

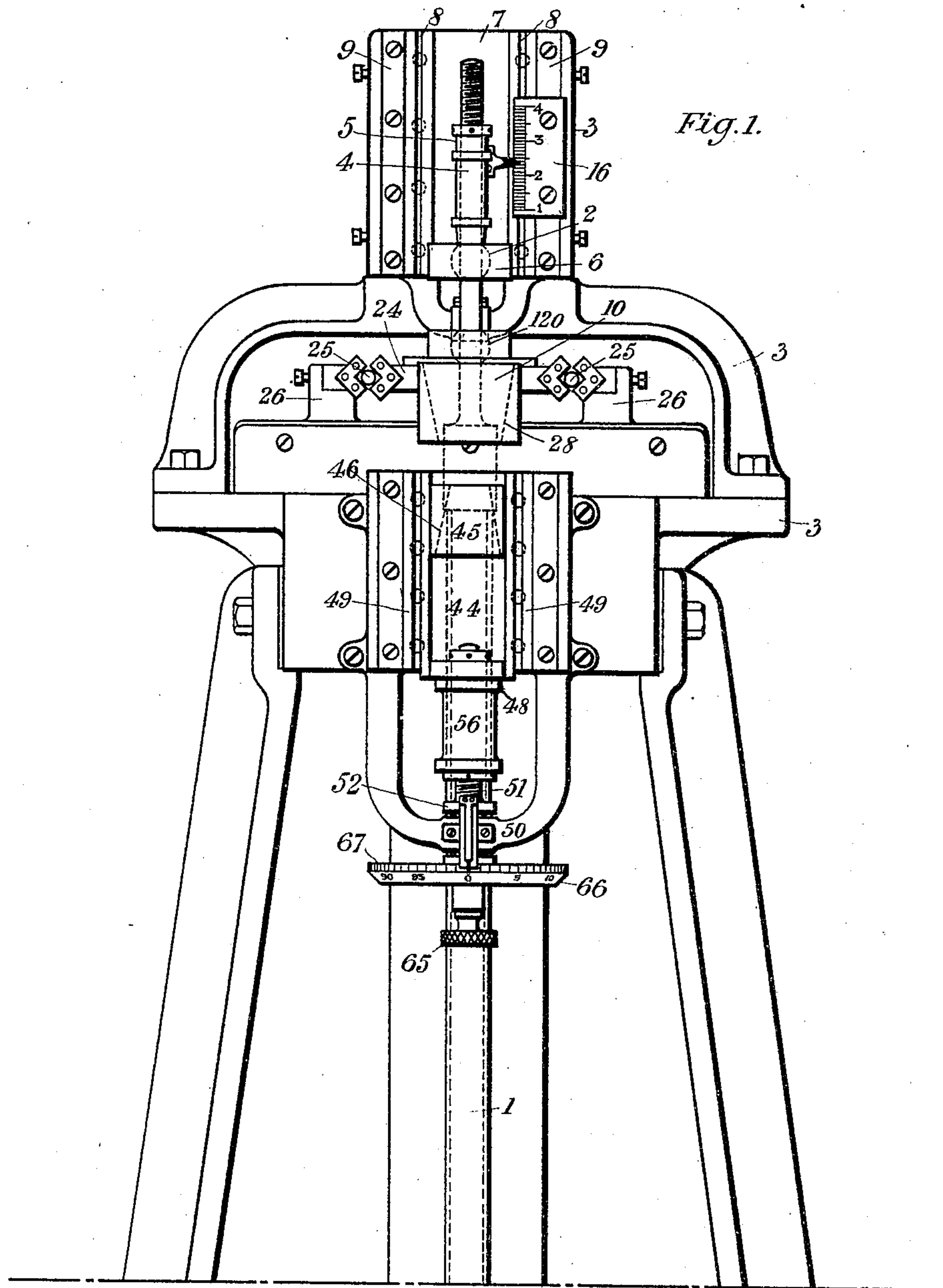
No. 774,027.

PATENTED NOV. 1, 1904.

M. BARR.  
ENGRAVING MACHINE.  
APPLICATION FILED MAY 31, 1901.

NO MODEL.

7 SHEETS—SHEET 1.



Witnesses.  
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No. 774,027.

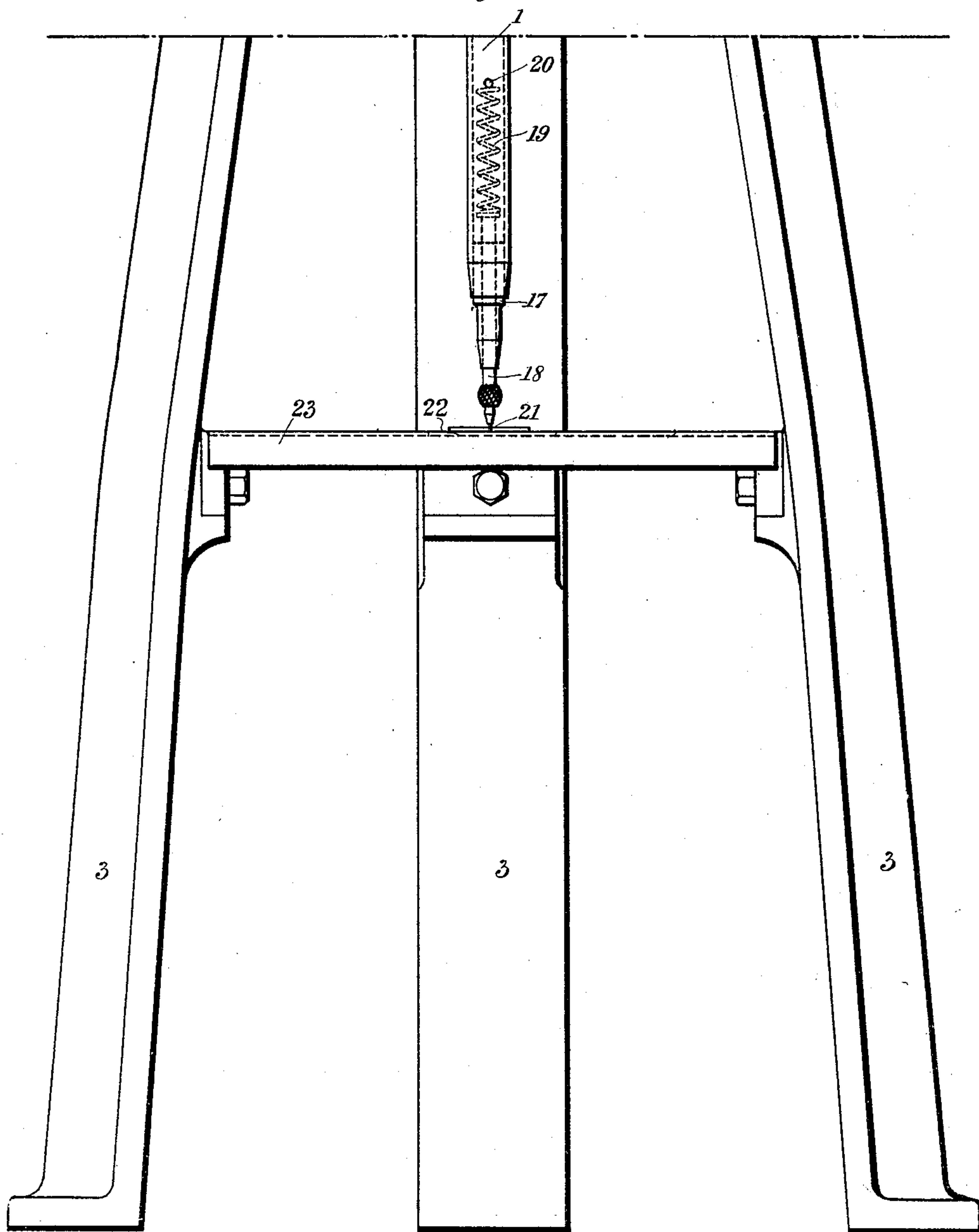
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7 SHEETS—SHEET 2.

Fig. 2.



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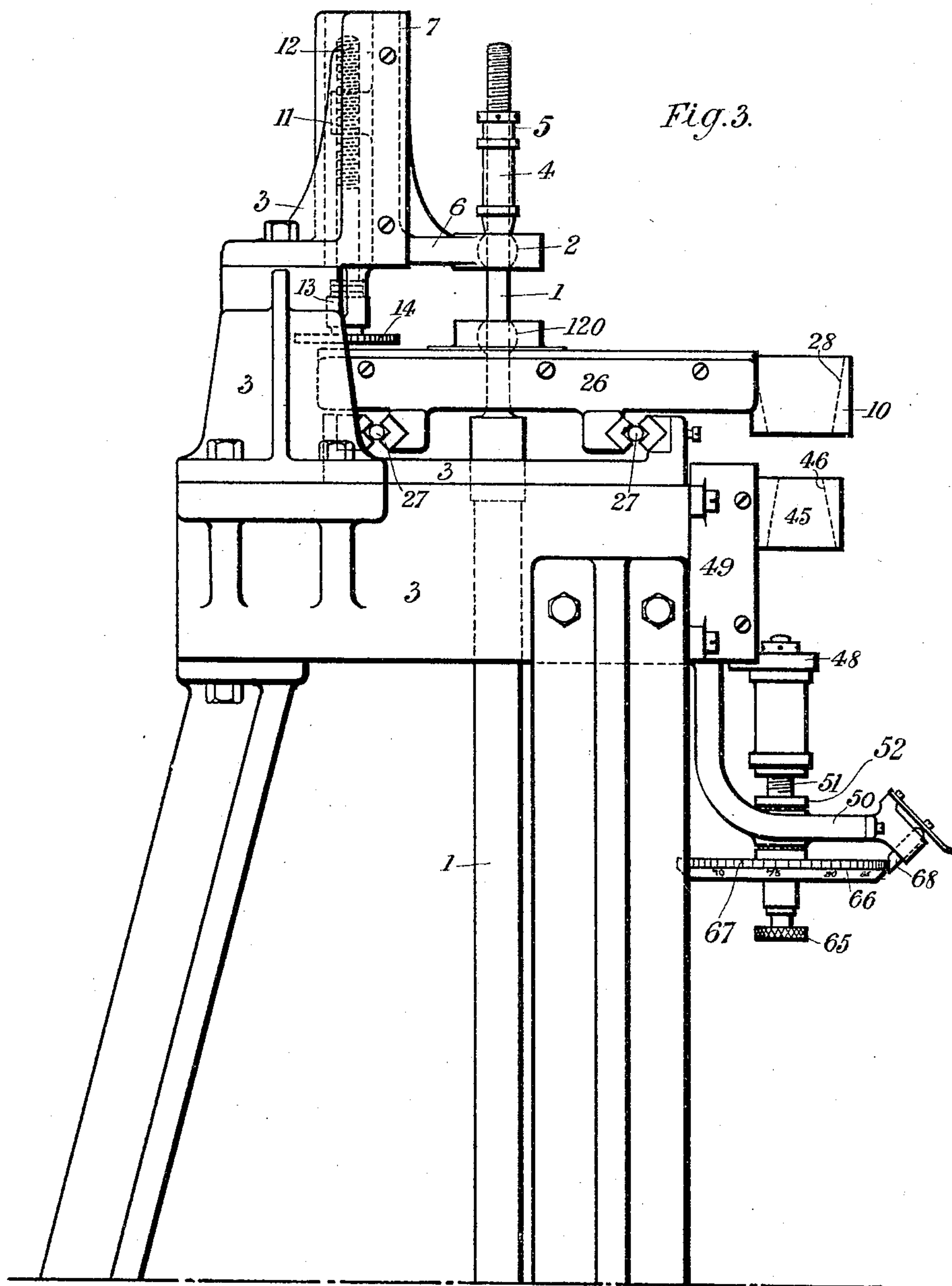
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7 SHEETS—SHEET 3.



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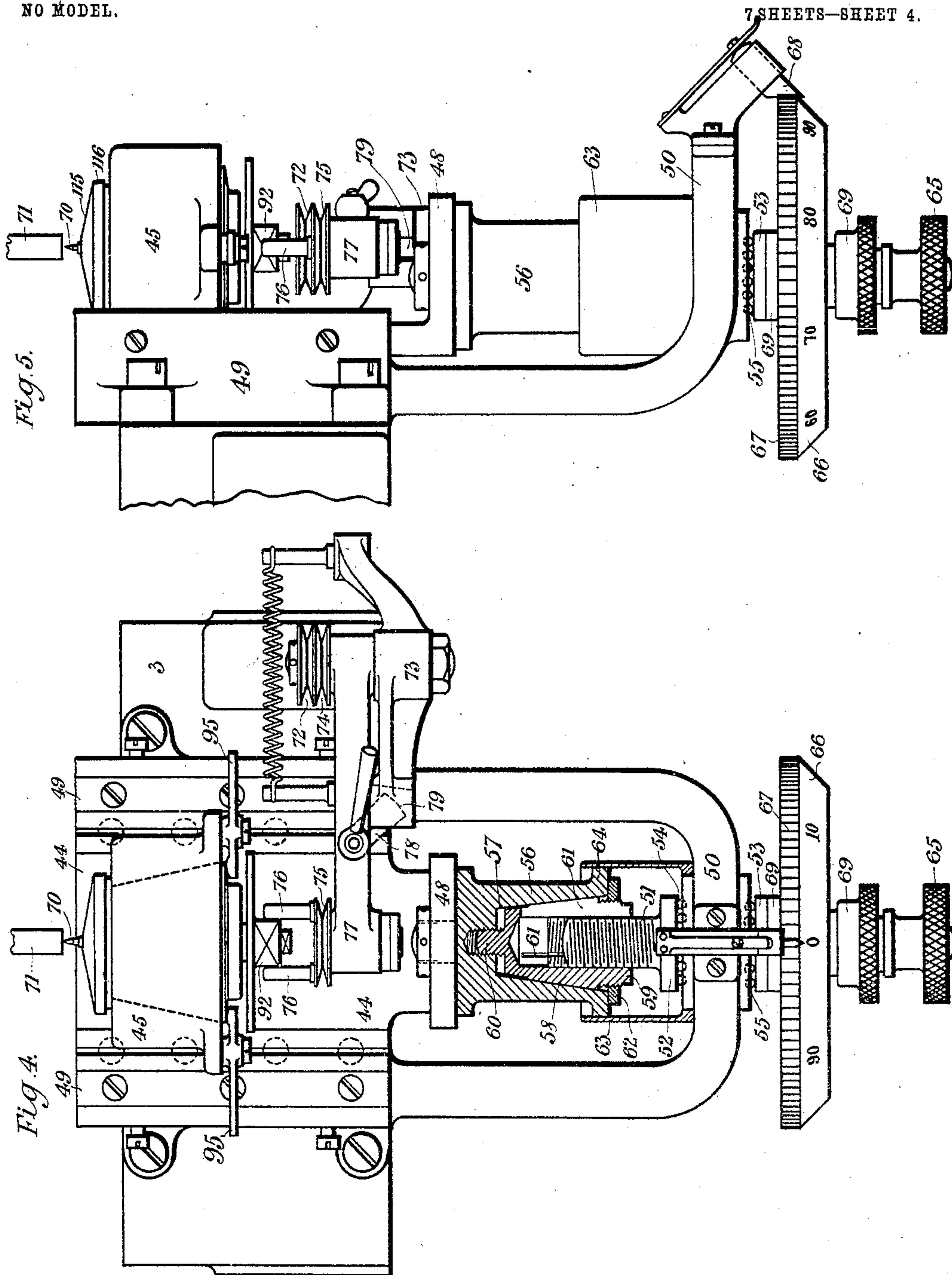
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NO MODEL.

7 SHEETS—SHEET 4.



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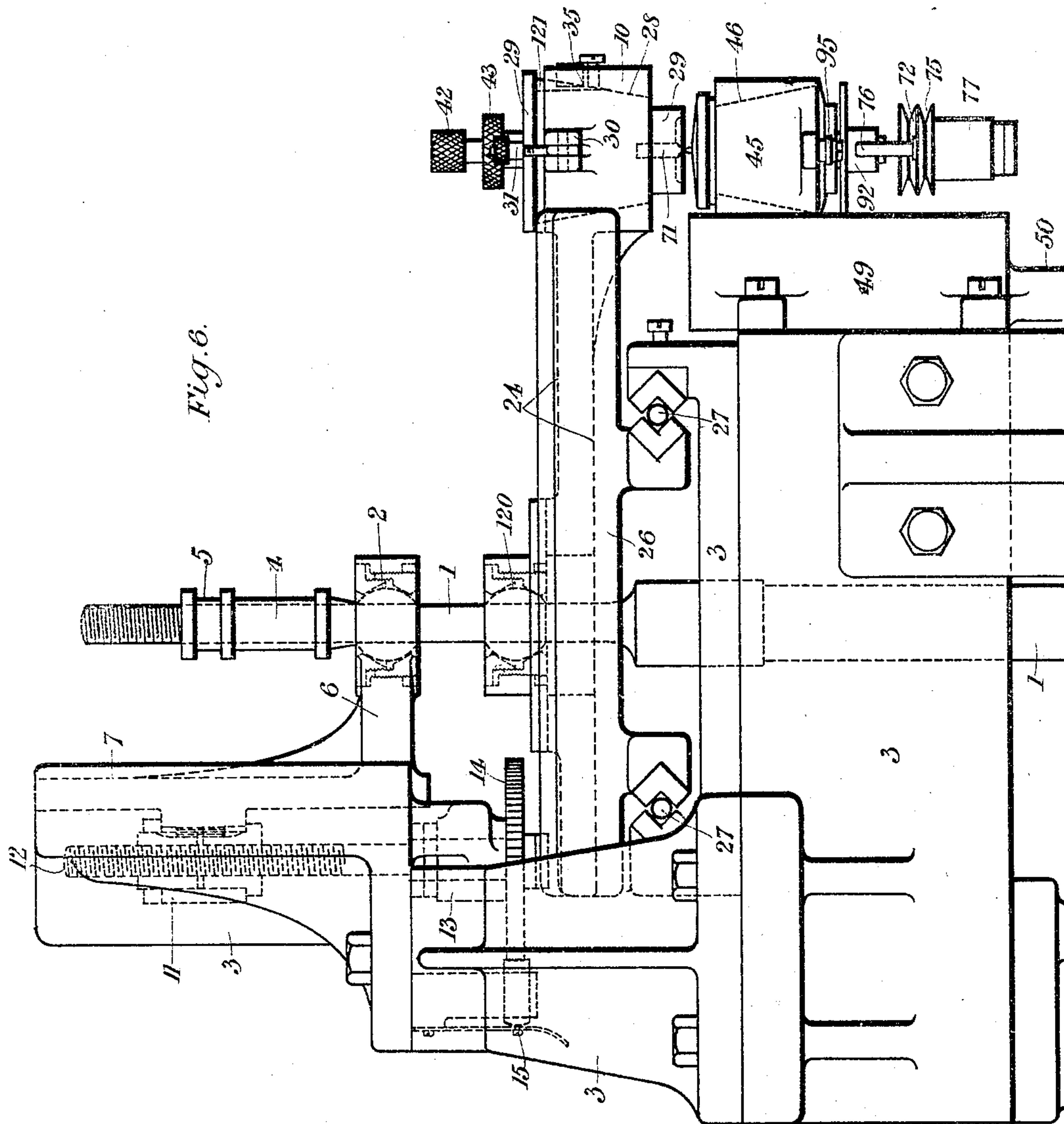
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7 SHEETS—SHEET 6.



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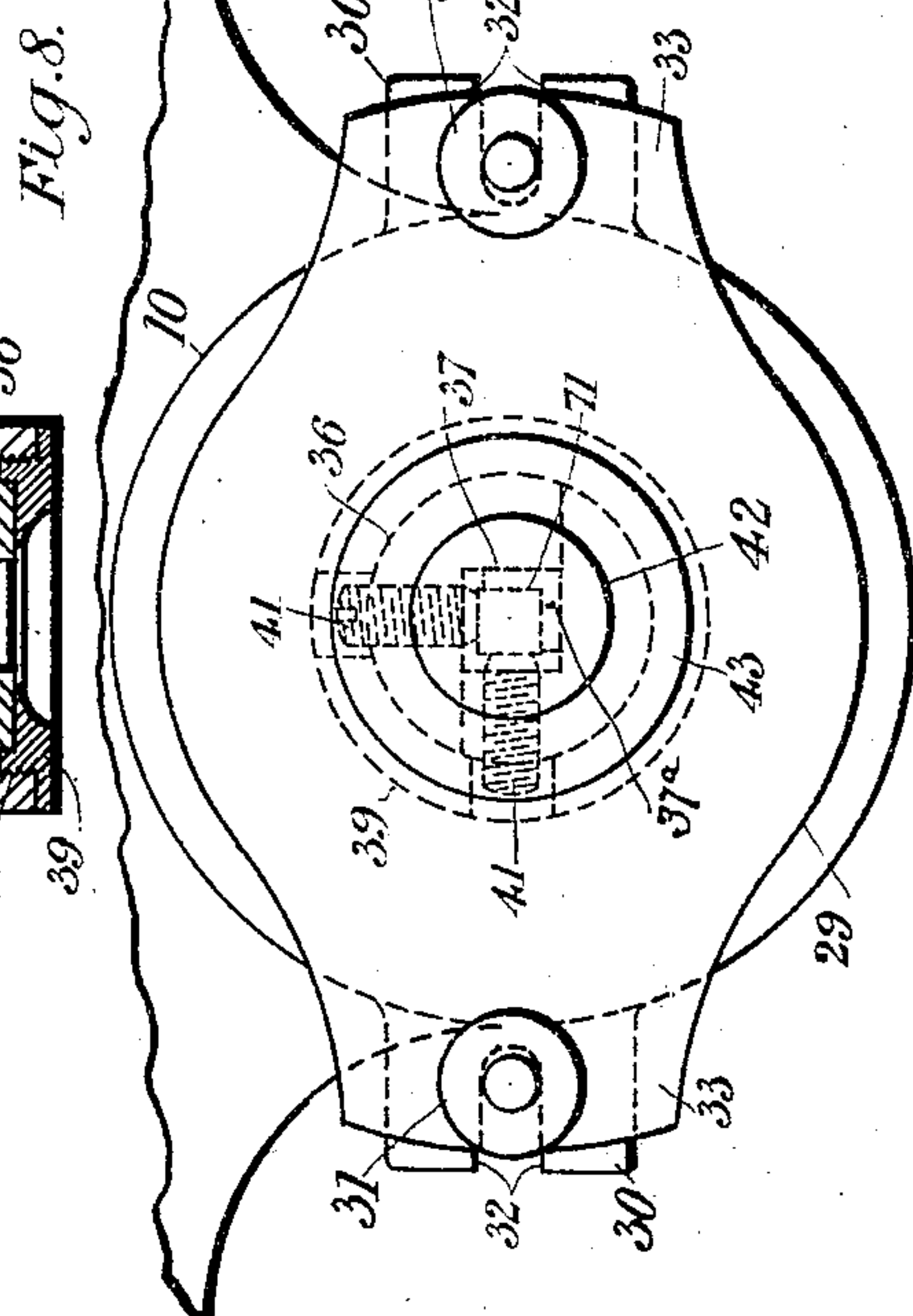
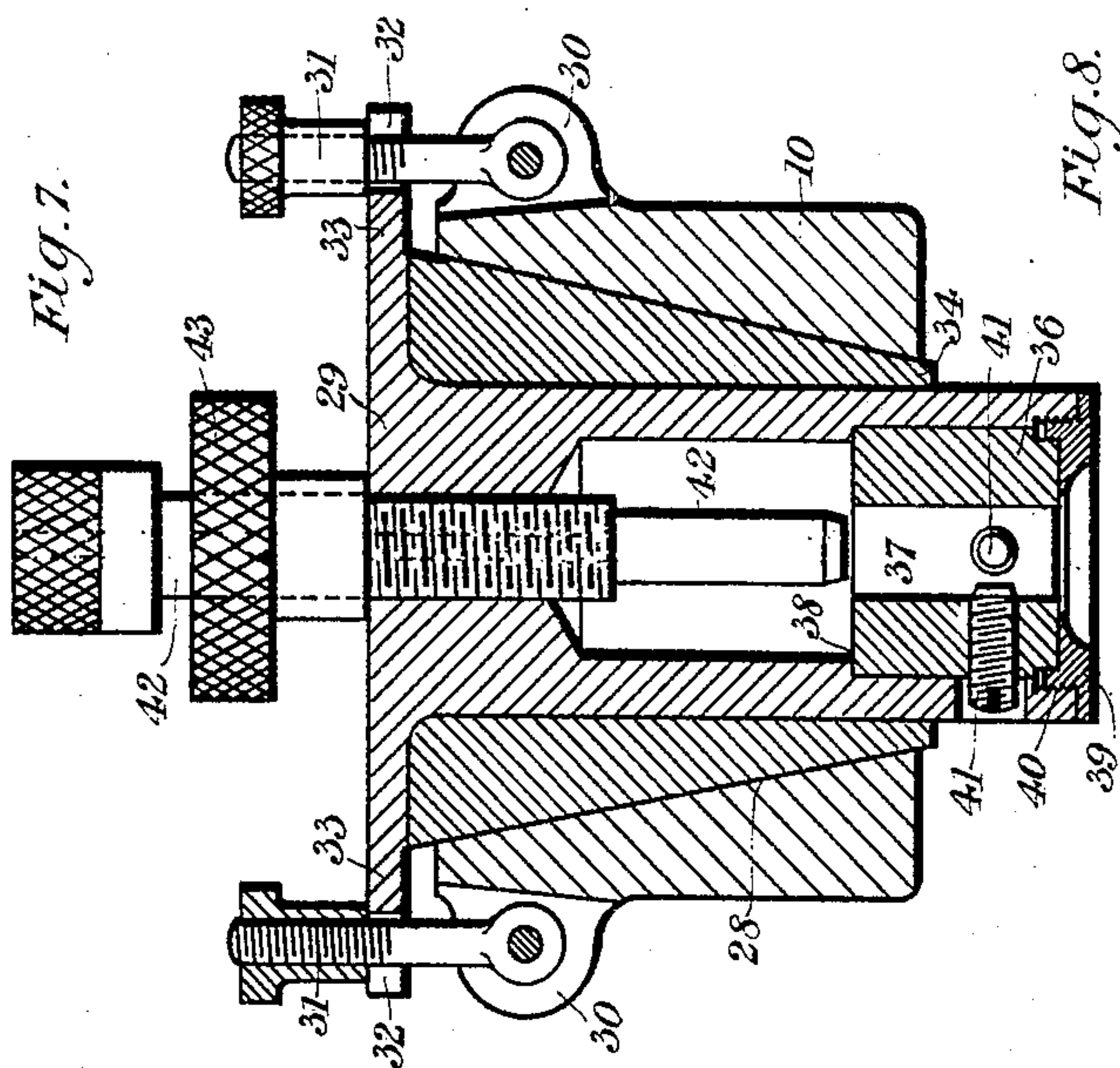
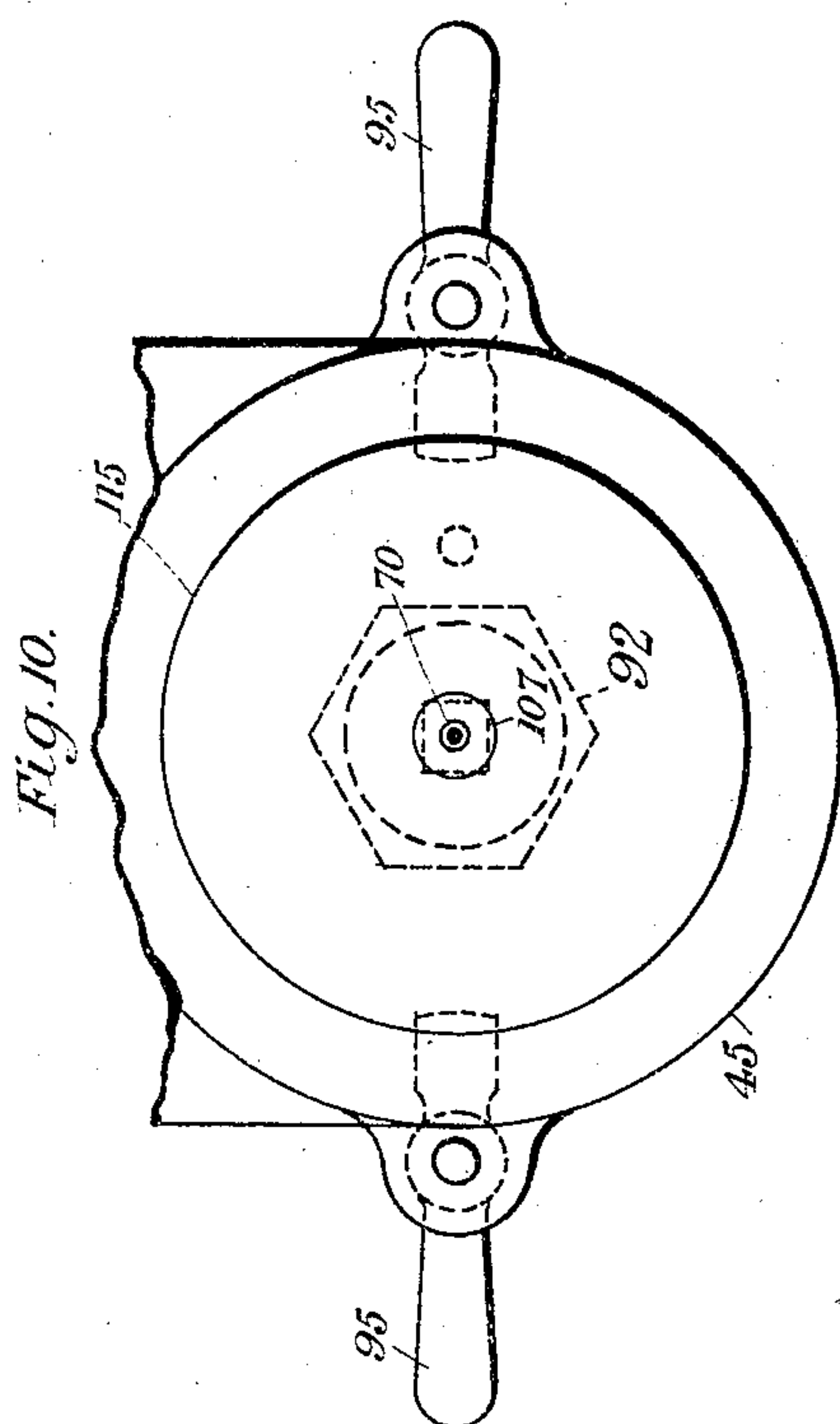
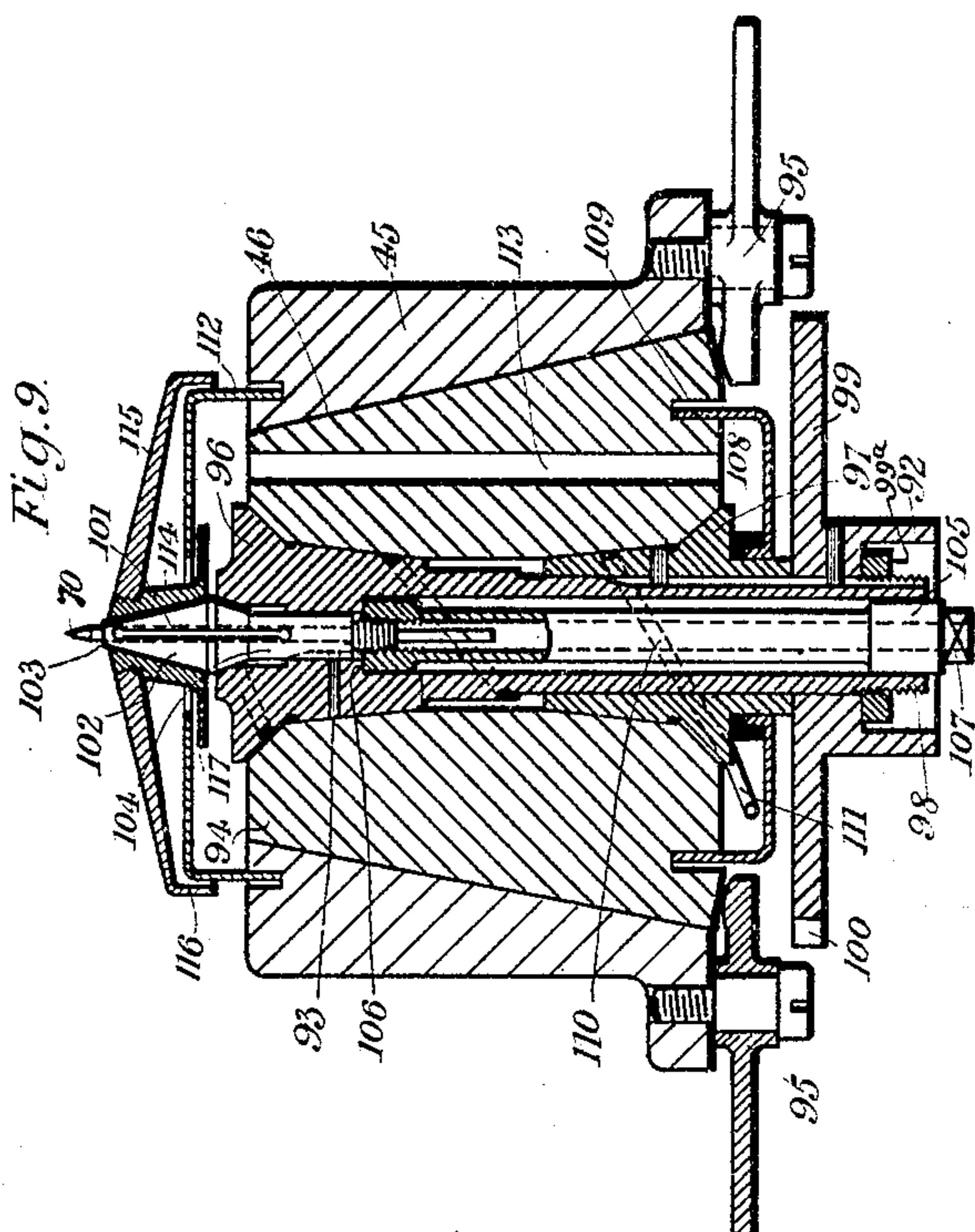
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NO MODEL.

7 SHEETS—SHEET 6.



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APPLICATION FILED MAY 31, 1901.

NO MODEL.

7 SHEETS—SHEET 7.

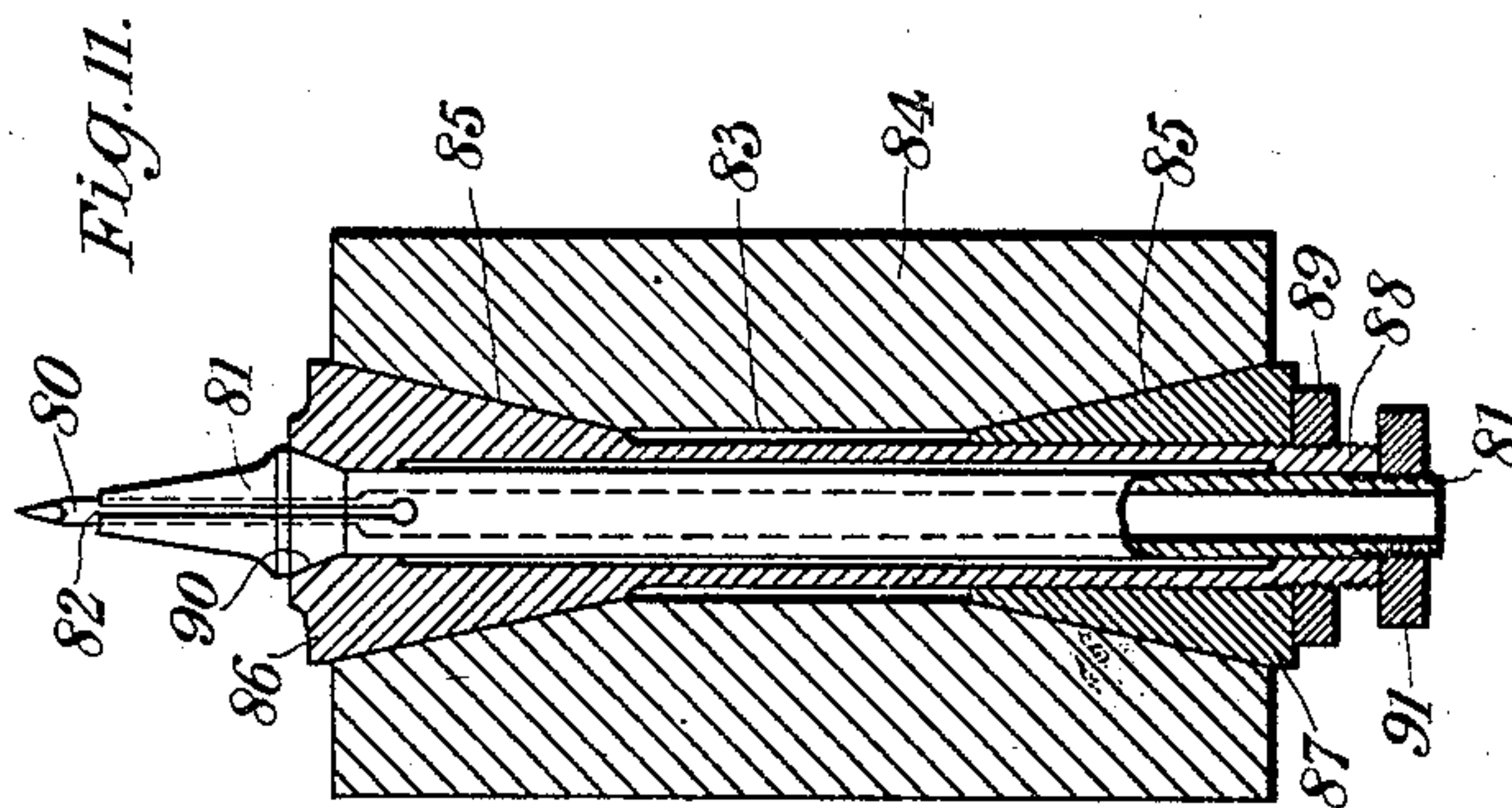
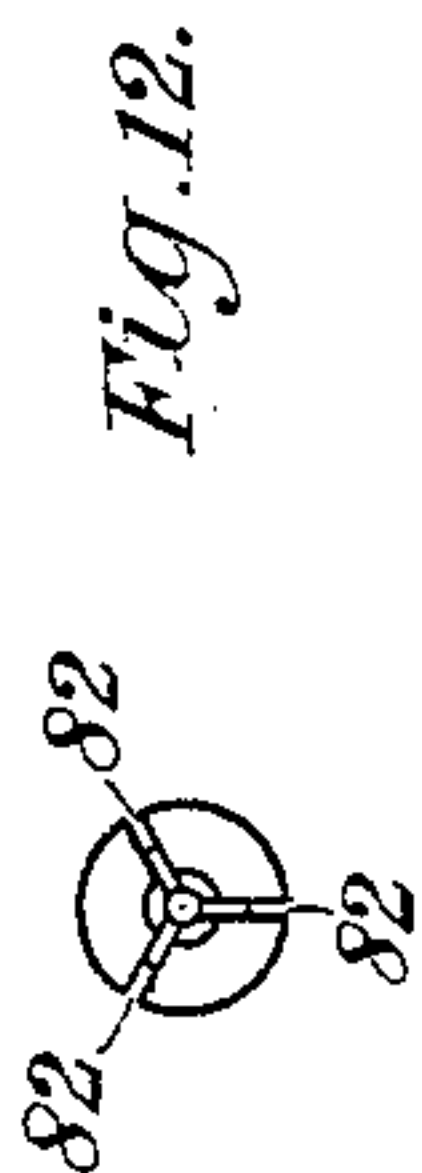


Fig. 14.

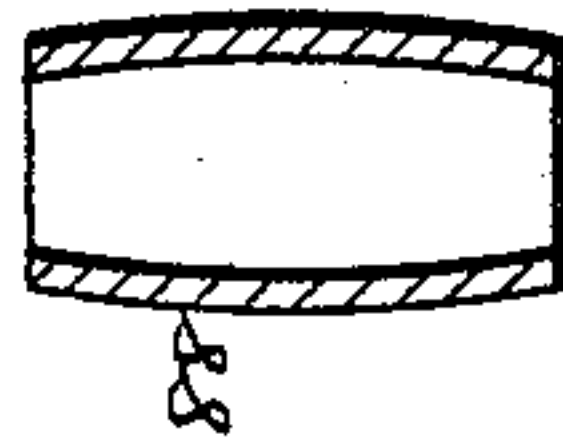
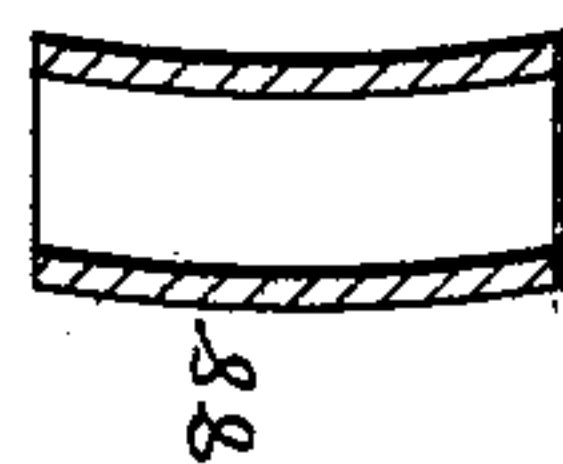


Fig. 13.



Witnesses.  
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# UNITED STATES PATENT OFFICE.

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

## ENGRAVING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 774,027, dated November 1, 1904.

Application filed May 31, 1901. Serial No. 62,614. (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  
5 invented certain new and useful Improvements in Engraving-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it ap-  
10 pertains to make and use the same.

The present invention relates to improvements in engraving-machines such as are specially adapted to engrave or cut the punches for punching the formative cavities in the mat-  
15 rices for type, linotypes, and the like.

Referring to the accompanying drawings, which are to be taken as part of this specification and read therewith, Figure 1 is a front elevation of the upper half of the machine;  
20 Fig. 2, a front elevation of the lower half thereof; Fig. 3, a side elevation of Fig. 1 from the left hand; Fig. 4, a front elevation, partly sectional, of the tool-holder; Fig. 5, a side elevation of Fig. 4 from the left hand; Fig. 6, a  
25 side elevation, on a larger scale, of the upper part of Fig. 3; Fig. 7, a vertical section, and Fig. 8 a plan, of the punch-blank holder; and Fig. 9 a vertical section, and Fig. 10 a plan, of the tool and quill. Figs. 11, 12, 13, and 14  
30 are details illustrating the construction of the quill-holder at present in use.

The tracer-rod 1 swings from a fulcrum 2 in the top of the main frame 3. The joint of this fulcrum is of the type described in the  
35 specification of British Letters Patent No. 7,540 of 1898. The rod 1 fits nearly tight in the ball of the ball-joint 2 and does not slide through it while the machine is at work. Its rise (see Figs. 1 and 6) therethrough is pre-  
40 vented by its own weight and its drop by a sleeve 4 and nut 5 on the top of the said rod, which is screw-threaded to receive the nut, the latter consequently being adjustable thereon. The plate 6, carrying the said joint 2, is  
45 the horizontal member of a bracket, the vertical member 7 of which has steel-faced vertical V-grooves 8 in its side edges to form ball-races with similar grooves in the vertical guides 9 for the bracket. (See Figs. 1 and 6.)

The fulcrum 2 of the tracer-rod 1 is adjustable  
5c vertically with reference to the work-holder 10 through the above-mentioned bracket 6 7 by means of a vertical slot in the back of the main frame 3, a screw-threaded nut 11 on the bracket projecting therethrough and a screw  
55 12 engaging in the said nut 11 and turning in a bearing 13 on the main frame 3 without motion in the direction of its axis. The screw 12 is fitted with a suitable device to indicate the position of the joint 2, such as a divided  
6c head 14 on it and a stationary detent 15, past which the head 14 is rotated. There are two scales, a vertical one, 16, for integers of the rise and fall of the back 7 of the bracket and the other in decimals of the said integers on  
65 the divided head 14.

The bottom end (see Fig. 2) of the tracer-rod 1 is telescopic. The rod itself is tubular to secure the maximum strength and light-  
70 ness. The said end is internally coned outward in a downward direction (but the extent of this coning is too small to be shown) to receive a hardened-steel tubular plug 17, through which slides a parallel rod 18 with a  
75 very perfect fit. A spring 19, resilient within the tracer-rod 1 and between a fixed abutment 20 therein and the top of the rod 18, acts to keep the tracer-point 21 in contact with the pattern 22, which is flush with the surface of  
80 the table 23. The bottom end of the rod 18 is bored to receive the follower or tracer-point 21.

24 is the work-table. It is capable of a reciprocating rectilinear motion in ball-races  
85 25 25 in a frame 26, which is on its part capable of a like reciprocating rectilinear motion in ball-races 27 27 in the main frame 3, the two motions being at right angles with each other, as heretofore. The tracer-rod 1 passes through the center of the work-table  
90 24, and the two are joined together by a universal joint 120 of the same type as the joint 2, already described. It must be understood that the rod 1 can slide freely through the joint 120 in either direction, because there is  
95 no such device combined with it as the sleeve 4 and nut 5, above described with reference to the connection of the same rod 1 with the



joint 2. This junction of work-table 24 and tracer-rod 1 insures that the center of the former is always in the axis of the latter, while the races 25 25 and 27 27 prevent the work-table 24 being turned about the tracer-rod 1 by the resistance of the tool 70 to the lateral motion of the punch-blank 71 as the rod 1 moves the table 24 in any direction.

It is to be particularly noted that the above-named ball-races 25 and 27 have their V-grooves arranged side by side instead of, as ordinarily, one above the other. By this arrangement the wear of each ball-race 25 will tend to decentralize the work-table 24 in the sliding frame 26 by moving the said table in a horizontal plane in a direction perpendicular to the length of the said ball-race. As, however, the force thus exerted by one ball-race of a pair is exactly balanced and counteracted by that exerted by the companion ball-race, it follows that these equal and opposite forces conspire to maintain the work-table 24 constantly in its proper central position in the frame 26. A precisely similar result is obtained by the ball-races 27 as regards the relationship between the sliding frame 26 and the main frame 3. It will also be observed that the before-described ball-races 25 27 serve, respectively, to lock the work-table 24 and the frame 26 in their proper working positions.

28 is a vertical conical hole in the work-holder 10 to receive the punch-blank holder or chuck 29. (See Figs. 7 and 8.) At this point it may be explained with advantage that as far as practicable the several parts of the different mechanisms of the present invention are, in contour at least, bodies of revolution, the object of that being to diminish cost of production and to secure all the advantages in exact fitting of the one to the other incidental to coned or tapered relationships. The holder 10 has a lug 30 on each side of it. Each lug has a screw-threaded bolt and nut 31 pivoted to it. This pair of nutted bolts 31 31 holds down the chuck 29 by engaging with notches 32 32 in flanges 33 33 on the top thereof. Externally the main piece of the chuck 29 is circular and (ignoring the flange) cylindrical. Between it and the holder 10 there is a bush 34, parallel internally and coned externally to correspond with the conical hole 28 of the holder 10. At this point it may be explained with advantage that wherever in respect of the several parts of the different mechanisms of the invention there is one that requires to be much machined that part is of comparatively soft material—*e. g.*, mild steel—and that the wearing-surfaces of such parts are detached pieces of such shapes as can be hardened as much as the function of each may make advisable or desirable without risk of distortion or cracking, such parts acquiring at the same time the capacity of being replaced *per se*. Thus the chuck 29, having

many non-continuous surfaces and double angles separating them, is of soft material, its bearing-surface (the bush 34) being detachable, of plain contour, hardened up, and then shrunk on. In other words, fewness of parts or an apparent simplicity of construction is a secondary consideration to permanence of wearing parts and facility of replacement of them. The bush 34 is prevented from turning in the holder 10 by a screw 35. (Shown in Fig. 6 as passing through the said holder 10 into a slot 121 in the bush.)

A punch-blank 71 is square in cross-section, and the block 36, that receives it, consists of two pieces both internally right-angled and externally curved and fitting up to each other, so as to make an internal square hole 37 and a circular contour axially parallel with each other. (See Figs. 7 and 8.) This block 36 is forced into a bore in the chuck 29 up to an annular abutment 38. The extreme bottom end of the chuck 29 is a flanged detachable glass-hard and thin ring 39, held in place by being screwed into the chuck 29, as shown at 40, Fig. 7. The function of this ring 39 is to bear the smoothing off or rubbing down with a stone to which the face of the punch-blank 71 is subjected after it has been duly chucked. This punch-blank 71 is held in its square hole 37 by two set-screws 41, working through the block 36 and bearing against the blank 71 at right angles with each other, thereby holding it up true to two sides and one internal angle of the hole 37. Pushing the punch-blank 71 out of the center (even if this is done) does not matter; but it may be kept in the center by packings, such as the angle-packing 37<sup>a</sup>, (shown in dotted lines in Fig. 8,) conjointly with the above-named screws 41. A headed pin 42 engages by a screw-thread on it in a suitable screw-threaded and central hole in the top of the chuck 29. The upper portion of the screw-thread on this pin carries a lock-nut 43, which is normally screwed down on the chuck 29 to lock the pin 42 in working position. When the screws 41, that hold the punch-blank 71 in the block 36, are nearly tight, the lock-nut 43 is turned up the pin 42 and the latter screwed down to protrude the face of the punch-blank 71 to be smoothed or rubbed down whenever it may require. Arkansas stone is suitable for the job. As the sides of the hole 37 must respectively stand parallel with and perpendicular to the motions of the frame 26, the block 36 and the slot 121 in the bush 34 must be square with each other and with the said motions as well, the slot 121 being the determining factor in keeping the hole 37 in the desired position.

The tool-holder consists fundamentally of a slide 44, mounted in the main frame 3 in the same way as described with reference to the bracket 6 7 and by like means. The top of the slide 44 carries a frontward extension 45, which has a vertical conical hole 46 through



it, the longer diameter at the bottom, to receive the quill-holder 94. The bottom of the tool-holder has a corresponding extension 48 parallel with the top one, 45, and standing directly under it. The means for moving the slide 44 up and down in its guide 49 are as follows: The guide 49 carries a depending bracket 50, in which turns a vertical rod 51. Any motion in the direction of its axis is prevented by a collar 52 on one side and a screw-threaded nut 53 on the other side of the bracket 50.

54 is a ball-bearing between the collar 52 and the bracket 50, and 55 a second one between the nut 53 and the same bracket.

A barrel-piece 56 depends from the bottom extension 48, to which it is made fast, and has an axial and slightly conical bore 57, within which fits a plug 58, bored internally and screw-threaded to receive the screw-threaded end of the rod 51. The bottom end of this plug 58 is a head 59 to make a screw-threaded end 60 on the top of the plug 58 turn in either direction in the closed top end of the barrel-piece 56. The plug 58 is slit at 61 down its sides, as shown in Fig. 4, to allow of it being closed upon the screw-threaded rod 51 by the plug-head 59 to take up wear.

62 is a locking-nut to lock the plug 58 in its adjusted position in the barrel-piece 56. The inward motion of each of the split ends of the plug 58 is an arc having an average radius as long as a slit 61. This length is under the circumstances long enough to make that motion nearly rectilinear and at right angles with the axis of the rod 51. Consequently each thread inside the plug 58 fits into the respective space between the two engaging threads on the rod 51 without jamming. This slit device is only to take up wear and tear between the screw-threads on the rod 51 and the plug 58. Access of dust to the screw-threads on the rod 51 and plug 58 is prevented by a short tube 63, which fits over the ball-bearing 54 and over a flange 64 on the bottom of the barrel-piece 56, such flange fitting pistonwise within the tube 63. The bottom end of the rod 51 carries a milled head 65 to turn it, the rod carrying just above the said head a disk 66. The edge of this disk 66 is divided by a notched scale 67 and has a self-releasing or spring detent 68 combined with it to engage therein. The disk 66 can be turned freely about the rod 51 to bring its zero-notch opposite the detent 68 and can be locked to the said rod to make the motion of the scale 67 past the detent 68 indicate the advance of the tool 70 into the punch-blank 71. The locking device consists of a screw-threaded nut 69, engaging with the rod 51 on each side of the disk 66. This disk is unlocked and the detent 68 engaged in the zero-notch in the disk 66. The milled head 65, fast on the rod 51, is turned until the tool 70 contacts with the face of the punch-blank 71. This contact thus coincides

with the zero position of the disk 66. The latter is then locked to the rod 52 by the nuts 69 and the tool 70 advanced into the punch-blank 71 by turning the milled head 65, the amount of such advance being indicated by the passage of the scale 67 past the detent 68.

The quill-motor drives by a belt onto a pulley 72, Figs. 4, 5, having its bearing in a stout bracket 73, fast to one of the steadiest parts of the machine-frame 3. A second pulley 74 on the same axis drives by a second belt onto a third pulley 75 and a pin-drive 76, turning in the outer end of an arm 77, swinging on the bracket 73, concentrically with the two pulleys 72 74. The pin-drive 76 engages with a hexagon nut 92, fast to the disk described farther on. The arm 77 is locked in working position by a wedge-shaped bolt 78, adapted to engage in a corresponding notch 79 in the said arm and the bracket 73, part of the notch being in the arm 77 and part in the bracket 73, the two parts registering with each other when the arm 77 is in position for being locked.

Figs. 11 to 14 illustrate the way in which quill-holders have been hitherto made. The tool 80 is held axially within the appropriate end of the quill 81, and which end is split at 82 to be closed tightly upon it. The bore 83 of the quill-holder 84 has two conical surfaces, one at each end and both trending outward. There is a conical annular piece 86 fitting within each of the said conical surfaces, the top one, 86, having a tubular prolongation 88 less in diameter than the bore of the holder 84, and which prolongation 88 is continued downward through the bottom annular conical piece 87, beyond which it is screw-threaded to receive a nut 89, which by bearing against the conical piece 87 can pull the two pieces 86 up to their respective conical surfaces 85 85 till they fit against them properly for turning in them, the same pull also pulling the pieces 86 toward each other. The quill 81 is passed through the two pieces 86 87, a conical surface 90 on it just below the split end that grasps the tool 80 bearing against a corresponding surface within the piece 86, while the bottom end of it projects beyond the end of the prolongation 88, where it is screw-threaded to receive a nut 91, the screwing up of which against the prolongation 88 as an abutment pulls the cone 90 on the top end of the quill 81 against the said corresponding surface and closes the split ends of the quill upon the tool 80; but when the nut 91 is screwed up for that purpose the portion of the prolongation 88 between the two pieces 86 87 being only weak and unsupported is either bent, as shown in Fig. 13, or distended, as shown in Fig. 14, by the strain to which it is then subjected, and as the turning fit of the two pieces 86 87 in the holder 84 will have already been attained by screwing the nut 89 along the prolongation 88 up against the bot-



tom piece 87, which fit will need alteration only when wear makes readjustment of it necessary, the bending or distention of the prolongation 88 tends to make the pieces 86 87 bind in the holder 84, while the split end of the quill may not yet have been closed upon the tool 80. Now according to the present invention (see Figs. 9 and 10) all the parts of the quill-holder 94 are bodies of revolution in a distinctive way—that is to say, they are easy to make, one slides over or into another, and the fitting-surfaces are conical, so that it is parallel with or along their common axis that they all tend to move as they are tightened up to take up wear and tear. The quill-holder 94 is conical and wider across the bottom than the top and is held up in the hole 46 in the extension 45 by a pair of latches 95 95. The top conical annular piece 96 has two bearing-surfaces coned at different angles. The bottom conical annular piece 97 fits over the tubular prolongation 98 of the top one and up into the holder 94, substantially as heretofore. The bottom end of the prolongation 98 carries a disk 99, held thereon by means of a nut 99<sup>a</sup>, and whose periphery has as many equidistant notches 100 in it as the tool 70 has facets. These facets are engaged in succession by a detent in the grinding-machine, which latter, however, is no part of the present invention. The old splits 82 in the tool-holding end of the quill 81 are replaced by slots 101, closed at both ends, the intermediate ribs 102 being collapsed up to the tool 70 to grip it, the quill 104 having an annular end 103, within which the tool 70 fits, as compared with the free ends of the quill 81, which were generally forced out of their proper working position. The quill 104 is screwed into the expanded end of a tube 105, which fits by its top end inside the top conical piece 96 and by its bottom end inside the tubular prolongation 98, its top end also bearing against an annular abutment 106 on the bore of the said piece 96. The bottom end of the tube 105 projects beyond the prolongation 98, where it carries a square 107, by which it can be turned on the abutment 106 to collapse the ribs 102 of the quill-top against the tool 70, a spline device 93 preventing the quill 104 being turned. The top and bottom pieces 96 97 and all parts within or attached to them revolve together within the quill-holder 94, the external surfaces of the said pieces 96 97 being the only rubbing ones and the internal one of the said holder 94 being the only bearing one.

The quill 104 is revolved at such a high velocity that special lubricating devices become necessary. These are as follows: A stationary and annular oil-pan 108 is held to the bottom face of the quill-holder 94 by having its sides sprung into an annular groove 109. The inside edge of the pan 108 fits easily over the depending end of the piece 97. There is a spi-

ral groove 110 in the external periphery common to the two pieces 96 97, and this groove is connected with the oil in the pan 108 by a take-up pipe 111, which dips thereinto. The excess oil is thrown outward onto the top of the quill-holder 94, where centrifugal and upward dispersion of it is prevented by an annular oil-stop 112, carried by the extension 45. 113 is a passage to return the said excess into the oil-pan 108. A piece 114, coned out to fit down over the top of the quill 104, carries a circular shield 115, having a downwardly-sloping top and depending rim 116, which latter stands outside and just clear of the oil-stop 112 to prevent fragments getting into the oil-cavities. The piece 114 also carries a flange 117 between the oil-stop 112 and the quill-holder 94 to prevent the undue displacement or removal of the said oil-stop when the quill-holder 94 and quill 104 are taken out of the extension 45.

I claim—

1. In an engraving-machine, the combination of a work-table a tracer-rod controlling the motions thereof, a ball-joint on the work-table through which the tracer-rod passes, and ball-races supporting the said table and each comprising two V-slides arranged side by side and a row of balls engaging both V-slides.
2. In an engraving-machine, a chuck adapted to fit into a fixed work-holder, a two-part block fitting into the chuck, to receive the work to be engraved and a glass-hard facing-ring secured into the chuck to withstand the action of the abrading-stone used for smoothing the face of the work held in the chuck.
3. In an engraving-machine, a chuck adapted to fit into a fixed work-holder, a two-part block fitting into the chuck to receive the work to be engraved, a detachable glass-hard facing-ring secured into the chuck to withstand the action of the abrading-stone used for smoothing the face of the work held in the chuck and a screw-threaded pin to protrude the said work from the chuck.
4. The combination with a tool-holder and the screw by which it is moved up to and away from the work, of an internally-coned barrel-piece, an externally-coned and screw-threaded plug fitting within the said barrel-piece and receiving the screw above mentioned, and longitudinal slots in the sides of the said plug.
5. The combination with a tool-holder and the screw by which it is moved up to and away from the work, of an internally-coned barrel-piece, an externally-coned and screw-threaded plug fitting within the said barrel-piece and receiving the screw above mentioned, slots in the sides of the said plug and a screw on the end of the plug engaging in the closed end of the barrel-piece to take up wear between the screw-threads of the plug and the screw engaging therewith.



6. The combination with a tool-holder and the screw by which it is moved up to and away from the work, of an internally-coned barrel-piece, an externally-coned and screw-threaded plug fitting within the said barrel-piece and receiving the screw above mentioned, slots in the sides of the said plug, a screw device on the end of the plug engaging with the closed end of the barrel-piece to take up wear between the screw-threads of the plug and the screw engaging therewith, and a screw-thread and locking-nut on the outer end of the coned plug to lock it in its adjusted position in the barrel-piece.

7. The combination with quill-holder, top and bottom conical piece fitting therein, prolongation of the top piece through the bottom conical piece, and adjustable means on the outer end thereof to hold the two pieces with a working fit up to the respective surfaces of the quill-holder, of an internal annular abutment on the top conical piece, a piece fitting with a working fit within the said prolongation and up to the said abutment, and a detachable connection between the respective ends of the quill and the said piece.

8. The combination with a quill-holder, top

conical piece and bottom conical piece fitting therein, prolongation of the top piece through the bottom conical piece, and adjustable means on the outer end thereof to hold the two pieces with a working fit up to the respective surfaces of the quill-holder, of an internally-annular abutment on the top conical piece, a piece fitting with a working fit within the said prolongation and up to the said abutment, and a detachable connection between the respective ends of the quill and the said piece, and a spline device to prevent the quill turning in the top conical piece.

9. The combination with quill-holder, of oil-pan, a spiral groove in the outer surface of the pieces carrying the quill, take-up pipe depending from the bottom end of the said groove into the oil-pan, a fixed annular oil-stop outside the top of the quill-holder and a return port from the quill-holder top to the oil-pan.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

MARK BARR.

Witnesses:

WALTER J. SKERTEN,

CHAS. S. WOODROFFE.