(No Model.) 2 Sheets—Sheet 1.

G. W. LITTLEHALES.

ENGRAVING MACHINE.

No. 561,677. Patented June 9, 1896.

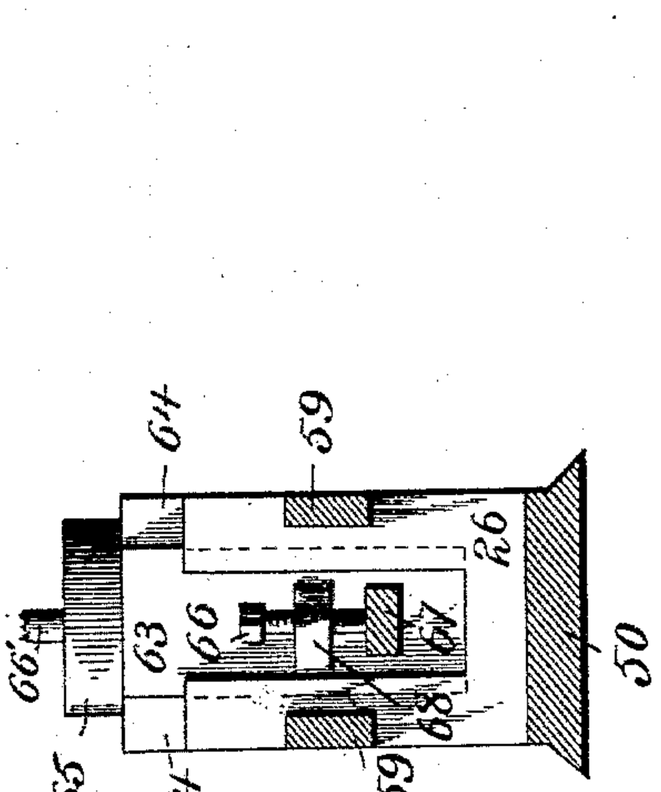

Fig. 4.

Fig. 1.

Fig. 5.

Witnesses:
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(No Model.) 2 Sheets—Sheet 2.

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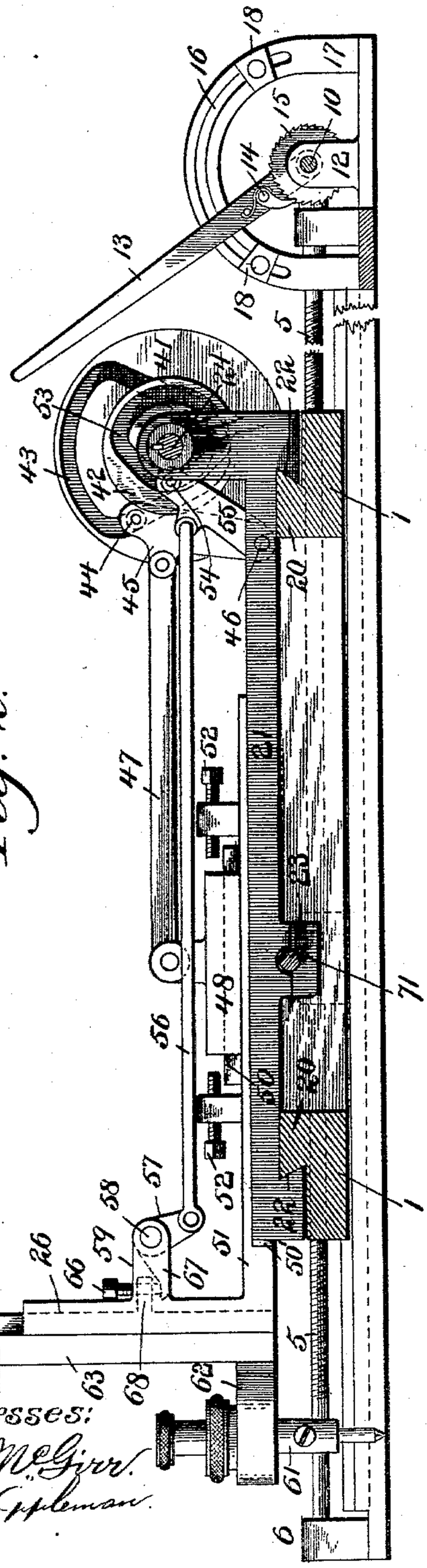

Fig. 2.

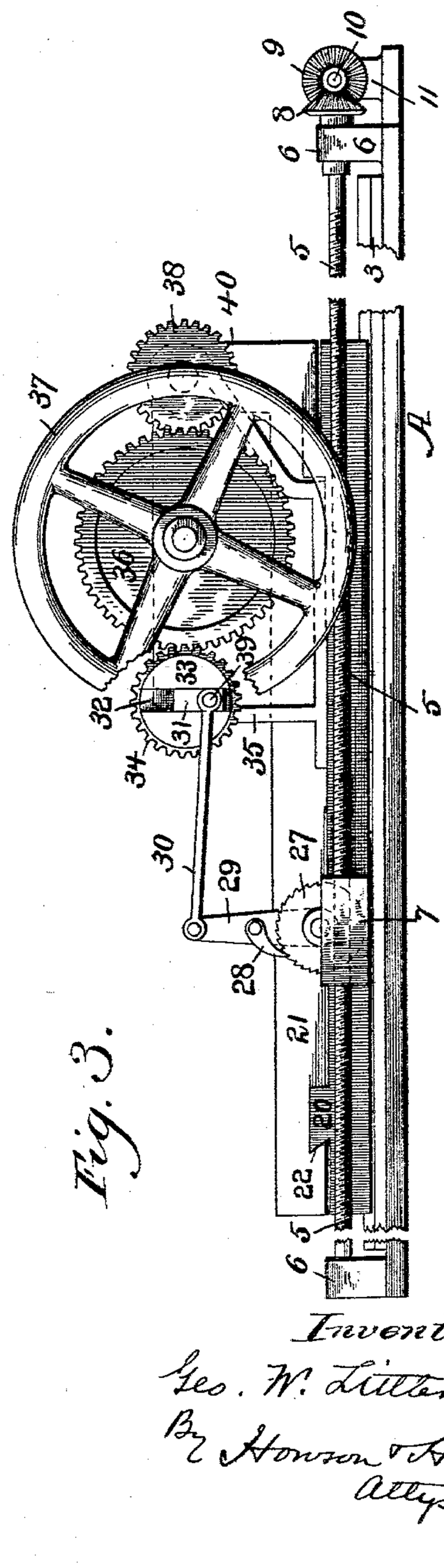

Fig. 3.

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UNITED STATES PATENT OFFICE.

GEORGE W. LITTLEHALES, OF WASHINGTON, DISTRICT OF COLUMBIA.

ENGRAVING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 561,677, dated June 9, 1896.

Application filed November 5, 1895. Serial No. 568,040. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. LITTLEHALES, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Engraving-Machines, of which the following is a specification.

My invention relates to engraving-machines, and more particularly to machines for shading border-scales on maps and charts and for engraving parallel lines which are used as technical representations or symbols of mud or mud flats on charts and maps. Among the requirements of a machine designed to execute work of this nature may be mentioned the following: The stroke of the tool should be so regulated as to be uniformly accurate, and the mechanism for giving motion to the same should be capable of nice and delicate adjustment for varying the length of the stroke of the tool for engraving the lines of different lengths, while the spacing mechanism should likewise be capable of ready adjustment for varying the distance between the adjacent parallel lines. The movement of the tool over the plate to be engraved should be even and regular and entirely free from vibration of any kind, and the operative parts should be as simple and as compactly arranged as possible.

In the drawings I have illustrated a machine embodying the principles of my invention, having for its particular object the shading of border-scales on charts indicating the latitude and longitude and the representation of mud-symbols, to which use it is particularly adapted, though it is to be clearly understood that it may be applied for any purpose where it is desired to either engrave on a plate a series of parallel lines or to mark such lines on any suitable material, in which latter case a suitable marking instrument may be substituted for the engraving-tool.

In the drawings, Figure 1 is a perspective view of my invention. Fig. 2 is a transverse sectional view taken to the right of the center, Fig. 1. Fig. 3 is a right-hand end view. Figs. 4 and 5 are sectional details.

Referring now particularly to the drawings, in which the same reference characters designate the same corresponding parts in all of the views, A indicates a supporting-frame adapted to rest upon the table supporting the plate to be engraved, at each end of which are two parallel transverse bars, on which bars are mounted or formed integral therewith two parallel V-shaped slideways 3, upon which the main carrier-frame 4 is mounted to slide, two V-shaped grooves on the under side of said carrier-frame meshing accurately with the slideways 3. At each end of the main frame I provide a transverse feed-screw 5, journaled in upwardly-projecting lugs 6 on the cross-bars and passing through threaded blocks 7, secured to the side of the carrier-frame 4. On the rear ends of the feed-screws are bevel-gears 8, meshing with similar gears 9 on the ends of the shaft 10, extending longitudinally of the machine at the rear and journaled in suitable end bearings 11 and intermediate bearings 12, formed on the rear longitudinal frame-bar 1 of the main supporting-frame.

Between the intermediate bearings 12, which are preferably mounted at or near the center of the frame, is an arm 13, loosely sleeved on the shaft 10 and carrying a spring-pressed pawl 14, engaging with the ratchet-wheel 15, fixed to said shaft adjacent to the arm and between said arm and one of the bearings 12. Two sliding stop-blocks 18 are adjustably secured in the slot 16 in the yoke 17 on either side of the operating-arm by set-screws, so that the said stops may be moved the desired distance apart to regulate the throw of the arm 13 for moving the carrier-frame 4 along the slideways 3.

By the mechanism described the main carrier-frame, with the mechanism carried thereby, may be moved along the slideways 3, so as to bring the engraving-tool at different points over the plate or work operated upon.

The main carrier-frame 4 consists, essentially, of two longitudinal bars 1 and the two transverse bars 2, uniting the ends of the said longitudinal bars, and secured upon or formed integrally with the latter are two guideways 20, the beveled edges of which form slideways, which mesh with the corresponding grooves 22 in the under side of the tool-carriage 21. These grooves 22, meshing with the beveled edges of the guideways 20, confine the tool-carriage to travel in a path longitudinally of the main carrier-frame.

In order to secure the proper motion of the tool to effect the result intended, it is necessary to provide mechanism for moving the tool longitudinally with respect to the work when the line is engraved and mechanism for lifting the tool out of contact with the plate or material upon which it is operating as the feed-screw moves the tool-carriage the distance required for the next line and to provide mechanism for adjusting the several motions to conform to the change in the length of the line engraved. These results are secured by mechanisms which are now to be described.

In order to secure an intermittent longitudinal movement of the tool-carriage on the main frame 4, I provide a spacing mechanism, which consists of a feed-screw 23, journaled in suitable bearings 25 on the cross-bars 2 and engaging with a suitable lock-nut 71 on the under side of the tool-carrier frame 21. The upper half of the nut has a semicircular smooth bore, while the lower half is screw-threaded to correspond with the feed-screw 23, and it is hinged to the upper half of the nut and provided with a suitable locking device, consisting in the present instance of a pivoted latch 69, normally engaging a pin 70 on the lower half of the nut and provided with a handle, which may be readily operated to release the lower half of the nut and permit it to fall out of engagement with the feed-screw, thus allowing the tool-carriage to be quickly returned after it has traveled the desired distance over the carrier-frame 4.

One end of the feed-screw 23 is provided with a ratchet-wheel 27, adapted to be operated by a pawl 28, carried by an oscillating arm 29, which is connected by a pitman 30 to an eccentric block 31, sliding in a dovetail groove 32 across the face of the disk 33, secured to a pinion 34, journaled in the bearing 35. The pinion 34 meshes with a spur driving-gear 36, journaled in the bearing 35, to the spindle of which spur-gear is secured a suitable crank or hand wheel 37, by means of which motion is communicated to the feed-screw 23 and to the shaft 24 by the intermeshing driving gear and pinion 34 and 38.

The eccentric-block 31 is adjustably held in its groove on the face of the disk by a suitable friction screw-clamp 39, whereby the said block may be clamped at different distances from the center on the operating-disk, so as to vary the throw of the pitman 30 and thus regulate the longitudinal movement of the tool-carriage for spacing the lines engraved.

I will next describe the mechanism for giving the stroke of and raising the tool out of contact with the plate or work, both of which are operated from the main shaft 24, journaled in the end bearings 35, and passing loosely through the intermediate bearings 40, projecting upwardly from the tool-carriage 21. Splined to this shaft between the bearings 40 are two cam-grooved disks 41 42, so as to rotate therewith but slide longitudinally thereon, in the former of which is a cam-groove 43, in which is confined to travel a roller 44, carried by an oscillating arm 45, fulcrumed on the pin 46, attached to one side of the tool-carriage, which arm is connected by a pitman 47 to a block 48, provided with a dovetail groove 49, engaging with a corresponding slideway 50 on the base or tool-carrying plate 51. On each side of this block are two screw-stops 52, mounted in lugs projecting upwardly from the base-plate, the ends of which are adapted to contact with the ends of the sliding block in its movement to and fro on the base-plate. By adjusting the said stops the lost motion between them and the sliding block may be varied, so that the length of travel of the base-plate with respect to the tool-carriage may be varied within certain limits, which plate, it will be seen, is caused to move to and fro by the movement of the sliding block while in contact with the stops. The base-plate 51 is provided with slideways 50′, engaging with corresponding grooves in the tool-carriage 21. The cam 41, through the intervening mechanism described, thus operates to give a proper stroke of the tool while engraving the line.

When the line is finished, it is necessary to lift the tool slightly above the plate and lower it again when the said tool has been moved to the next point to be operated upon. This operation is effected by means of the cam-grooved disk 42 on the shaft, in which cam is a groove 53, provided with a roller 54, confined to travel therein and journaled on the oscillating arm 55, fulcrumed on the pin 46, which arm is connected by a pitman 56 to one end of the bell-crank lever 57, fulcrumed on a pin 58, carried by bearing-lugs 59, projecting from an upward extension or standard 26, secured to or forming a part of the base-plate. The tool 61 is carried by a suitable support 62, projecting from the face of the tool-slide 63, on the rear of which slide are suitable guiding-flanges or slideways 64, engaging with dovetailed grooves on the face of the standard. The tool-slide is normally pressed downward by suitable weight or weights 65, mounted on a rod 66′, projecting upwardly therefrom, or, if desired, springs attached to a fixed part of the machine and the tool-slide may be provided in lieu of the weights, though I prefer the latter.

Instead of employing two separate cams for imparting the horizontal and vertical movements, respectively, as above described, to the tool, it is obvious that I may dispense with either one of these cams and provide the remaining cam with operating-grooves on both sides thereof, the other mechanism being disposed to conform to such change without alteration in its construction.

Projecting from the tool-slide is a lug 68, in which is mounted a screw-stop 66, the lower end of which is adapted to engage with the

tappet-arm 67 of the bell-crank lever. By the mechanism thus described it will be seen that as the bell-crank lever is operated this tappet-arm will come in contact with the screw-stop and lift the tool-slide, on which said stop is carried, out of contact with the work, and whenever the length of the stroke is changed the limit of the movement of the tappet-arm while in contact with the screw-stop will have to be correspondingly changed, in order to cause the tool-slide to be lifted at the proper time, which is effected by a simple adjustment of said screw-stop.

By mounting the operating crank and wheels upon the main carrier-frame independent of and apart from the tool-carriage I obviate the serious objection existing in a machine heretofore constructed for a similar use as mine in that I avoid the vibration of the tool during the process of engraving, and whatever slight vibrations may be caused by the irregular turning of the hand-wheel are counteracted and taken up by the rigid end bearings and will not be communicated to any part of the tool-carriage. The arrangement of the different slideways for the various motions at right angles to one another likewise conduces to the same result, since the bearings of the slideways are of sufficient length to resist any tendency of twisting or turning out of their natural paths.

The operation of the machine will be understood from the foregoing description without further detail, though it may be observed that while the machine is illustrated as adapted to be operated by hand through the hand-wheel it may when found expedient be driven by any suitable motive power, such as dynamo, gas-engine, water-power, &c.

I claim as my invention—

1. In an engraving-machine, the combination with a main supporting-frame, a main carrier-frame mounted thereon, a tool-carriage slidably mounted upon longitudinal ways on said carrier-frame, a shaft extending longitudinally of the carrier-frame and journaled in bearings thereon and passing loosely through bearings on the tool-carriage, an engraving-tool carried by a sliding plate on the tool-carriage, and connections between the shaft and plate for communicating a reciprocating motion to said plate, substantially as described.

2. In an engraving-machine, the combination with the main supporting-frame, of a main carrier-frame mounted upon transverse slideways thereon, means for moving said carrier-frame along said ways, a tool-carriage mounted upon longitudinal ways on the carrier-frame, means for intermittently moving said carriage along said ways, a shaft journaled in end bearings on the carrier-frame and extending loosely through bearings on the tool-carriage, a sliding base-plate on the tool-carriage carrying an engraving-tool at its outer or front end, connections between the shaft and tool-plate for reciprocating the same as the shaft rotates, and connections between the shaft and tool for raising the latter after the completion of each reciprocation and lowering it again, substantially as described.

3. In an engraving-machine, the combination with the main supporting-frame, of the main carrier-frame mounted thereon, the tool-carriage slidably mounted on said carrier-frame, spacing mechanism for moving said carriage intermittently along the carrier-frame, a tool-carrying plate slidably mounted on the tool-carriage, a shaft journaled in bearings on the main carrier-frame, a driving-gear journaled in one of the said bearings and meshing with a pinion on the shaft, connections between the shaft and tool-carrying plate for reciprocating the same, connections between the spacing mechanism and the driving-gear, and mechanism between the shaft and tool for raising the tool upon the completion of a stroke, and lowering it again when the carriage has been moved by the spacing mechanism, substantially as described.

4. In an engraving-machine, the combination with the main supporting-frame, a main carrier-frame slidably mounted thereon of the tool-carriage mounted upon longitudinal ways on said carrier-frame, a rotating shaft extending longitudinally of the carrier-frame and journaled in bearings independent of the tool-carriage, connections between said shaft and tool for reciprocating the latter, substantially as described.

5. In an engraving-machine, the combination with the main supporting-frame, of the tool-carriage slidably mounted upon longitudinal ways carried by the frame, a rotating shaft journaled in bearings independent of the tool-carriage, connections between the shaft and tool for reciprocating the same, mechanism operated by the shaft for intermittently moving the tool-carriage at the end of each stroke, and mechanism for raising the tool out of contact with the work as the tool-carriage is shifted, substantially as described.

6. In an engraving-machine, the combination with a tool-carriage, of the rotating shaft passing loosely through bearings thereon, the sliding base-plate mounted on said carriage, the cam-grooved disk splined on said shaft between the bearings, the vibrating arm fulcrumed on the carriage and provided with a roller on one end traveling on the groove of the disk, and a pitman connecting said arm and sliding plate and means for moving the tool-carriage longitudinally with respect to the shaft, substantially as described.

7. In an engraving-machine, the combination with the tool-carriage, of the rotating shaft passing loosely through bearings thereon, the sliding plate mounted on said carriage, the adjustable stops on the carriage arranged to limit the travel of the plate with respect to the carriage, the arm fulcrumed in the carriage and provided with a roller on one end, the grooved cam-disk on said shaft between

the bearings in the groove of which the said roller is confined to travel, and the pitman connecting the said arm with the sliding plate, substantially as described.

8. In an engraving-machine, the combination with a tool-carriage, and means for moving the same, of a rotating shaft journaled in fixed bearings independent of the tool-carriage, a sliding base-plate on said carriage, an engraving-tool carried by said base-plate, with connections between the shaft and plate, and connections between the shaft and tool, whereby the said tool is given two movements at right angles to each other, without shock or vibration, substantially as described.

9. In an engraving-machine, the combination of the main supporting-frame, of the carrier-frame mounted thereon, the tool-carriage slidably mounted on the carrier-frame, provided with a lock-nut on its under side, a feed-screw shaft provided with a ratchet-wheel on one end journaled on the carrier-frame and engaging said lock-nut, a rotating shaft journaled in bearings on the carrier-frame and passing loosely through bearings on the tool-carriage and provided with a pitman for one end thereof, a driving spur-gear mounted in one of said bearings on the carrier-frame, a pinion mounted in said bearing and meshing with the driving-gear, a rotating arm carrying a pawl for engaging with the ratchet-wheel of the feed-screw shaft, a pitman connecting said arm to the pinion at a point eccentric to its axis, connections between the main rotating shaft and the tool for reciprocating the same, and connections between the shaft and the tool for raising and lowering the same, substantially as and for the purposes set forth.

10. In an engraving-machine, the combination with the tool-carriage, of the sliding base-plate mounted thereon, the driving-shaft, connections between the shaft and tool-plate for reciprocating the same, means for varying the travel of said plate, the tool-slide mounted upon a vertical extension of said sliding base-plate, connections between the shaft and slide for raising and lowering the slide, with means for varying the time of movements of said tool-slide, substantially as described.

11. In an engraving-machine, the combination with the tool-carriage, of the sliding base-plate, the tool-slide mounted upon a vertical extension of said plate, a sliding block on said base-plate, adjustable stops on the base-plate between which said block is confined to travel, a driving-shaft, connections between said shaft and block, a bell-crank lever fulcrumed on the vertical extension, one arm of which is adapted to contact with a stop on the tool-slide, and connections between the other arm and the driving-shaft, substantially as and for the purposes set forth.

12. In an engraving-machine, the combination with the tool-carriage, the driving-shaft, the sliding base-plate mounted on said carriage, adjustable connections between the shaft and base-plate, the tool-slide mounted on a vertical extension of said base-plate, and adjustable connections between the driving-shaft and tool-slide, with spacing mechanism for moving the tool-carriage operated from the driving-shaft, substantially as described.

13. In an engraving-machine, the combination with the main supporting-frame, of a carrier-frame slidably mounted thereon, a driving-shaft mounted in bearings on the main supporting-frame, a tool-carriage slidably mounted on the carrier-frame, spacing mechanism operated by the driving-shaft for moving the carrier-frame intermittently on the main supporting-frame, a sliding base-plate provided with a vertical extension, a sliding block on the base-plate, adjustable screw-stops on the said base-plate between which the said block is confined to travel, a cam on the driving-shaft and a pitman connecting said cam and block, a bell-crank lever fulcrumed on the vertical extension, a cam on the driving-shaft, a pitman connecting one arm of said lever and the cam, an adjustable screw-stop on the tool-slide arranged to be engaged by the other arm of the bell-crank lever, substantially as described.

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

GEORGE W. LITTLEHALES.

Witnesses:

S. A. TERRY,

R. T. FRAZIER.