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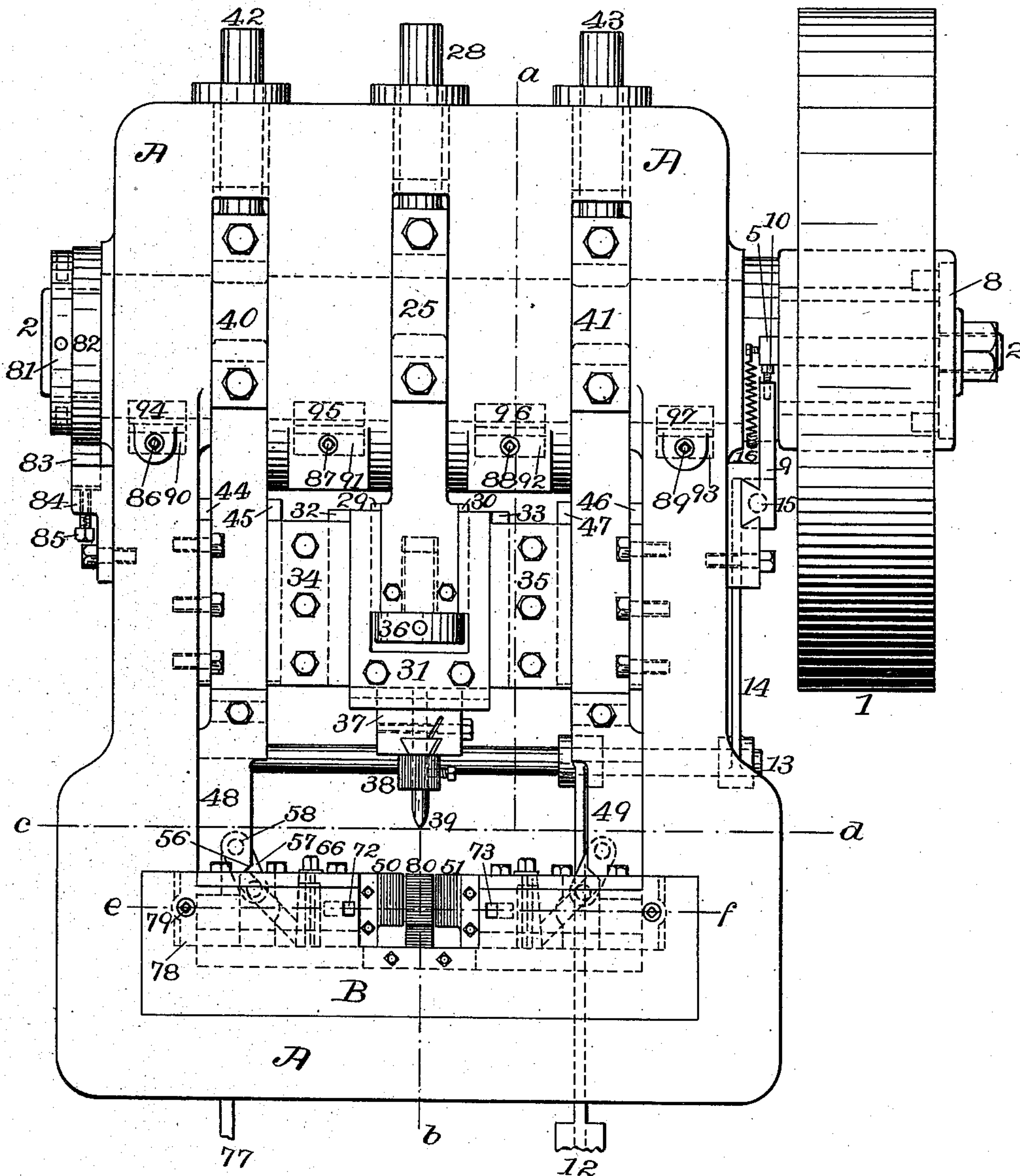
6 Sheets—Sheet 1.

H. HAMMOND.  
FORGING MACHINE.

No. 400,670.

Patented Apr. 2, 1889.

*Fig. 1*



Witnesses:

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Arthur T. Payne

Inventor:

Henry Hammond  
by Albert H. Walker, Atty

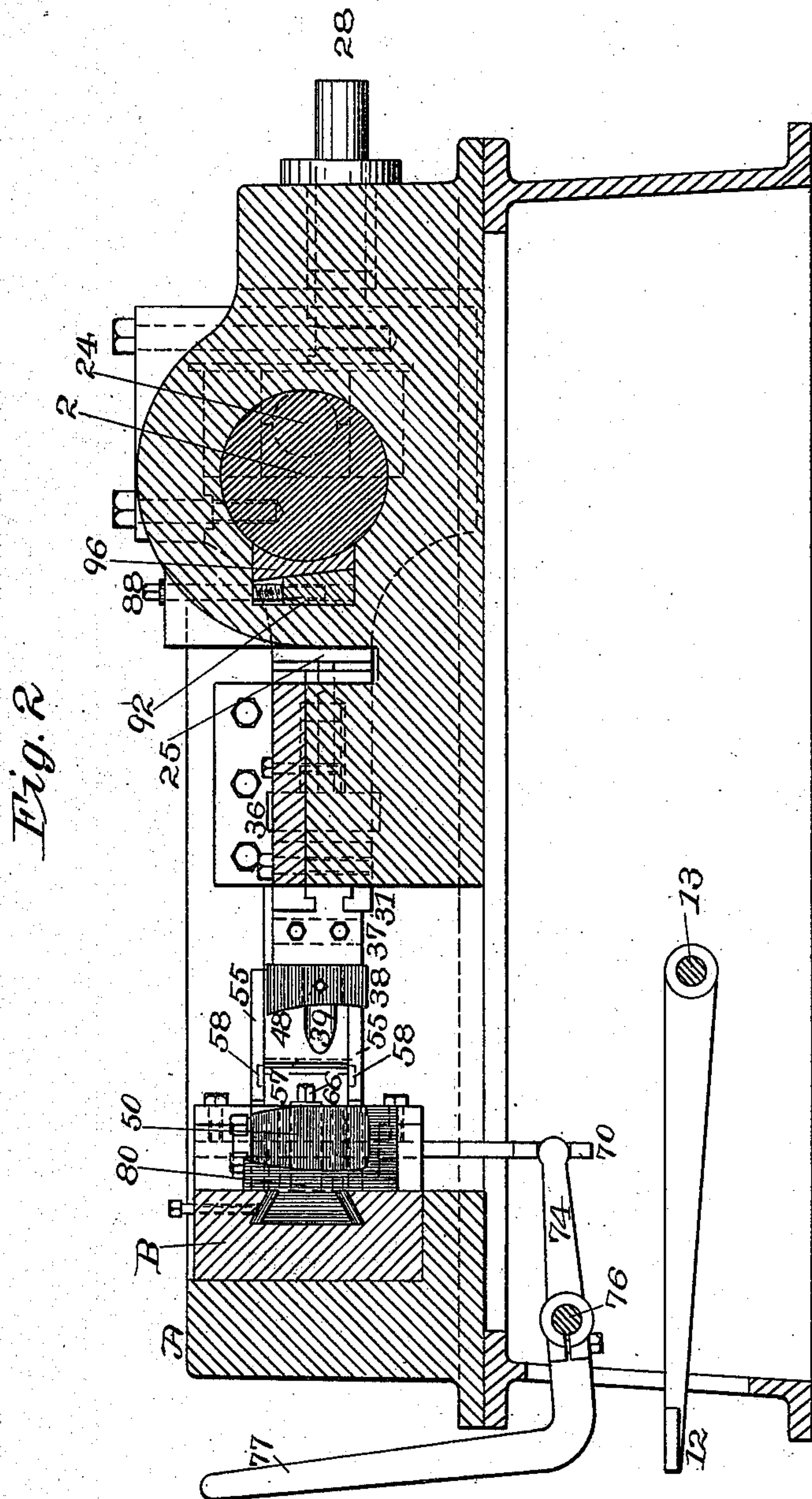
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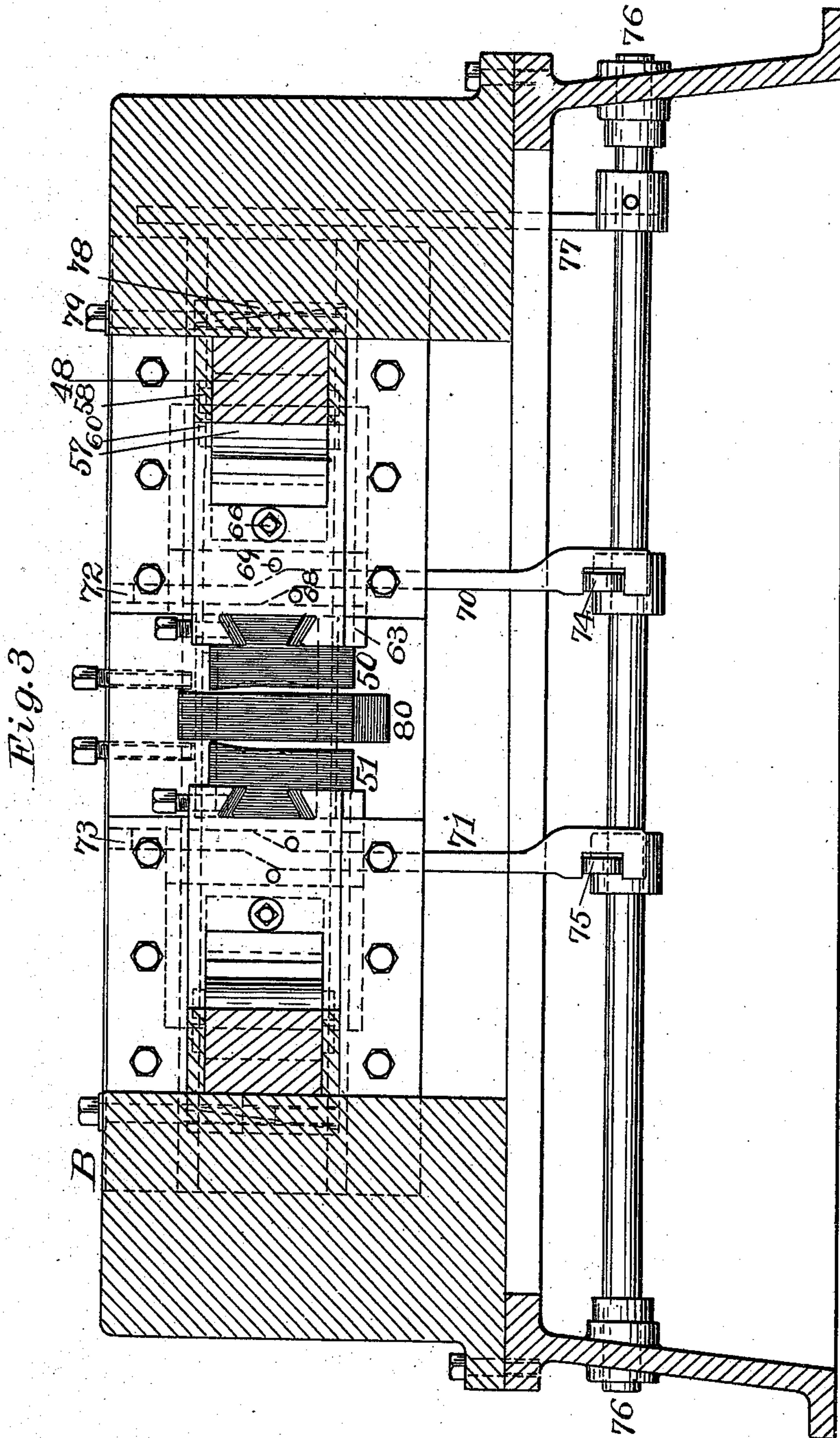
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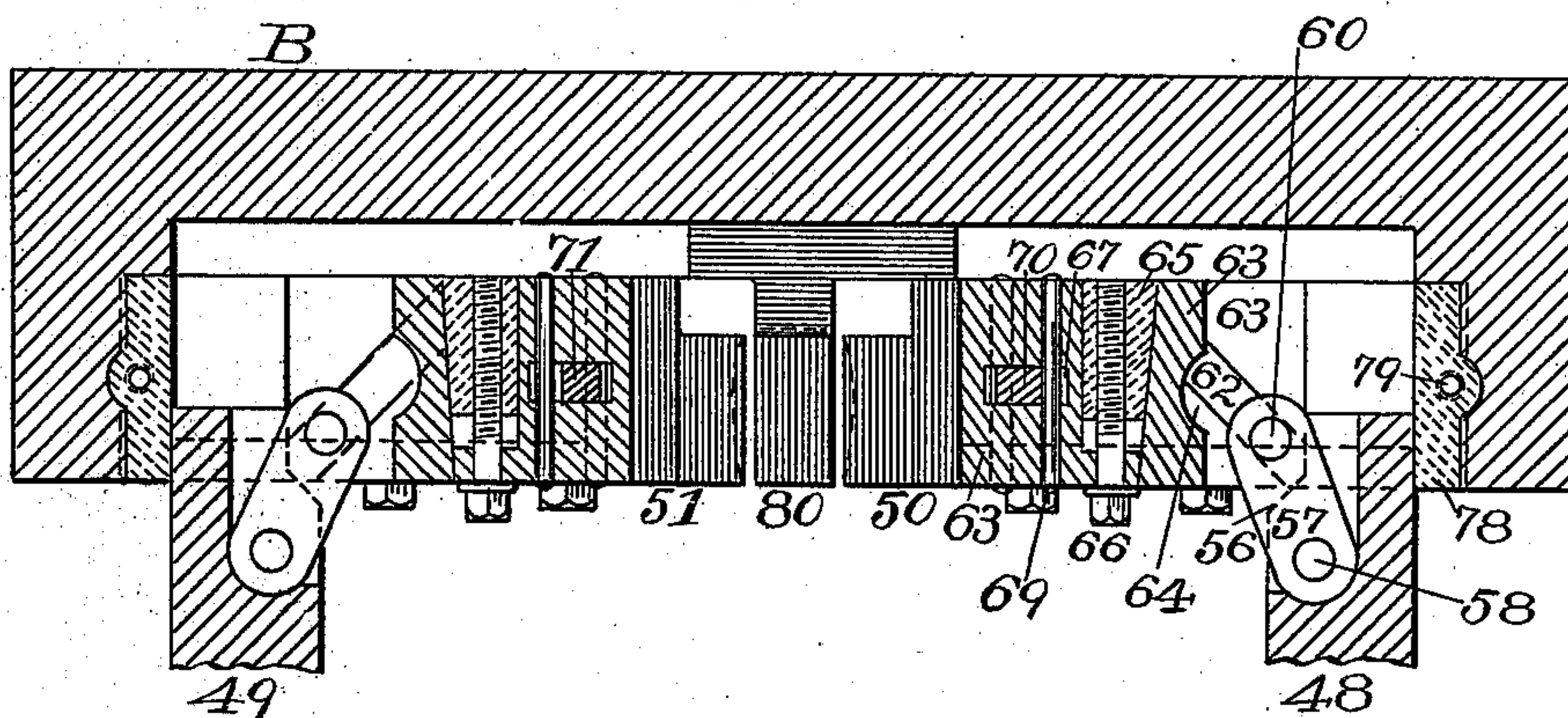
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H. HAMMOND.  
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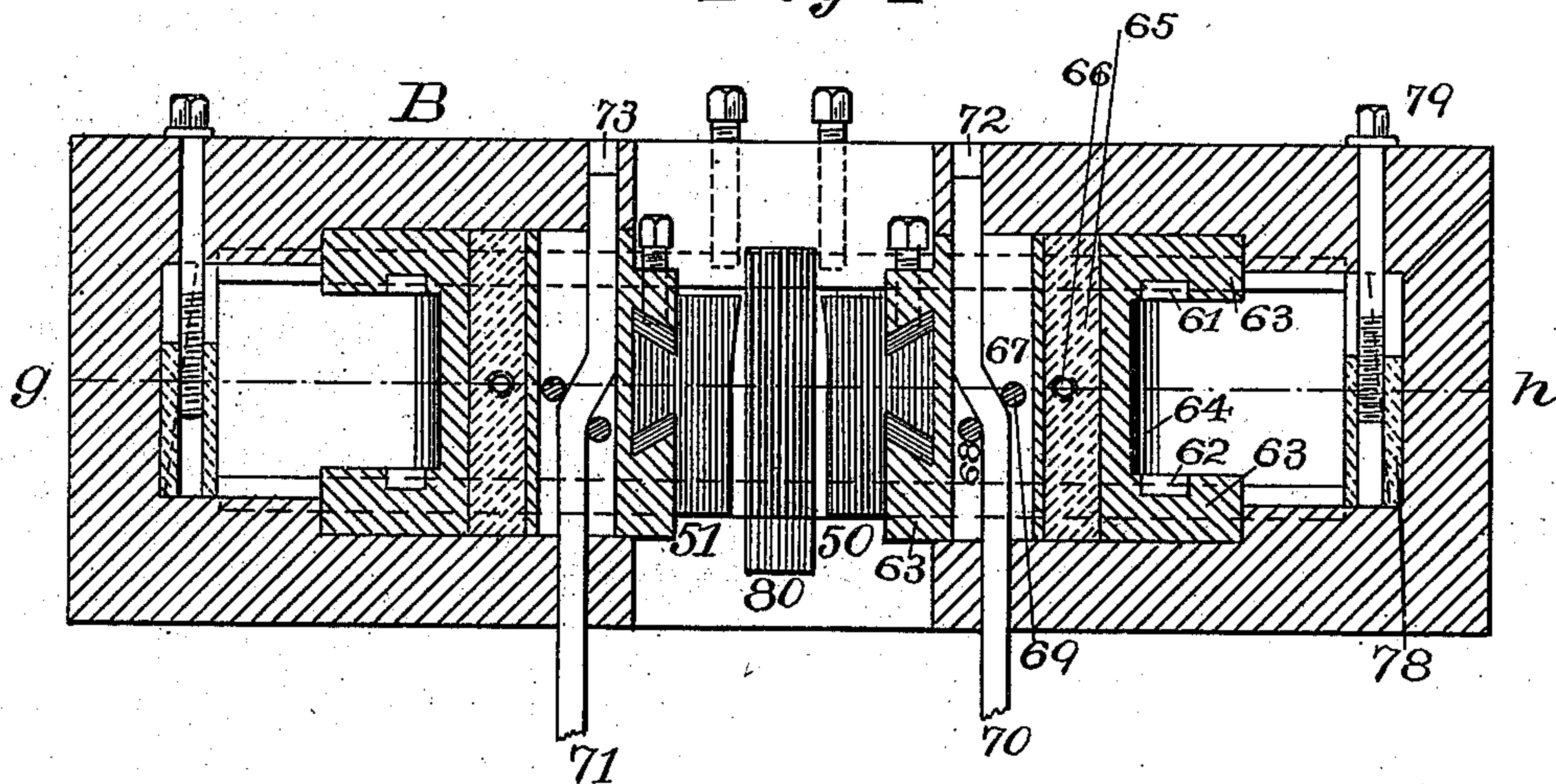
No. 400,670.

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*Fig. 5*



*Fig. 4*



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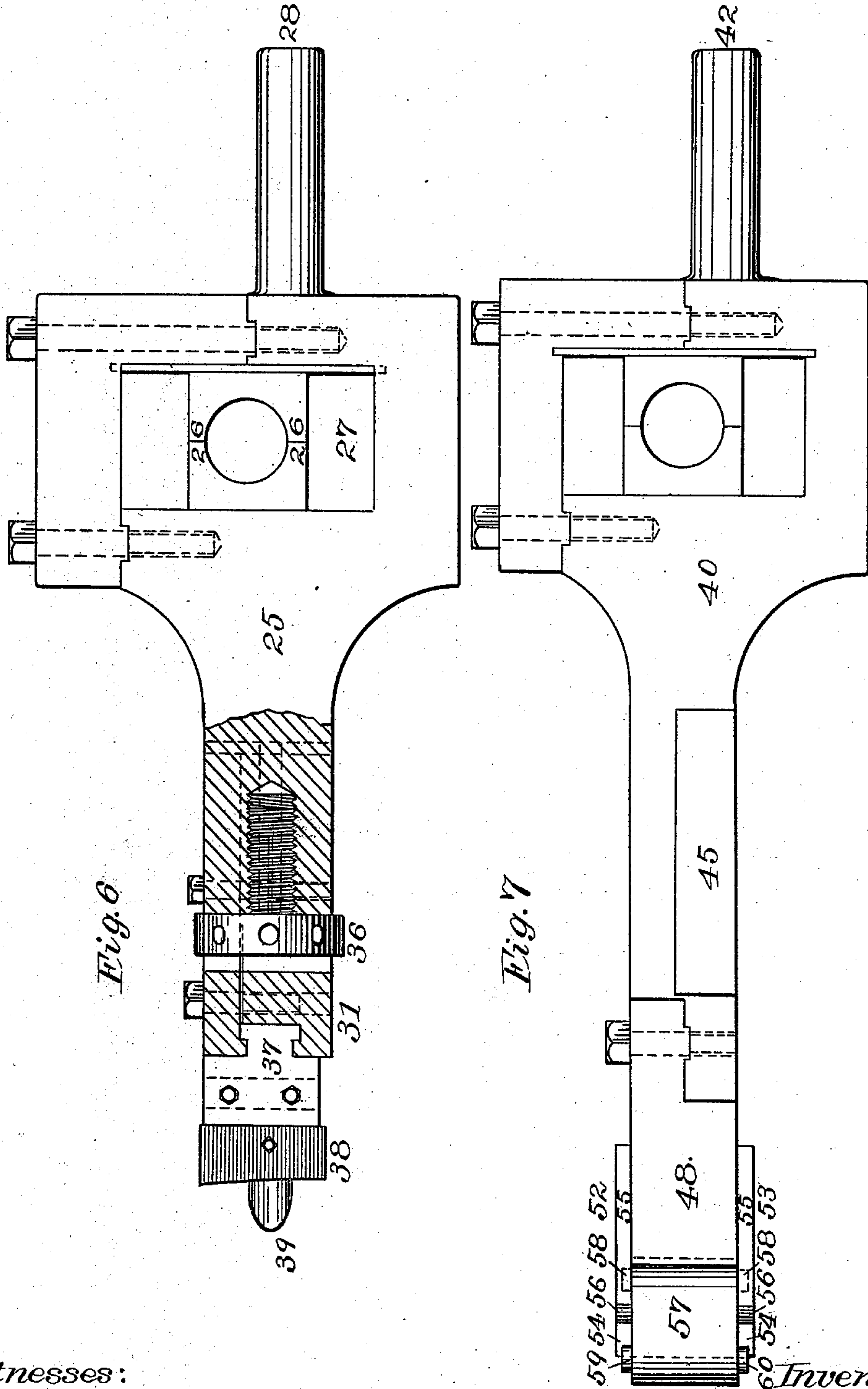
(No Model.)

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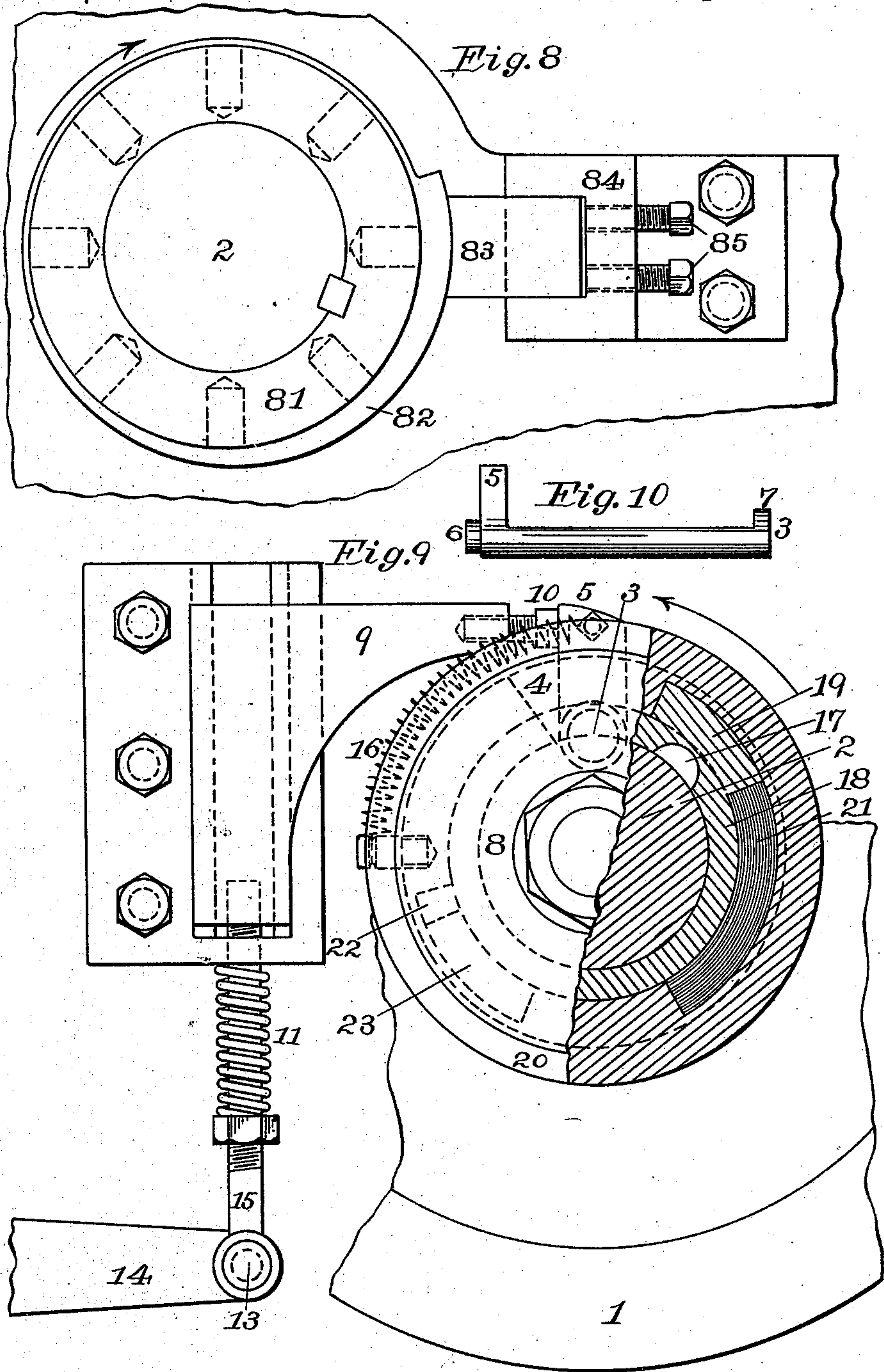
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Patented Apr. 2, 1889.



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# UNITED STATES PATENT OFFICE.

HENRY HAMMOND, OF NEW HAVEN, CONNECTICUT.

## FORGING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 400,670, dated April 2, 1889.

Application filed December 4, 1888. Serial No. 292,637. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY HAMMOND, of New Haven, Connecticut, have invented a new and useful Forging-Machine for the Manufacture of Axes and other Similar Articles, of which the following description and claims constitute the specification, and which is illustrated by the accompanying six sheets of drawings.

This machine is particularly adapted to punch the eyes in ax-blanks and ax-poll blanks, and to forge the exterior surfaces of such blanks into a finished form.

Figure 1 of the drawings is a plan view of the machine. Fig. 2 is a vertical longitudinal section on the compound line *a b* of Fig. 1. Fig. 3 is a vertical lateral section on the line *c d* of Fig. 1, and looking toward the letter *b* of that figure. Fig. 4 is a vertical lateral section on the line *e f* of Fig. 1, looking in the same direction. Fig. 5 is a lateral horizontal section on the line *g h* of Fig. 4. Fig. 6 is a vertical view, partly in elevation and partly in section, of the central pitman of the machine and of the punch operated thereby. Fig. 7 is a view of the inside of a side pitman of the machine and of the link and inclined plane through which it operates upon one of the side die-blocks. Fig. 8 is a side view of the brake, which operates to retard the machine at each revolution of its main shaft. Fig. 9 is a view, partly in section, of the apparatus by means of which the main shaft is alternately keyed and unkeyed with the pulley which drives it. Fig. 10 is a view of the key with which that alternate keying and unkeying is accomplished.

The pulley 1 runs as a loose pulley upon the crank-shaft 2 when the key 3 is in the position shown in Fig. 9, and as a fixed pulley when that key is turned upon its axis in the direction of the arrow in that figure. The journal of the shaft 2 has longitudinally of its periphery a groove corresponding in cross-section with the middle portion of the key 3. The shaft is enlarged between the outside of the frame of the machine and the inside of the pulley, and in the face of that enlarged part of the shaft is the recess 4, in which the arm 5 of the key 3 is adapted to oscillate. In the rear wall of that recess there is a round socket for the reception of the bearing 6 of

the key 3. The bearing 7 of the key 3 turns in a socket of the washer 8, which washer revolves with the shaft 2. The axes of the bearings 6 and 7 are on a line with the upper surface of the middle part of the key 3, and the axes of the two sockets are on a line with the circle of the journal of the shaft 2. The slide 9 reciprocates vertically on the side of the machine, and is provided with the adjustable extremity 10, and is worked in one direction by the adjustable spring 11 and in the other direction by the treadle 12 through the rock-shaft 13, the arm 14, and the rod 15. The spring 16 holds the key in its keying position, except when the arm of the key is raised to its upright position by colliding with the extremity 10 of the slide 9. It so collides and thus stops the shaft at each revolution unless the treadle is kept depressed against the action of the spring 11. Whenever the shaft is not revolving, it may be started by depressing the treadle and thus releasing the arm of the key from the extremity of the slide. When the arm of the key is thus released, the key is turned upon the axes of its bearings 6 and 7, and its middle portion is thus carried into the longitudinal groove 17 in the interior of the bushing 18, which groove is a counterpart of that on the periphery of the journal of the shaft 2. The exterior of the bushing 18 is provided with the longitudinal projection 19, which works in a corresponding recess in the interior of the hub 20 of the pulley 1 against the resistance of the elastic cushion 21. A corresponding recess, 22, in the opposite side of the interior of the hub 20 of the pulley is occupied by the projection 23 on the exterior of the bushing 18, and that portion of the latter space not occupied by the latter projection may be partly or wholly occupied by a solid block to reduce or suspend, as the case may be, the function of the cushion 21, which consists in easing the start of the machine when the shaft 2 and the bushing 18 are keyed together by the key 3. The crank 24 of the shaft 2 works the pitman 25 by means of the sliding box 26, which reciprocates in the recess 27 in the head of that pitman. The pitman 25 is guided by its cylindrical projection 28, which reciprocates in a bearing through one end of the frame of the machine, and also by



the tongues 29 and 30, which project from its opposite sides and reciprocate in grooves on the insides of the U-shaped gate 31. That gate is provided with the tongues 32 and 33, which reciprocate in grooves in the adjacent fixed parts of the machine 34 and 35, respectively. The working end of the pitman 25 is provided with the adjustable head 36, which reciprocates in the forward part of the interior of the U-shaped gate 31, and limits the reciprocation of the pitman 25 relatively to that gate. The die-block 37 is fixed to the forward face of the gate 31, and is adjustable horizontally thereon, while the die-section 38 is fixed to the forward face of the die-block 37 and is adjustable vertically thereon. The punch 39 is removably fixed in the forward face of the die-section 38. The pitmen 40 and 41 are worked by cranks of the crank-shaft 2, which cranks are identically set relatively to the axis of the crank-shaft, but are set about forty-five degrees behind the crank 24. Those pitmen are guided by their projections 42 and 43, respectively, and their tongues 44 and 45, and 46 and 47, respectively, and they are constructed with the forward detachable sections 48 and 49, respectively, and they aid to operate the die-sections 50 and 51, respectively, by means of intermediate mechanisms which are duplicates of each other, and which, therefore, I now describe once only, and in connection with the pitman 40. The forward section, 48, of the pitman 40 is provided with the upper projection, 52, and the lower projection, 53, and each of those projections is provided with the inward-looking surfaces 54 and 55, united by the inclined surface 56, and the pitman-section 48 is provided with the link 57, the rear end of which is pivoted thereto at 58, and the forward end of which is provided with the guides 59 and 60, which reciprocate in diagonal grooves 61 and 62 in the opposite faces of the inner sides of the U-shaped die-block 63. The outward face of that die-block is provided with the concavity 64 for the reception of the forward convex end of the link 57.

The die-block 63 is constructed in two pieces, and is adjustable in length by means of the wedge 65, worked between those two pieces by the threaded bolt 66. The forward face of the die-block 63 is provided with a dovetailed groove for the adjustable reception of the die-section 50. The die-block 63 is also provided with the vertical recess 67 and the horizontal pins 68 and 69, passing through that recess crosswise of that die-block. The die-block 63 and its counterpart which carries the die-section 51 are not only operated upon by the pitmen 40 and 41, but are also caused to reciprocate toward and from each other by the cam-rods 70 and 71, respectively. The upper ends of those rods reciprocate in the vertical recesses 72 and 73, respectively, in that part of the frame of the machine which is designated by the letter B, and which rests upon the main part A of the frame of the machine,

and the lower ends of those rods are forced to thus reciprocate by the arms 74 and 75, respectively, and those arms are worked with the rock-shaft 76 by the arm 77. The rod 70 operates upon the die-block 63 by means of its inclined surfaces at its inclined portion working against the pins 68 and 69, and the rod 71 works the opposite die-block by means of corresponding pins. The wear between the rearward side of the pitman-section 48 and the adjacent part of the frame B may be taken up by the wedge 78, worked by the threaded bolt 79, and the corresponding wear between the rearward side of the pitman-section 49 and the adjacent part of the frame B may be taken up by the corresponding wedge and bolt. (Shown in Figs. 4 and 5.) The forward and bottom die-section, 80, is adjustably fixed to the forward side of that rectangular recess in the frame B which contains it, and contains, also, the side die-sections, 50 and 51.

The brake consists of the disk 81, keyed to one end of the shaft 2, and provided with the eccentric surface 82 for contact with the brake-shoe 83, and that brake-shoe is adjustably fixed to the side of the frame A by means of the bracket 84 and the set-screws 85. The wear of the shaft 2 may be taken up by the threaded bolts 86, 87, 88, and 89, working the wedges 90, 91, 92, and 93 against the concave shoes 94, 95, 96, and 97, respectively.

The mode of operation of this machine is as follows: When the die-sections are in the open positions shown in Fig. 1, the operative places the blank to be punched and formed head downward upon the forward and bottom die-section, 80, and between the die-sections 50 and 51. Then he so moves the arm 77 as to pull downward the rods 70 and 71, and thus force the die-block 63 and its counterpart on the other side of the machine, together with the die-sections 50 and 51, toward each other, so as to clasp the blank between them, and to hold its center exactly opposite to the point of the punch 39. The operative then presses down the treadle 12, and thus raises the slide 9 and its extremity 10 away from contact with the arm 5 of the key 3, and thereby starts the shaft 2 on a revolution in the direction of the arrow shown in Fig. 9. That revolution first moves the pitman 25 without moving the gate 31 until the forward side of the head 36 strikes the adjacent surface of that gate. During that motion the pitman 40 is driven forward by its crank, so as to carry the faces 55 of the pitman-section 48 behind the die-block 63, and the corresponding parts on the other side of the machine operate correspondingly. Thereupon the further revolution of the shaft forces the gate 31 forward with the pitman 25, and thereby carries the point of the punch to the edge of the blank, and then punctures an eye half-way through the same. During this motion the pitman 40 moves forward far enough to carry the forward end of the link 57 into the concave recess 64, and the corresponding parts on



the other side of the machine again operate correspondingly. Thereupon the further revolution of the shaft withdraws the pitman 25 and the head 36 without withdrawing the gate 31 and the punch 39, and while the head 36 is moving through its open space in the gate 31, and while the punch therefore remains in the blank, the last-mentioned further revolution of the shaft carries the pitman 40, the link 57, the die-block 63, and the die-section 50 forward with great power, and correspondingly carries the corresponding parts on the other side of the machine, and thus operates to squeeze the blank between the die-section 50 and 51. Thereupon the further and final part of the revolution of the shaft withdraws the punch from the blank and withdraws the forward end of the link 57 from the concave recess 64, and correspondingly withdraws the corresponding parts on the other side of the machine. At the end of the revolution of the shaft the projection 10 of the slide 9 collides with the arm 5 of the key 3 and drives the key into the position shown in Fig. 9, thus releasing the shaft 2 from the power of the pulley 1. The momentum of the moving parts of the machine, which might otherwise still make the shaft revolve, is thereupon restrained by the brake 81 and the brake-shoe 83, and the machine is thus brought to a full stop. Then the operative moves the arm 77, so as to raise the rods 70 and 71, and thus opens the die-sections 50 and 51 to make the machine ready for a repetition of the described operation.

I claim as my invention—

1. The combination of the pitman 48, provided with a surface, 55, parallel to the direction of its stroke, and with a surface, 56, inclined to the direction of its stroke, the link 57, pivoted to the pitman opposite to that parallel surface, and the block 63, adapted to slide substantially at right angles to the stroke of the pitman and during one such stroke to be first caused by that inclined surface thus to slide, and then to be held sta-

tionary by that parallel surface, and then to be forced by that link to slide still farther, all substantially as described.

2. The combination of the shaft 2, the pitman 25, provided with the head 36, and the gate 31, and the pitman 40, provided with the link 57 and the die-block 63, all constructed and combined substantially as described.

3. The combination of a pulley mounted on a shaft with a bushing between them, and with an elastic cushion between the pulley and the bushing, and a rotating eccentric key between the bushing and the shaft, a shaft carrying the pulley and intermittently revolved thereby, and three pitmen harmoniously worked by cranks on the shaft, all constructed and combined so that the pulley turns freely on the shaft when the key is in one position, and that turning the key into another position locks the shaft to the bushing and transmits the motion of the pulley to the shaft and thence to the pitmen, and that the cushion eases the otherwise sudden shock of the beginning of that transmission, all substantially as described.

4. The combination of the shaft 2, provided with cranks, substantially as described, the pitmen 25, 40, and 41, worked by those cranks, the disk 81, keyed to that shaft and provided with the eccentric surface 82, and the shoe 83, fixed adjacent to that surface, all constructed and combined so that the shoe will tend to stop each revolution of the disk and shaft and each reciprocation of the pitmen, all substantially as described.

5. The combination of the shaft 76, worked by the arm 77 and having the arms 74 and 75, with the cam-rods 70 and 71, reciprocating two opposite die-blocks simultaneously in opposite directions, all substantially as described.

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Witnesses:

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JOHN H. KIRKHAM.