a bevel-gear at or near each end, two vertical screw-threaded shafts geared to said transverse shaft, the carriage track or way, and its depending arms provided with screw-threaded apertures for engagement with said vertical shafts, substantially as described.

2. The combination, with the tool-carriage and the pivoted tracer-arm carrying a tracer, of the tool-post pivoted on and at right angles to the tracer-arm, substantially as described.

3. The combination of the wave-roll and tracer with the tracer-arm constructed to permit the adjustment of the tracer at a greater or less distance from its pivot, substantially as described.

4. The combination of the longitudinally-adjustable wave-roll and the tracer with the tracer-arm constructed to permit the adjustment of the tracer at a greater or less distance from its pivot, substantially as described.

5. The combination of the tracer having a head or flange with the tracer-arm constructed with a longitudinal slot and groove for holding said tracer and a nut for clamping the latter in position, whereby the tracer may be adjusted at a greater or less distance from the pivot of the tracer-arm, substantially as described.

6. The combination, with the pivoted tracer-arm, of the tool-post pivoted thereto and an adjustable spring for automatically lifting said tool-post, substantially as described.

7. The combination, with the pivoted tracer-arm, of the tool-post pivoted thereto, a spring for automatically lifting said tool-post, and a screw for adjusting the tension of said spring, substantially as described.

8. The combination of the tool-bracket and the carriage with a clamping device for holding said tool-bracket stationary and preventing both outward and inward movement thereof on its pivot, substantially as described.

9. The combination of the tool-bracket carrying a tracer firmly connected thereto with the wave-roll, tool-carriage, and a spring for pressing said tracer in contact with the wave-roll, substantially as described.

10. The combination, with the tool-bracket, carriage, and a screw-rod provided with a collar and an operating-knob, of a spring arranged on said rod between said collar and said tool-bracket, substantially as described.

11. The combination, with the tool-post provided with a lifter-rod, of the carriage and a cam or incline arranged to slide thereon and connected with the means for reciprocating said carriage, substantially as described.

12. The combination, with the carriage and the tool-post provided with a lifter-rod, of the carriage-rack, the latter arranged to have a

limited sliding movement on the carriage, and a cam or incline connected with said rack for co-operation with said lifter-rod, substantially as described.

13. The combination, with the tool-post provided with a lifter-rod having an adjustable end, of the carriage and a cam or incline arranged to slide thereon and connected with the means for reciprocating said carriage, substantially as described.

14. The combination, with the tool-post provided with a curved slot, of a tool-holding plate arranged to be guided in the arc of a circle, a bolt passing through said slot, and a thin clamping plate and nut for locking the several parts in position, substantially as described.

15. The combination, with the tool-post provided with a curved slot, of a tool-holding plate arranged to be guided in the arc of a circle, a bolt passing through said slot and plate and arranged so as not to rotate, and a clamping plate and nut for locking the several parts in position, substantially as described.

16. The combination, with the tool-post provided with a curved groove and a curved slot, of a tool-holding plate having a wedge-shaped groove on its face and a curved flange on its back to guide it in the arc of a circle, a bolt passing through said slot and plate, a clamping-plate, and a nut for clamping the tool between said plates and the said plates to the tool-post, substantially as described.

17. The combination, with the tool-post, of the guide or bearing foot arranged in front of the cutter, substantially as described.

18. The combination, with the tool-post, of the guide or bearing foot projecting laterally from the spring-bar and in front of the cutter, substantially as described.

19. The combination, with the wave-roll, of a graduated disk arranged thereon for turning said roll, a spring-pawl, and a cam-lever for holding said spring-pawl in engagement with said disk, substantially as described.

20. The combination, with the wave-roll constructed and arranged to be shifted longitudinally, of a swiveled screw-rod engaging one of the journals of said wave-roll, and provided with an operating-knob for turning the same, substantially as described.

21. The combination, with the wave-roll provided with a graduated disk for rotating the same, and constructed and arranged to be shifted longitudinally, of a swiveled screw-rod engaging one of the journals of said wave-roll, and provided with an operating-knob for turning the same, substantially as described.

22. The combination, with the wave-roll arranged to have longitudinal motion in its bearings, of a graduated disk secured to a sleeve splined to one of the journals of said wave-roll, and a swiveled screw-rod engaging the said journal and provided with a graduated operating-knob, substantially as described.

23. The combination, with the wave roll arranged to have longitudinal motion in its bearings, of a graduated disk secured to a sleeve splined to one of the journals of said wave-roll, a graduated plate fixed to said wave-disk, a screw-rod swiveled in said plate and engaging the said journal, and a graduated operating-knob secured to said screw-rod and placed adjacent to said plate, substantially as described.

24. In an engraver's ruling-machine, the revolving plate provided with a worm-gear, and with a circular rack on the under surface of and adjacent to said worm-gear, substantially as described.

25. The combination, with the revolving plate provided with a worm-gear, and the perspective device arranged to be thrown into and out of engagement with said worm-gear, of a circular rack arranged on the under side of said worm-gear, and a pinion meshing with said rack and provided with an operating-handle for rotating the revolving plate when the perspective device is shifted out of engagement with said worm-gear, substantially as described.

26. The combination, with the feed-wheel, of an operating-lever provided with a double-ender pawl having a cam located near the pivot thereof, and a flat spring bearing directly on said cam for the purpose of causing the pawl to bear lightly on the ratchet-wheel, substantially as described.

27. The combination, with the feed-wheel, of an operating-lever provided with a double-ender pawl having a cam located near the pivot thereof, and a spring mounted on said handle and provided with a notch, said spring arranged to bear on said cam to hold the pawl lightly in engagement with the ratchet-wheel and to engage said cam when the pawl is in its intermediate or inoperative position, substantially as described.

28. The combination, with the revolving plate, of the screw-clamps, the vertical screws of which are provided with headed rods freely passing through transverse openings therein for rotating the same, substantially as described.

In testimony whereof I have signed my name in presence of two witnesses.

THERON A. RICHARDS.

Witnesses:

JOHN C. MASON,

JAMES PERRY.