No. 759,957. PATENTED MAY 17, 1904.

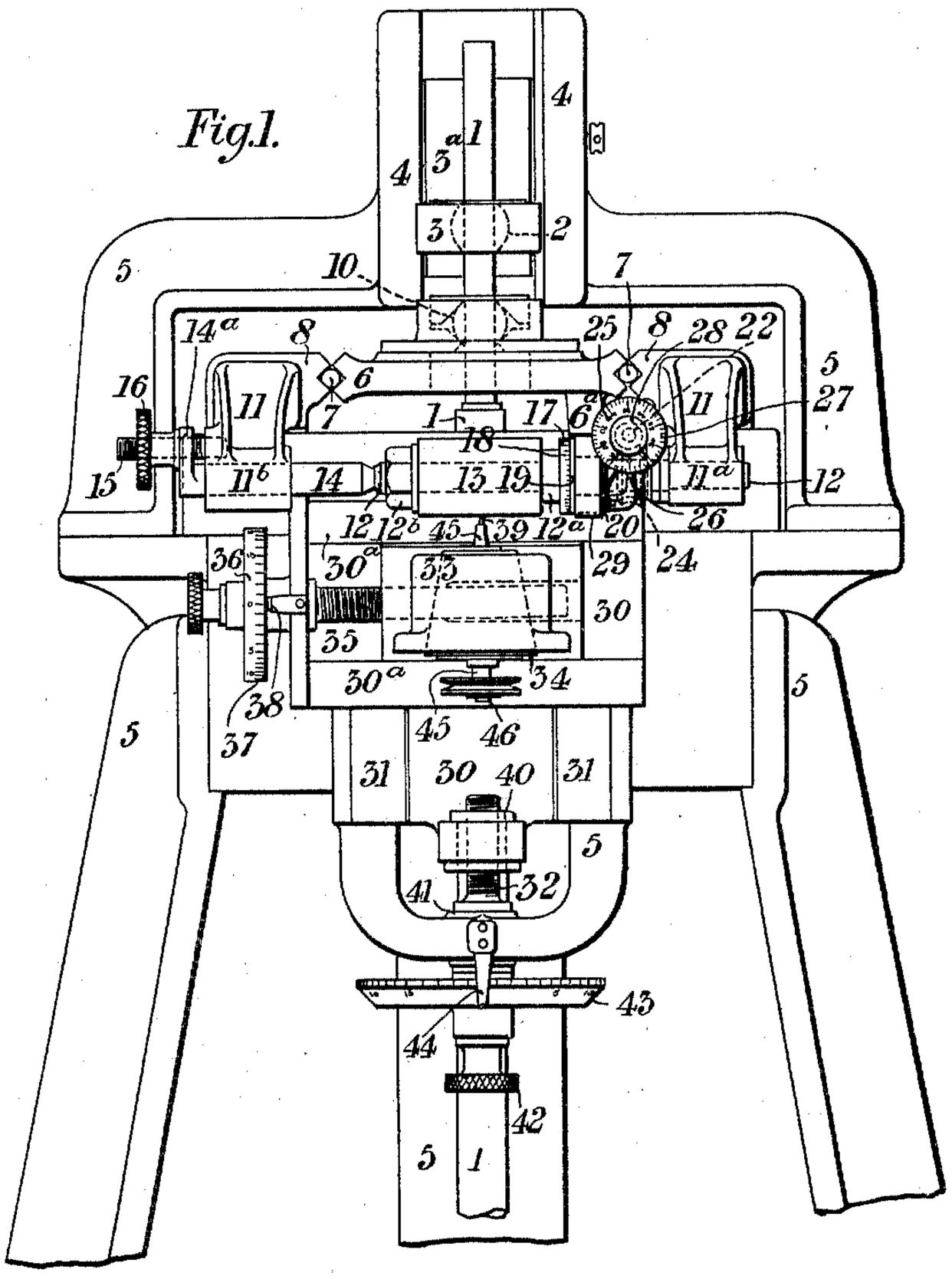
M. BARR.

PANTOGRAPH ENGRAVING MACHINE.

APPLICATION FILED MAR. 3, 1902.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 1.



Witnesses.
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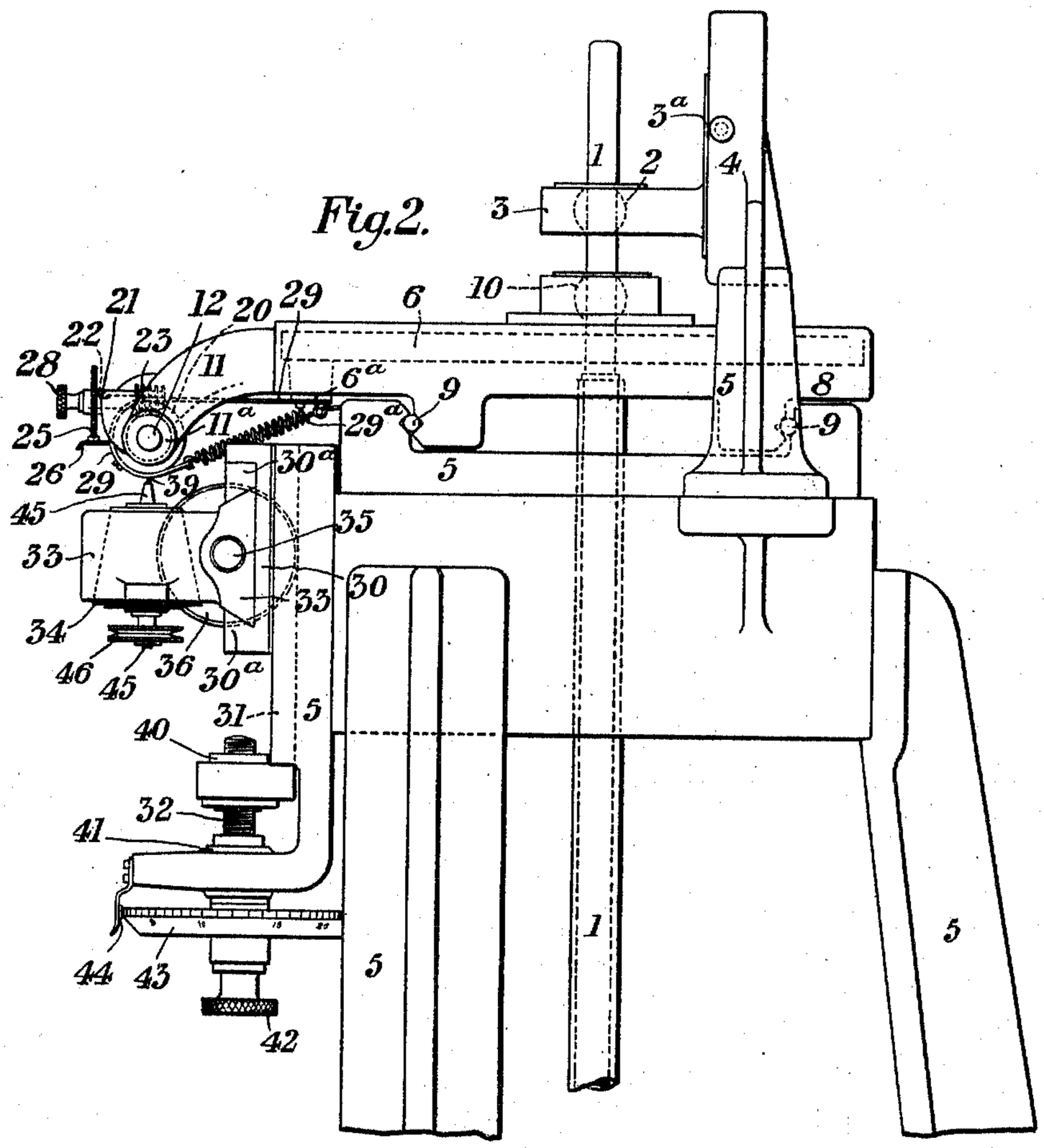
NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.



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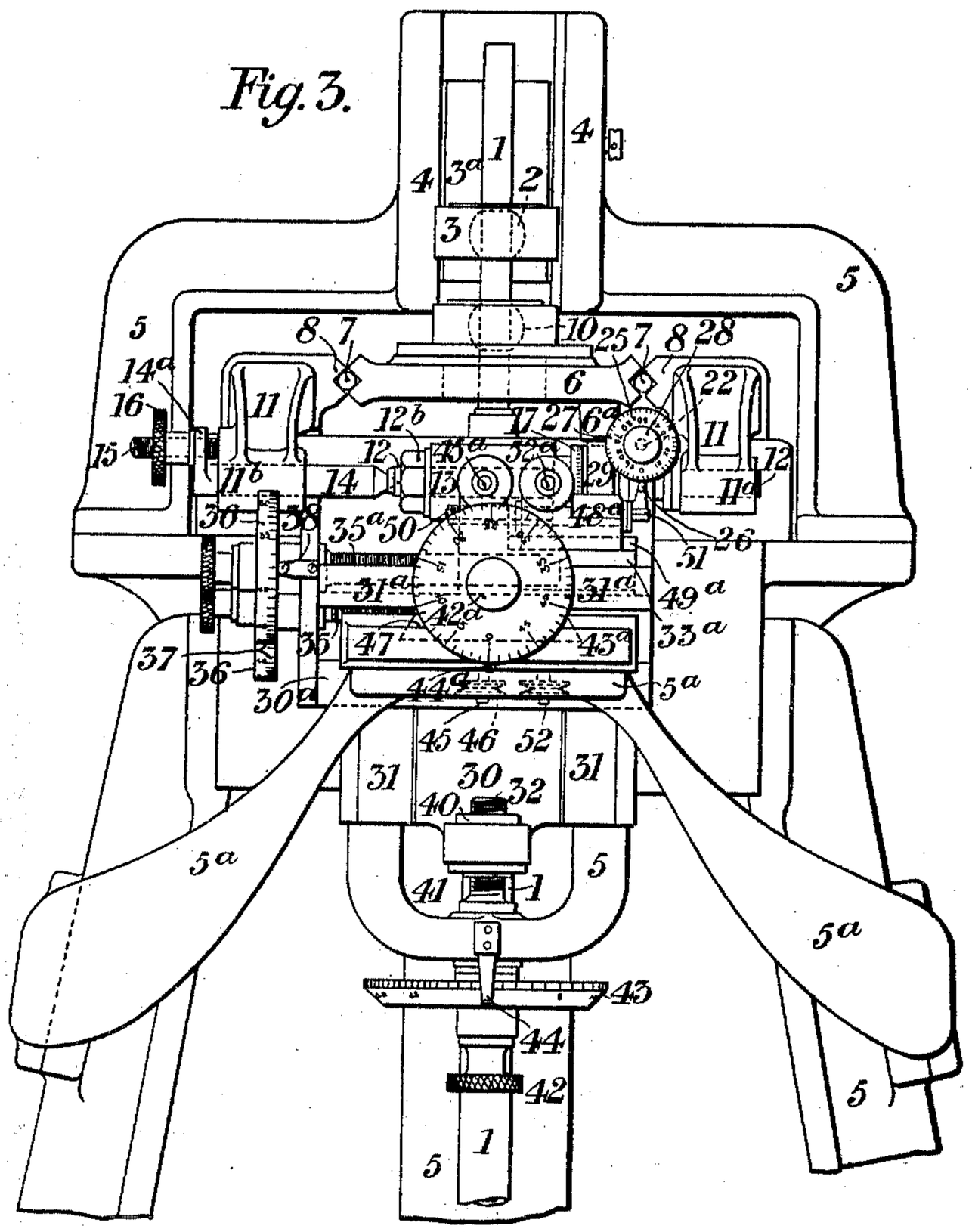
NO MODEL. 4 SHEETS—SHEET 3.

Fig. 3.



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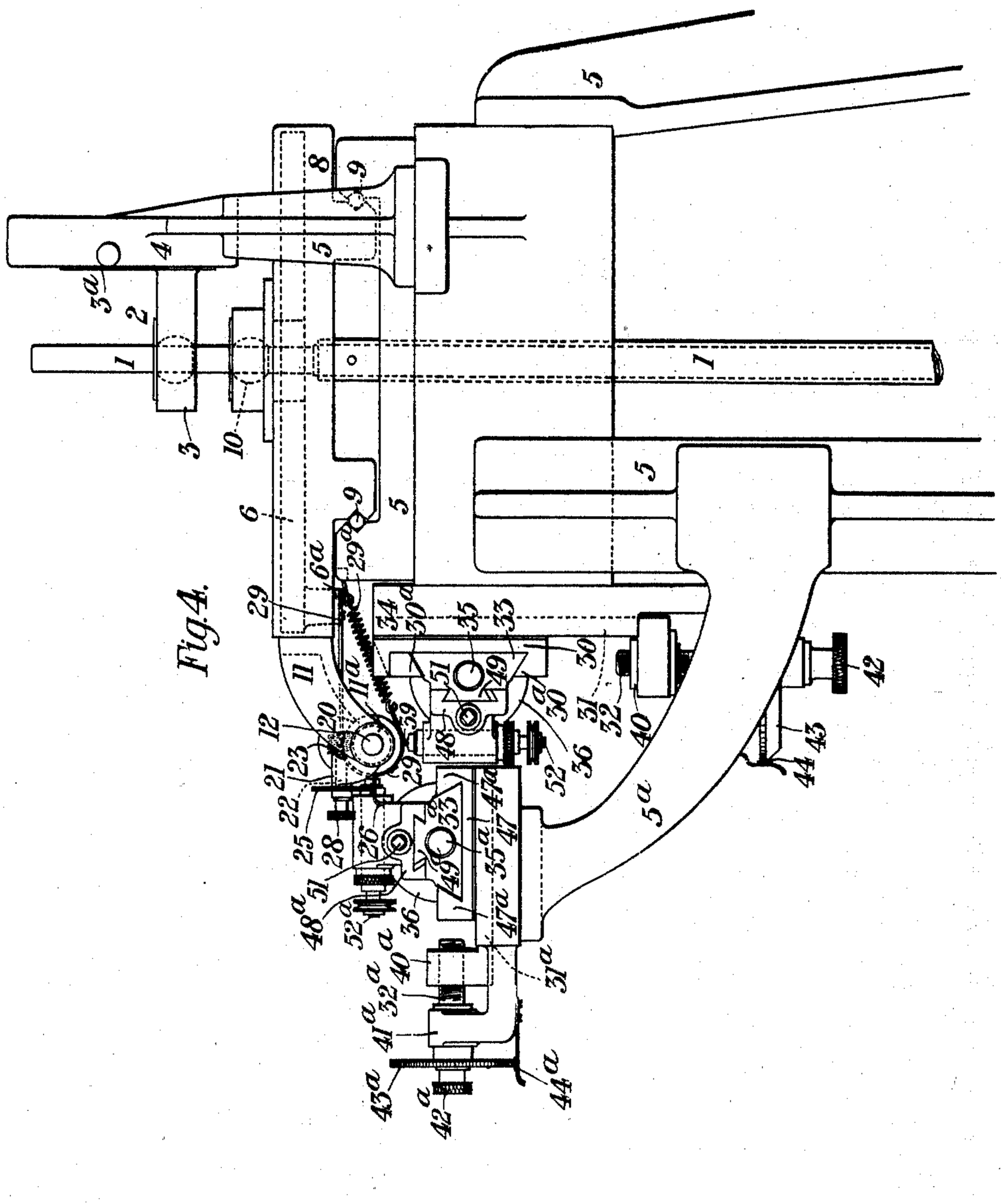
NO MODEL. 4 SHEETS—SHEET 4.

Fig. 4.



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No. 759,957. Patented May 17, 1904.

UNITED STATES PATENT OFFICE.

MARK BARR, OF KENSINGTON, ENGLAND, ASSIGNOR TO THE LINOTYPE COMPANY, LIMITED, OF LONDON, ENGLAND.

PANTOGRAPH ENGRAVING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 759,957, dated May 17, 1904.

Application filed March 3, 1902. Serial No. 96,510. (No model.)

To all whom it may concern:

Be it known that I, MARK BARR, residing at No. 25 Kensington Court Gardens, Kensington, in the county of Middlesex, England, have invented certain new and useful Improvements in Pantograph Engraving-Machines, of which the following is a true, clear, and full description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention has for its object an engraving-machine wherein by means of pantographic apparatus incorporated therewith a cylindrical body or a segment of a cylinder is moved both axially or longitudinally and angularly in direct relationship to the movements of the tracer about a given pattern, so that by means of one or more engraving-tools bearing upon the cylindrical surface one or more exact reproductions of said pattern at a predetermined ratio of reduction may be engraved on the said surface.

It is proposed as a matter of convenience to construct the machine as a vertical one, and in this specification the invention is described as embodied in such a vertical machine; but it is to be understood that it may also be embodied in a horizontal machine.

In the accompanying drawings, which are to be taken as part of this specification and read therewith, Figure 1 is a front elevation of one form of the engraving-machine adapted to give a single reduced engraving from a given pattern; Fig. 2, an elevation of the right-hand side of Fig. 1; Fig. 3, a view similar to Fig. 1 of a machine adapted to give a plurality of reduced engravings from a given pattern, and Fig. 4 an elevation of the right-hand side of Fig. 3.

Throughout the several figures of the drawings corresponding parts are referred to by similar numerals.

In the preferred form of vertical machine, in connection with which (as a convenient example) the present improvements are hereinafter described, the tracer-rod 1 swings from a fulcrum 2 in the top of the main frame, the joint of this fulcrum being of the type described in the specification of United States Letters Patent No. 625,412, and the rod does not slide through it in either direction. The plate 3, carrying the said joint 2, is the horizontal member of a bracket, the vertical member 3^a of which is free to slide in vertical guides 4 in the main frame 5.

The work-table consists of a plate 6, adapted to reciprocate from front to rear in ball-races 7 7 in a pair of parallel and horizontal guide-bars 8 8, constituting the two sides of a rigid frame, adapted to reciprocate from side to side in similar ball-races 9 9 in the main frame. The tracer-rod 1 passes through the work-table 6, to which it is connected by a joint 10 of the same type as the fulcrum-joint 2. At their front ends the before-mentioned pair of parallel and horizontal guide-bars 8 8 are provided with forwardly-projecting arms 11 11, terminating in bearings 11^a and 11^b, respectively, both of which latter are coaxial. In the bearing 11^a is rotatably mounted one end of a shaft 12, on whose other end is secured concentrically therewith the work 13 to be engraved. This shaft 12 is hereinafter referred to as the "work-shaft." Assuming for convenience that the said work is, as represented in the drawings, in the form of a cylinder, it is bored out to accurately fit the work-shaft 12 and clamped thereon between a fixed collar 12^a and a nut 12^b, the latter screwed on the end of the said shaft. At its screw-threaded end the work-shaft 12 is supported on a "lathe-center" 14, adjustable axially in the bearing 11^b, said center 14 being preferably provided with a lug 14^a, passing over a screw 15, fixed in the bearing 11^b, parallel with the center 14 and on which screw is a nut 16, whereby the center may be adjusted axially. A lock-nut or equivalent device (not shown in the drawings) may, if desired, be provided for securing the center 14 in any required position of adjustment.

The periphery of the above-named fixed collar 12^a or, as represented in Fig. 1, another collar 17, fixed adjacent thereto on the work-shaft 12, bears a scale 18, adapted to register with an index or pointer 19 upon a disk or pulley 20, angularly adjustable upon or relatively to the work-shaft 12. From one side

of the pulley 20 projects a bearing 21, in which is rotatably mounted a shaft 22, carrying a worm 23, engaging tangentially with a worm-wheel 24, fast on the work-shaft 12, and on the forward end of this worm-shaft is secured a disk 25, the edge of which is toothed or notched to frictionally engage with a yielding detent 26, secured to one side of the disk or pulley 20. A micrometer-scale 27 on the disk 25, conjointly with the yielding detent 26, gives readings of subdivisions of the previously-described scale 18. The worm-shaft 22 may also be provided with a milled head 28 to enable it to be rotated by hand.

Attached to the periphery of the disk or pulley 20 is a flexible band 29, secured at one end to a lug 6^a on the reciprocating plate or work-table 6 and at the other end to the fixed frame 5, preferably through a helical spring 29^a.

The tool-holder 30 is vertically adjustable in guides 31 31 on the main frame 5, preferably by means of a screw 32, and at the front of its upper part it is provided with horizontal guides 30^a 30^a, in which a block 33, carrying the quill-holder 34, is adjustable by means of a screw 35, whereon is mounted a notched disk 36, bearing a micrometer-scale 37, adapted, in conjunction with an index or pointer 38, fixed on the tool-holder 30, to give readings for adjustment of the tool 39 in the vertical plane containing the axis of the work 13 and shaft 12. The before-mentioned screw 32 engages the tool-holder 30 by means of a nut 40, secured in the lower end of the said tool-holder, and it is capable of turning without axial motion in a bearing 41, provided in the fixed frame 5. On its lower end the screw 32 is provided with a milled head 42, by which the said screw may be readily rotated, and it is also provided with a notched micrometer-disk 43, which, in conjunction with an index or pointer 44, fixed to the frame 5, gives readings for the adjustment of the tool 39 perpendicularly to the axis of the work 13, and at the same time by the engagement of the index 44 with the notches of the disk 43 the work-holder 30 is retained in any desired position of adjustment.

The tool 39 is secured in the upper end of a quill 45, rotatable in the quill-holder 34, and on the lower end of this quill is secured a pulley 46, to which rotary motion is transmitted from any suitable motor.

When the machine is operated, the sidewise movement of the tracer and tracer-rod 1 (the former of which is not shown in the drawings) through the work table or plate 6, pair of parallel guide-bars or frame 8 8, and the work-shaft 12 and center 14 moves the work 13 homologously in the direction of its axis and similarly with the forward or backward movement of the tracer and tracer-rod 1 in respect to the work table or plate 6. This forward or backward movement of the work table or plate 6, however, (unlike its sidewise movement,) is not communicated directly to the work 13, but only serves, through the flexible band 29 and pulley 20, to turn the work-shaft 12 in its bearing 11^a and on the center 14, the forward movement of said plate 6 by paying out the band 29 allowing the spring 29^a to turn the shaft 12 in one direction and the backward movement by drawing on the band 29 effecting (in opposition to the spring) the turning of the shaft in the opposite direction. By these means the surface of the cylinder 13 is moved homologously or in direct relationship with the movement of the tracer and by means of the tool 39 bearing thereon is engraved with the design or outline followed by the tracer at the predetermined ratio of reduction. According as the different portions or lines of the design are engraved the tool-holder 33 is moved sidewise by the screw 35 or the work is moved axially, so as to cause the tool 39 to operate on a fresh portion of the work 13, different patterns being introduced into the machine according to requirements. When the motion of a point in a cylindrical surface is the resultant of two component motions at right angles, then every other point in the same surface has a similar motion, even if either component is zero, and consequently it follows that to obtain multiple engravings it is only necessary to provide a multiplicity of engraving-tools and distribute them around and along the surface of the cylinder. These tools may be mounted in tool-holders adjustable in brackets secured to the main frame in a manner similar to that previously described. As an example of the way in which this development of the invention may be carried into effect there is represented in Figs. 3 and 4 of the accompanying drawings a machine adapted to simultaneously engrave four reduced copies of a given pattern on the same cylinder 13. In this arrangement, in addition to the vertically-adjustable tool-holder 30 previously described, there is provided a second tool-holder 47, which by a screw 32^a is horizontally adjustable in guides 31^a in a direction perpendicular to the axis of the work 13. The guides 31^a are supported by a forwardly-projecting bracket 5^a, secured to or constituting a part of the fixed frame 5, and the screw 32^a is provided or is in operative connection with a nut 40^a, bearing 41^a, milled head 42^a, notched micrometer-disk 43^a, and index or pointer 44^a, all constructed and operating substantially like the corresponding parts 40, 41, 42, 43, and 44 appertaining to the before-mentioned vertical screw 32. The tool-holder 47 is provided with guides 47^a 47^a, within which a block 33^a is capable of being moved by a screw 35^a in a direction parallel with the axis of the work 13, this block having rigidly mounted therein a quill-holder within which rotates a tool-carrying quill 45^a, Fig. 3. The vertical quill 45 (of which only a part is represented in Fig. 3) and the hori-

zontal quill 45ª (which is shown only in Fig. 3 in end view) each rotate in a quill-holder secured in the respective tool-holder 33 and 33ª. These quill-holders differ from the before-mentioned tool-holder 34 only in that the latter is preferably of conical form, as indicated in dotted lines in Figs. 1 and 2, whereas the former, owing to the restricted space available for them, are cylindrical in form and of comparatively small external diameter.

On each of the blocks 33 33ª is mounted an auxiliary block 48 and 48ª, capable of adjustment thereon along a dovetail guide 49 49ª, respectively. For effecting these adjustments each of the auxiliary blocks 48 48ª is traversed by a screw-threaded spindle 50, which is capable of turning without independent axial motion therein. The screwed end of each spindle 50 engages the block 33 or 33ª, as the case may be. The outer ends 51 51 of the spindles 50 50 are squared or otherwise suitably formed for the engagement therewith of keys or spanners for enabling the spindles to be rotated so as to move the auxiliary blocks 48 48ª nearer to or farther from the before-mentioned quill 45 45ª, respectively, and each of the auxiliary blocks 48 48ª has rotatable within it a tool-carrying quill 52 52ª, respectively. The quills 52 52ª may either be adjusted independently of the quills 45 45ª, respectively, as just described, or they may be adjusted conjointly therewith axially by means of the screws 32 and 32ª and laterally by means of the screws 35 and 35ª.

It will be obvious that instead of there being four engraving-tools, arranged as previously described with reference to Figs. 3 and 4, further tools may be provided to engage with the top, back, and other desired parts of the work 13, these being distributed about the axis of the work either uniformly or irregularly, according to requirements. Each set of these tools, moreover, may consist of three or more independently-adjustable units, or some sets may comprise less units than others. If desired, individual tools, as distinguished from tools arranged in sets, each comprising a plurality of such tools, may be distributed around the axis of the work at any suitable intervals apart. It will also be obvious that the necessary movements of the plate 6 may be transmitted to it by a pantograph of any construction. That being so, it will be clear that the present invention is not restricted to any particular construction of such operating device.

I claim—

1. In an engraving-machine, the combination with a tracer-rod, a tracer carried in the tracer-rod, a work-carrier comprising a movable plate connected to the tracer-rod by a universal joint, and a movable frame supporting the work, horizontal guides on the movable frame for the plate, and horizontal guides on the fixed frame, for the movable frame, these guides being at right angles to the guides for the movable plate, of a work-shaft rotatable in the movable frame, a disk on the work-shaft, a connector operatively connecting the periphery of the disk and the movable plate, a worm-wheel fast on the work-shaft, a tangent-screw engaging the worm-wheel, a bearing on the disk for the tangent-screw, scales indicating angular adjustment of the work-shaft relatively to the disk, a plurality of rotating engraving-tools distributed around the work-shaft, stationary bearing-blocks for the said tools, and fixed guides adjustably supporting the said bearing-blocks substantially as set forth.

2. In an engraving-machine, the combination with a tracer-rod a work-carrier comprising a movable plate connected to the tracer-rod by a universal joint, and a movable frame supporting the work, horizontal guides on the movable frame for the plate, and horizontal guides on the fixed machine-frame, for the movable frame, of a work-shaft rotatable in the movable frame, a disk on the work-shaft and a connector operatively connecting the periphery of the disk and the movable plate substantially as set forth.

3. In an engraving-machine, the combination with a tracer-rod, a work-carrier comprising a movable plate connected to the tracer-rod, by a universal joint, and a movable frame supporting the work, of a work-shaft rotatable in the movable frame, a disk on the work-shaft and a connector operatively connecting the periphery of the disk and the movable plate substantially as set forth.

4. In an engraving-machine, the combination with a tracer-rod a work-carrier comprising a movable plate connected to the tracer-rod by a universal joint, and a movable frame supporting the work, of a work-shaft rotatable in the movable frame, a disk on the work-shaft and a flexible connector fast to the disk and to the movable plate substantially as set forth.

5. In an engraving-machine, the combination with a tracer, a work-carrier comprising a movable plate in operative connection with the tracer and a movable frame supporting the work, a work-shaft rotatable in the movable frame, and a disk on the work-shaft, of a flexible band fast to the disk and to the movable plate, and a spring connecting the band to the fixed frame substantially as set forth.

6. In an engraving-machine, the combination with a tracer-rod a work-carrier comprising a movable plate connected to the tracer-rod by a universal joint, and a movable frame supporting the work, a work-shaft rotatable in the movable frame, a disk on the work-shaft and a connector operatively connecting the periphery of the disk with the movable plate, of a worm-wheel fast on the work-shaft, a tangent-screw engaging the worm-wheel, a bearing on the disk for the tangent-screw, and

relatively adjustable scale and index on the work-shaft and disk, substantially as set forth.

7. In an engraving-machine, the combination with a tracer-rod, a work-carrier comprising a movable plate connected to the tracer-rod by a universal joint, and a movable frame supporting the work, a work-shaft rotatable in the movable frame, a disk on the work-shaft, a connector operatively connecting the periphery of the disk with the movable plate a worm-wheel fast on the work-shaft, a tangent-screw engaging the worm-wheel and a bearing on the disk for the tangent-screw shaft of an index or pointer fast on the disk and a scale-dial fast on the screw-shaft, and adapted to coöperate with the index, substantially as set forth.

8. In an engraving-machine, the combination with a tracer-rod, a work-carrier comprising a movable plate connected to the tracer-rod by a universal joint, and a movable frame supporting the work, a work-shaft rotatable in the movable frame, a disk on the work-shaft, and a connector operatively connecting the periphery of the disk with the movable plate, of a tool-carrier adjustable on the machine-frame perpendicularly to the axis of the work-shaft, a block adjustable on the tool-carrier parallely with the axis of the work-shaft; and an engraving-tool rotatable in this block substantially as set forth.

9. In an engraving-machine, the combination with a tracer-rod, a work-carrier comprising a movable plate connected to the tracer-rod by a universal joint, and a movable frame supporting the work, a work-shaft rotatable in the movable frame, a disk on the work-shaft, a connector operatively connecting the periphery of the disk with the movable plate a tool-carrier adjustable on the machine-frame perpendicularly to the axis of the work-shaft, a block adjustable on the tool-carrier parallelly with the axis of the work-shaft, and an engraving-tool rotatable in this block, of an auxiliary block adjustable on the last-named one, parallelly with the axis of the work-shaft, an engraving-tool rotatable in this auxiliary block, of an auxiliary block adjustable on the last-named one parallelly with the axis of the work-shaft, an engraving-tool rotatable in this auxiliary block and a screw operatively connecting the two blocks for effecting the last-named adjustment substantially as set forth.

10. In an engraving-machine, the combination with a tracer-rod, a work-carrier comprising a movable plate connected to the tracer-rod by a universal joint, and a movable frame supporting the work, a work-shaft rotatable in the movable frame, a disk on the work-shaft, and a connector operatively connecting the periphery of the disk with the movable plate, of a plurality of tool-carriers distributed around the axis of the work-shaft and, in different planes, adjustable on the machine-frame perpendicularly to the axis of the work-shaft, blocks adjustable on these tool-carriers parallelly with the axis of the work-shaft, and an engraving-tool rotatable in each such block substantially as set forth.

In testimony that I claim the foregoing as my invention I have hereunto signed my name in the presence of two subscribing witnesses.

MARK BARR.

Witnesses:
CHAS. S. WOODROFFE,
WARWICK HY. WILLIAMS.