

(No Model.)

2 Sheets—Sheet 1.

E. L. SHARPNECK.
ROCK DRILL.

No. 495,275.

Patented Apr. 11, 1893.

FIG. 2

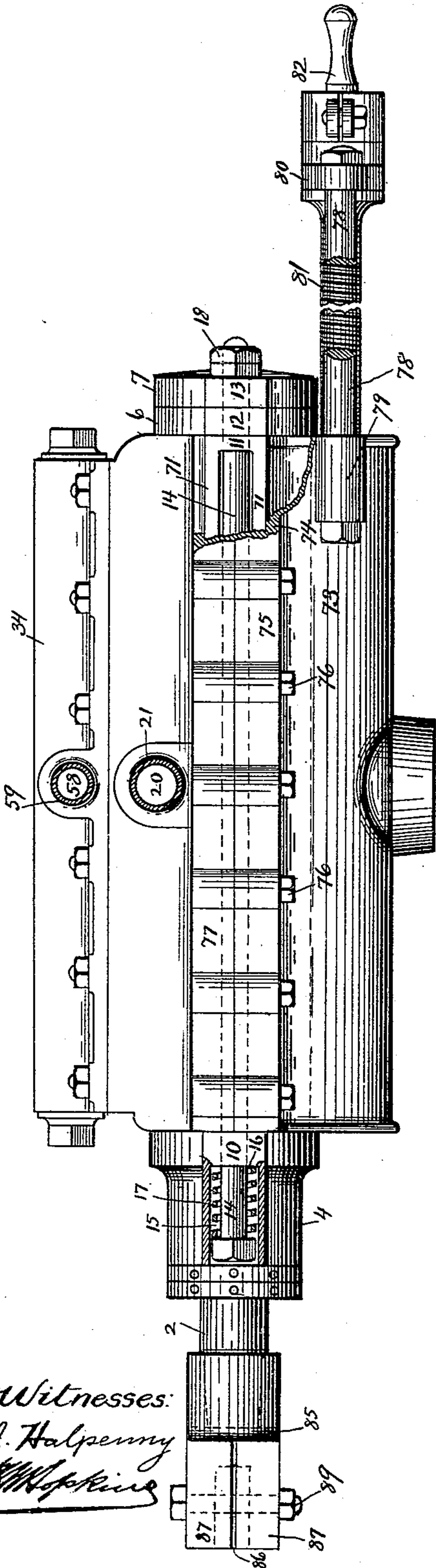
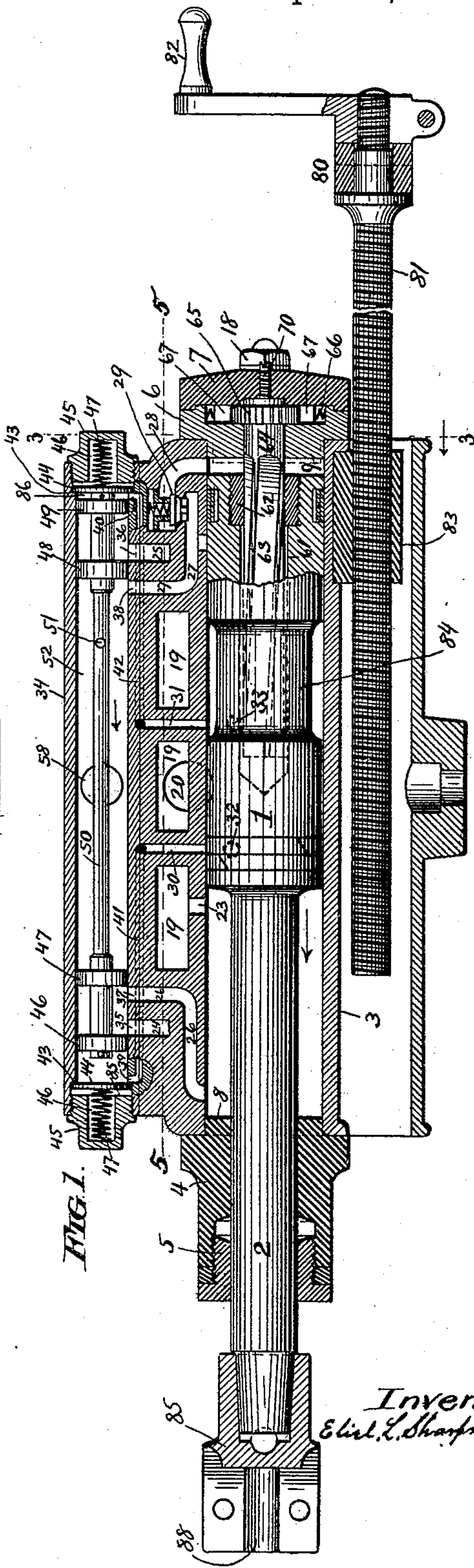


FIG. 1



Witnesses:
J. Halpenny
J. M. McKing

Inventor:
E. L. Sharpneck

(No Model.)

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FIG. 7.

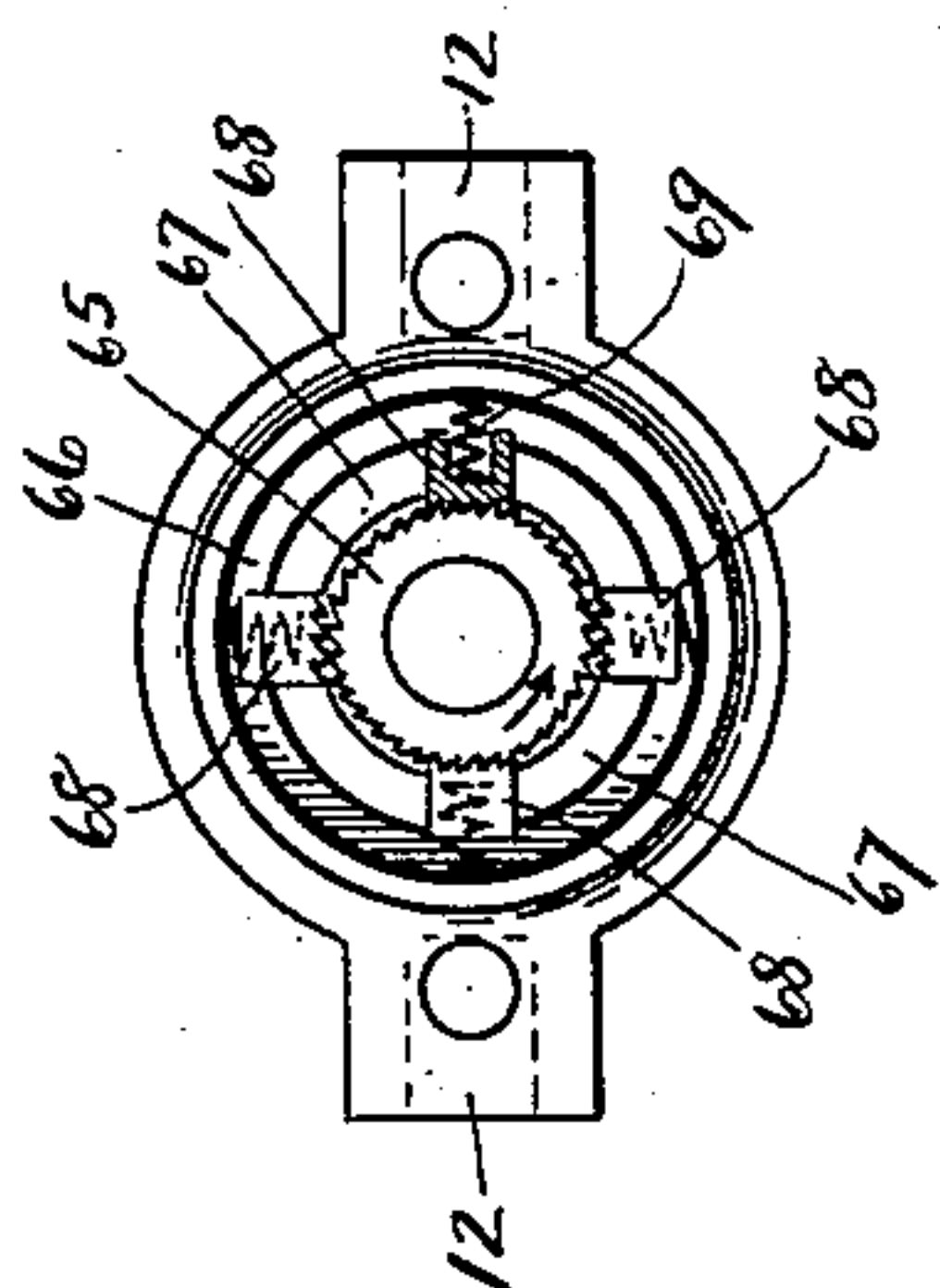


FIG. 8.

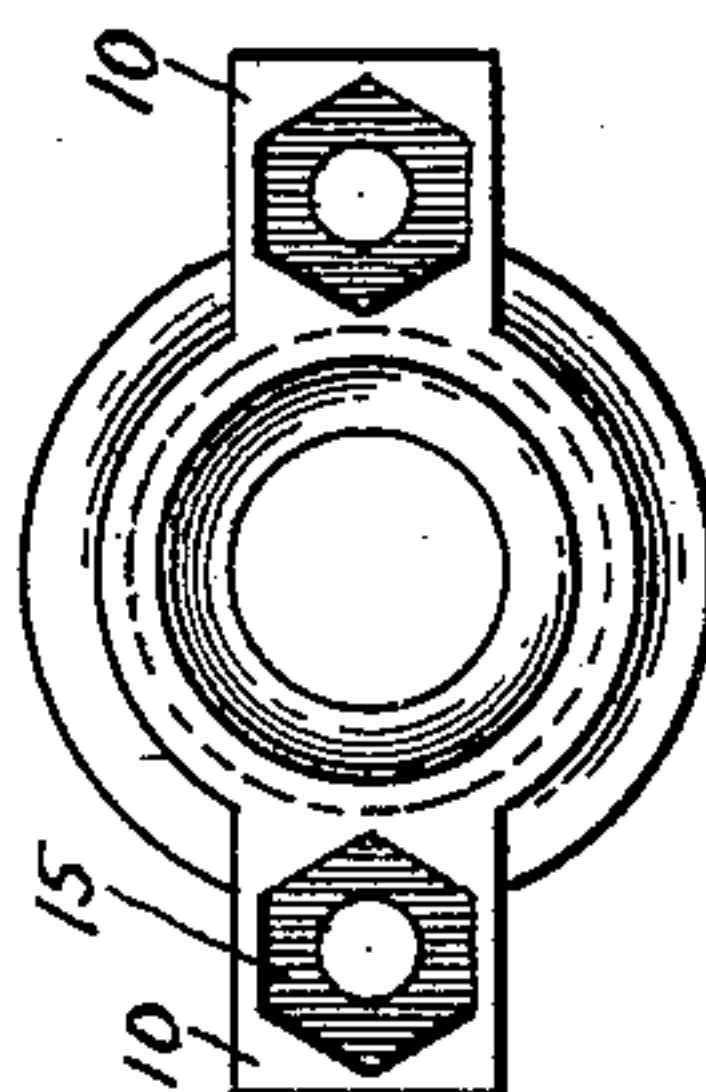


FIG. 4.

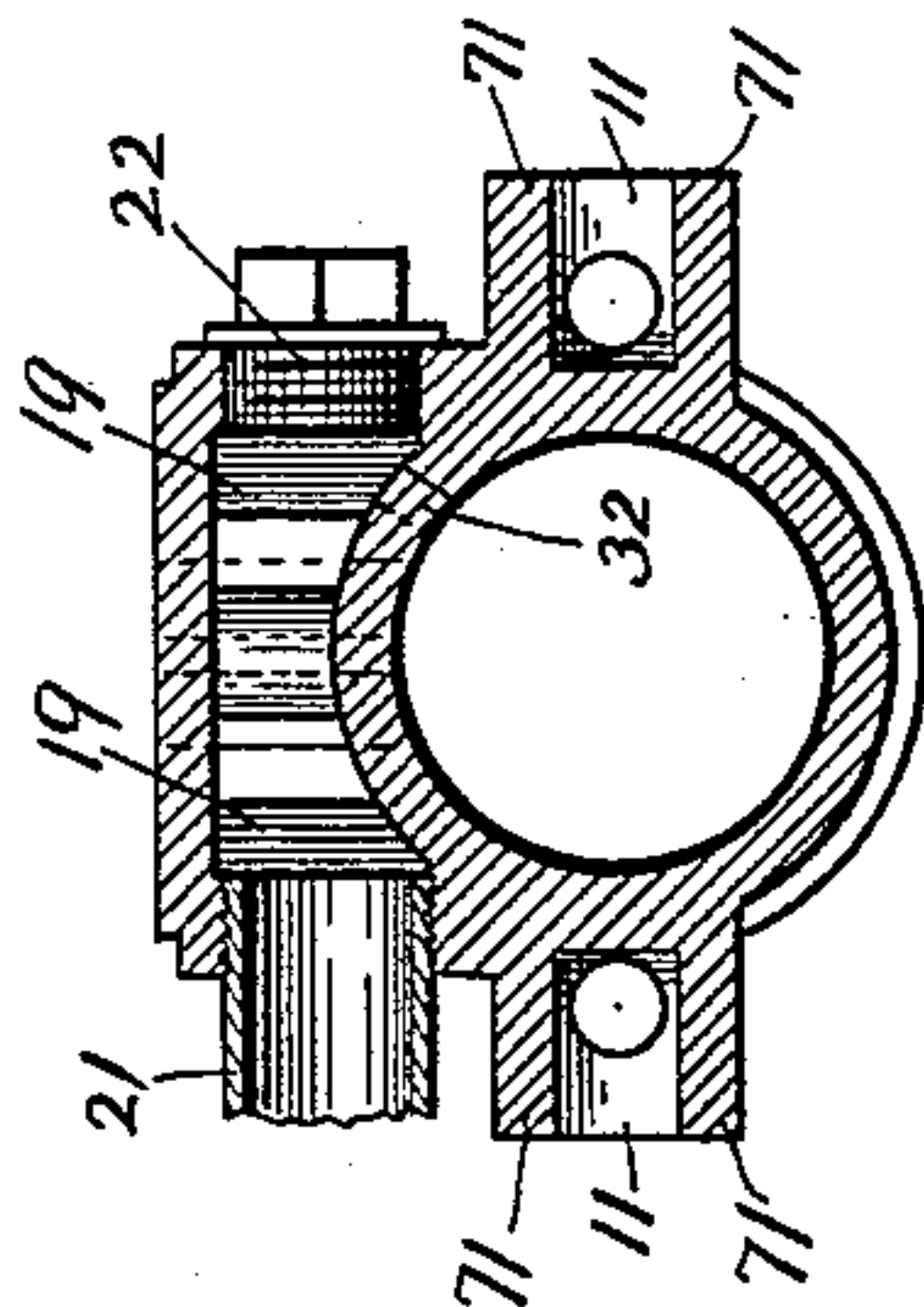


FIG. 5.

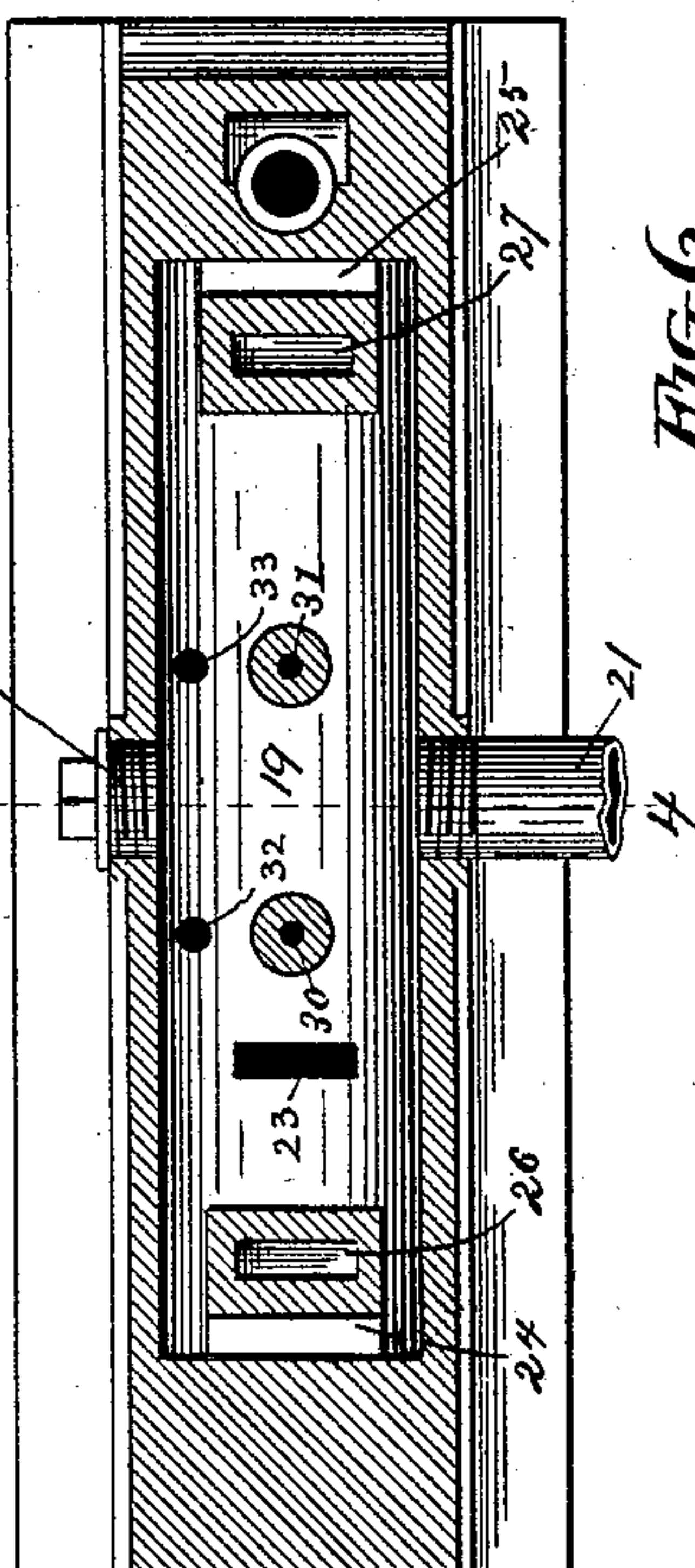


FIG. 6.

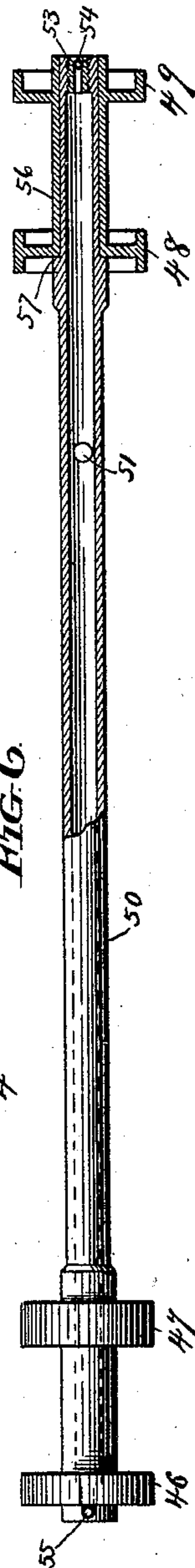
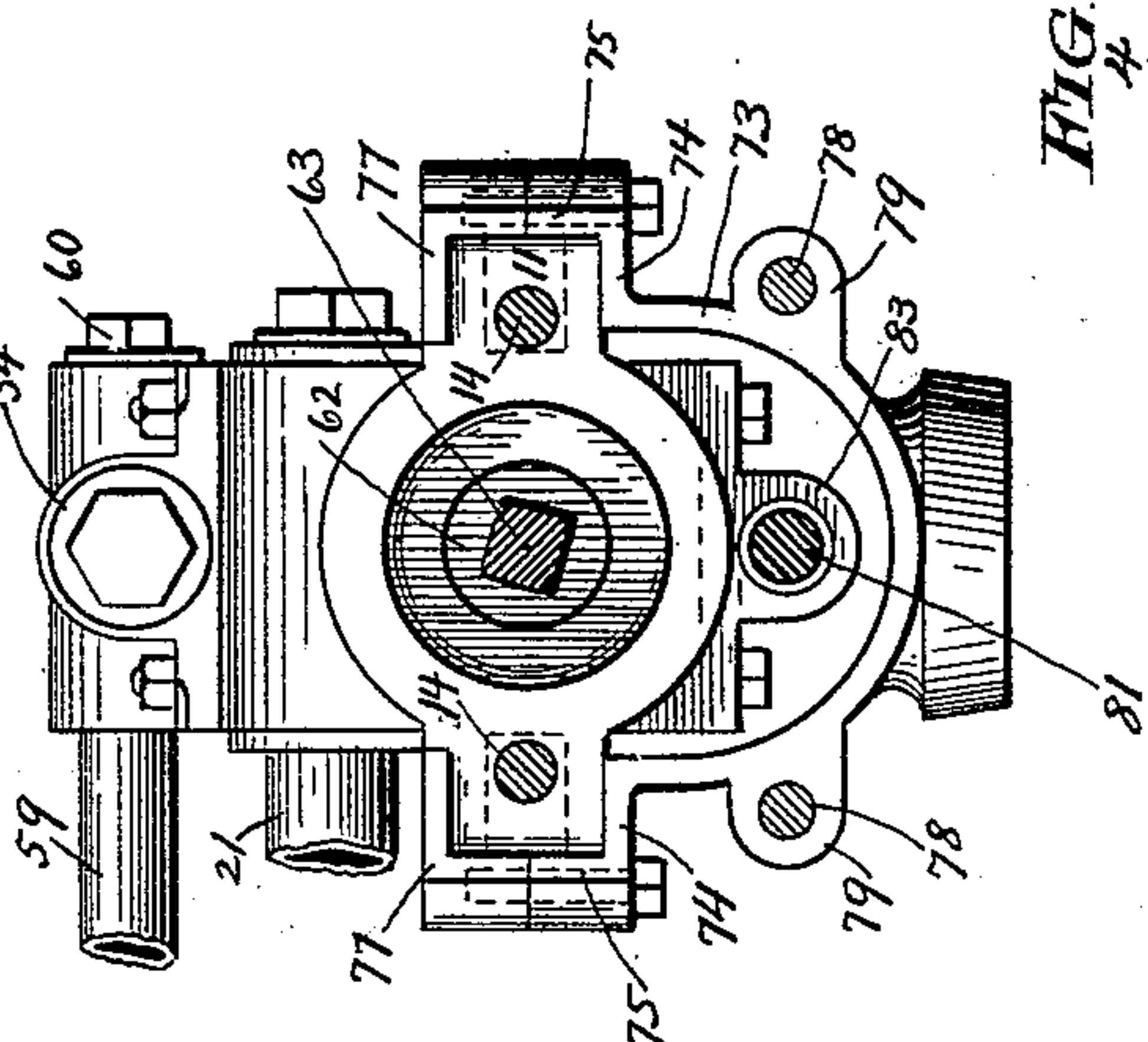


FIG. 3.



Witnesses:
J. Halpenny
J. Hopkin

Inventor:
Eli L. Sharpneck

UNITED STATES PATENT OFFICE.

ELIEL. L. SHARPNECK, OF EVANSTON, ILLINOIS.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 495,275, dated April 11, 1893.

Application filed February 6, 1893. Serial No. 461,080. (No model.)

To all whom it may concern:

Be it known that I, ELIEL. L. SHARPNECK, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Rock-Drills, of which the following is a specification, reference being had to the accompanying drawings, which are made a part hereof, and in which—

Figure 1 is a vertical, longitudinal section of a rock drill embodying the invention. Fig. 2 is a side elevation thereof. Fig. 3 is an elevation of the rear end thereof, with the rear head of the cylinder removed, and with certain of the parts in transverse section on line 3—3. Fig. 4 is a transverse section of the cylinder casting on the line 4—4. Fig. 5. Fig. 5 is a horizontal section of the said casting on line 5—5. Fig. 6 is a view of the valve, partly in section and partly in elevation. Fig. 7 is an elevation of the rear cylinder head with the outer cap removed. Fig. 8 is an end elevation of the front cylinder head.

The present invention consists in certain features of novelty that are particularly pointed out in claims hereinafter.

In the drawings 1 represents the piston, 2 the piston rod, 3 the cylinder in which the piston fits, 4 the forward cylinder head, which is perforated for passage of piston rod, and provided with a stuffing box 5.

6 is the rear cylinder head, and 7 a cap which is secured over said head, for a purpose that will appear hereinafter. The cylinder heads have projections 8 and 9 respectively, which extend a short distance into the cylinder and fit it snugly. Upon each side of the head 4 is a projection 10, upon each side of the cylinder are two projections 11, one at each end of the cylinder. Upon each side of the head 6 is a projection 12, and upon each side of the cap 7 is a projection 13. The projections on each of these parts are diametrically opposite each other, and all of said projections are of the same width, so that when the parts are in place, as shown in the drawings, they form a rib or wing extending in the direction of the length of the cylinder. All of the projections are similarly perforated for the passage of long bolts 14, and the projections 10 are counter bored as at 15, in order

to form shoulders 16, between which and the heads of the bolts are placed coiled springs 17. The counter bored portions 15 are of the non-circular shape, the object being to prevent the bolts from turning. Upon the ends of the bolts are secured nuts 18, which bear against lugs 13 of the cap plate 6, and hold said plate and the cylinder heads in place.

The top side of the cylinder casting is extended upward, and is dressed off flat, as shown in Fig. 4. This upward extension is also cored out, so as to form a chamber 19, from the sides of which open two ports 20, into one of which is screwed the exhaust pipe 21, the other being closed by a screw plug 22. This arrangement enables the exhaust to be led off from which ever side of the machine is more convenient.

23 is a port which places the interior of the cylinder and the chamber 19 in direct communication with each other.

24 and 25 are ports which open at the top side of the cylinder extension, and communicate with chamber 19.

26 and 27 are ports which open at the top side of the cylinder extension, and communicate with the interior of the cylinder near its opposite ends.

28 is a port which communicates at one end with the rear end of the cylinder, and at the other end with the port 27, communication between them being controlled by a spring seated valve 29, which is so arranged that the pressure within the port 27, acting upon the under side of the valve, can raise it, so that the steam or air may pass from port 27 into port 28, while the pressure within the port 28 tends only to hold the valve seated. With this arrangement, it will be seen, as soon as the piston has covered the port 27, the escape of steam or air is prevented, and the steam or air then remaining within the cylinder acts as a cushion for preventing the piston from coming in contact with the rear cylinder head. On the other hand, when the valve is conditioned to admit live steam to the port 27 it will raise the valve 29 and pass into the cylinder through port 28.

30 and 31 are ports which open at the top side of the cylinder extension, and communicate with the interior of the cylinder.

32 and 33 are ports which place the cylinder in direct communication with the chamber 19.

34 is the valve casing, one side of which is flat, said casing being secured onto the top side of the cylinder extension, so that ports 35, 36, 37 and 38 formed through the under side of said casing will register with the ports 24, 25, 26 and 27 respectively.

39 and 40 are ports formed through the under side of casing 34, and connected with ports 30 and 31 by means of the ports 41 and 42, which are shown only in dotted lines, and are formed partly in the top side of the cylinder extension and partly in the under side of the valve casing. The valve casing is counter bored at each end to form a shoulder 43, against which fits a disk 44, and is closed by a screw cap 45, formed with a socket 46, in which fits a spring 47 that bears against the disk 44 and holds it in place. The valve consists of four disks, 46, 47, 48 and 49, which fit the interior of the valve casing snugly and are connected by means of a hollow stem 50, which is provided, between the disks 47 and 48, with an opening 51, which places its interior in communication with the live steam space 52 of the casing. The extremities of this stem are closed by screw caps 53, which are provided with openings 54 and 55, the latter of which is made of larger diameter than the former, for a purpose that will appear hereinafter. Preferably this valve is constructed as shown in Fig. 6, the disks being formed integrally with a sleeve 56, which is slipped onto the stem and is held against longitudinal displacement by means of a shoulder 57. The valve casing is provided in its opposite sides with openings 58, into one of which is screwed the live steam pipe 59, the other being closed by a screw plug 60. The rear end of the piston is provided with a central bore 61, which is counter bored at its outer end and screw-threaded for receiving a nut 62, having a square opening.

63 is a spindle, which is planed off so as to be, for the greater part of its length, of substantially square cross section, and its planed surfaces follow a spiral course, so that it constitutes in effect a screw having a very steep pitch. The outer cylindrical end of this spindle passes through a perforation formed through the head 6, and to it is screwed a ratchet wheel 65, which fits in a recess formed in the outer surface of the head.

66 is an annular groove formed in the outer surface of the head, and resulting in an annular flange or rib 67. This flange or rib is provided with any desired number of radial slots, in which fit blocks 68, which are provided on their inner ends with teeth corresponding to the teeth of the ratchet wheel 65. The rear sides of these blocks are provided with sockets, in which fit coiled springs 69 that bear against the outer wall of the annular groove 66 and tend to force the blocks into engagement with the ratchet wheel. These

blocks are so located with relation to each other, and to the ratchet wheel, that when the teeth of one of them are fully engaged with the teeth of the ratchet wheel, the teeth of another of them will be out of engagement, as shown in Fig. 7. The cap plate 7 is provided for the purpose of concealing this pawl and ratchet mechanism, and is provided with a central opening for convenience in oiling said mechanism, said opening being closed by a screw plug 70.

Upon each side of the cylinder are two parallel flanges 71, which are located upon opposite sides of the bolt 14, and form a continuation of the rib formed by projections hereinbefore described. This rib is for the purpose of supporting the cylinder and permitting it to be moved longitudinally with relation to the base of the machine. This base is shown at 73, and is intended to be supported by a tripod or other suitable device that is not shown in the drawings. It is of substantially semi-cylindrical shape, in cross section, and has upon opposite sides horizontal flanges 74, upon which the flanges 71 rest, and vertical flanges 75, which project upward past the two lower flanges 71, and are perforated for the passage of bolts 76, which are tapped into angle irons 77, the horizontal flanges of which project over the upper flanges 71.

78 are two rods, the forward ends of which are secured in perforated bosses 79, which are casts on the base 73. To the rear ends of these rods is secured a cross head 80, in which is swiveled the feed screw 81, which is provided with a crank 82 for turning it and passes through a nut 83, secured to the under side of the cylinder.

Assuming the parts to be in positions shown by Fig. 1, the operation of the machine is as follows:—Live steam passes from the steam space 52 of the valve casing, through the ports 38 and 27 and lifts the valve 29, and passes through port 28 into the rear end of the cylinder. This causes the piston to move forward, or in the direction of the arrow. As soon as the piston reaches such a position that the ports 30 and 32 are uncovered, which they will be when the reduced portion 84 of piston comes opposite them, steam will escape from the space 85, through ports 39, 41, 30 and 32. This will relieve the steam pressure upon the lower side of the valve disk 46, and by reason of the excess of pressure in space 86, between the disk 49 and the end of the casing, the valve will be moved in the direction of the arrow. In doing so the disks 47 and 48 will pass the ports 37 and 38 respectively, thereby placing the forward end of the cylinder in communication with the steam space 52, through the ports 26 and 37, and at the same time placing the rear end of the cylinder in communication with the exhaust, through ports 27, 38, 36 and 25. Steam will then enter the forward end of the cylinder, and in like manner produce the stroke in the opposite direction. Similarly, when the

ports 30 and 32 are covered, and ports 31 and 33 are uncovered, steam will escape from space 86 through ports 40, 42, 31 and 33, and the excess of pressure in space 85 will return the valve to the position shown in the drawings. The opening 55 is larger than opening 54, and the object of this is to produce a quicker movement of the valve in one direction than in the other, in order that the piston may have time to complete its forward stroke before the valve is shifted and steam is admitted to the forward end of the cylinder. The rotation of the drill is produced by spindle 63 and the pawl and ratchet mechanism already described. As the piston moves forward it causes the spindle 63 to move in the direction of the arrow in Fig. 7, the teeth of the pawls and ratchet being presented in such direction as to permit of this movement, while preventing a movement in the opposite direction. It follows, therefore, that since the spindle cannot rotate upon the return stroke of the piston, the nut necessarily follows the spiral course of the planed surfaces of the spindle, and thereby produces a partial rotation of the piston and its connections.

The drill-chuck is secured to the forward end of the piston rod and consists of a block 86 of steel, which is split as shown at 87 to form a pair of jaws 88, 88, in the opposing surfaces of which the socket of the drill is formed. These jaws are perforated for the passage of bolts 89, by which the jaws may be forced together with the force necessary for securely holding the drill in place.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. The combination with the cylinder, the piston, the valve-casing and the valve, of ports of different capacities for admitting steam to the valve-casing upon opposite sides of the valve, ports communicating with the valve-casing upon opposite sides of the valve and with the cylinder, and exhaust ports opening from the cylinder, the piston being provided with a depression adapted to place in communication with exhaust first one and then the other of the ports that connect the valve-casing and cylinder, substantially as and for the purpose set forth.

2. The combination of the cylinder, the piston, the valve-casing, the valve consisting of disks 46, 47, 48, 49 and hollow stem 50, said stem having opening 51 communicating with live steam space 52, between disks 47 and 48 and openings 54 and 55 communicating with the spaces 85 and 86 upon opposite sides of the valve, ports 39 and 40 opening into said spaces 85 and 86, ports 30 and 31 opening into the cylinder and communicating with ports 39 and 40, and the exhaust ports 32 and 33 opening from the cylinder, the piston having the reduced portion 84, substantially as and for the purpose set forth.

3. The combination with the valve-casing of the hollow stem 50 open at its extremities

and having the centrally arranged lateral opening 51 communicating with the steam space of the casing, the valve disks 46, 47, 48 and 49 secured to it in pairs said pairs being located respectively on opposite sides of said lateral opening, the cylinder, the piston, and suitable ports connecting the valve-casing and cylinder and controlled by the valve, substantially as set forth.

4. The combination with the casing of the hollow stem 50 having the lateral opening 51 and the openings 54 and 55 of different capacities, valve disks 46, 47, 48, and 49 secured to the stem and adapted to control ports 35, 36, 37 and 38, ports communicating with the valve-casing upon opposite sides of the disks 46 and 49 and communicating with the cylinder, and the piston adapted to control these last named ports, substantially as set forth.

5. The combination with the casing of the hollow stem 50 having the lateral opening 51, caps 53 screwed into the ends of the stem and having openings 54 and 55, and the disks 46, 47, 48 and 49 formed with sleeves 56, one of said sleeves being slipped onto each end of the stem, substantially as set forth.

6. The combination with the cylinder having the perforated head 6 provided on its exterior with the annular groove 66 and the annular flange 67 having a number of radial slots, pawls 68 fitting in said slots, springs 69 engaging said pawls and the outer wall of the groove 66, the ratchet wheels 65 engaged by the pawls, the spindle 63 secured to the ratchet wheel and passing through the cylinder head, said spindle having a spiral portion, the nut 62 fitting said spiral portion, and the piston to which the nut is secured having the socket 61 in which the spindle fits, substantially as set forth.

7. The combination with the cylinder having the perforated head 6 and the piston, the spindle having a spiral portion engaging the piston and the cylindrical portion passing through the perforation of the head, pawl and ratchet mechanism located upon the outside of the head and adapted to permit the spindle to turn in one direction and prevent it from turning in the other direction, and the cap plate 7 secured to the head 6 and having the inwardly extending flange 67 slotted for the reception of the pawls, with means for holding the cap in place, substantially as set forth.

8. The combination with the cylinder, the head 4 having perforated projections on its sides, bolts passed through said projections and suitably anchored, and coiled springs interposed between the heads of the bolts and the projections, said projections being counter bored to form sockets inclosing the heads of the bolts and springs, substantially as set forth.

9. The combination of the cylinder having the perforated projections 11, the cylinder head 4 having the perforated projections 10, the cylinder head 6 having the perforated pro-

jections 12, all said projections being arranged in line, one set on each side of the cylinder the bolts 14 passed through said projections, and the coiled springs 17 interposed between
5 the heads of the bolts and the projections of the cylinder head, on each side of the cylinder substantially as set forth.

10 10. The combination with the cylinder having upon each side two parallel flanges 71 and having the perforated projections 11, of the cylinder head 4 having the perforated projections 10, the cylinder head 6 having the perforated projections 12, the bolts 14 passing through said projections and between the
15 flanges 71, springs interposed between the heads of the bolts and one of the cylinder heads, and the base 73 having guideways in which the flanges 71 fit and are adapted to slide, substantially as set forth.

20 11. In a rock drill such as described, the combination with the piston, cylinder and heads therefor having oppositely arranged projections thereon, the projections on one head being elongated and counter bored with
25 an irregular shaped opening, of the rods passing through said projections and having their

heads confined in the irregular shaped openings, whereby the rods are held against turning and the springs interposed between the heads of the rods and bottoms of the openings; substantially as described. 30

12. In a rock drill, the combination with the cylinder, the valve chest, the valve working therein having passages leading from the live steam chamber to opposite ends of the
35 same, passages leading from opposite ends of said valve chest and opening into the cylinder at points widely separated said passages not being crossed, and exhaust passages opening into the cylinder in approximately the
40 same transverse planes as the valve passages, of the piston reciprocating in the cylinder and having a reduced central portion approximately of a length corresponding to the distance between the passages, said piston having
45 a stroke of approximately three times the length of the reduced portion, as shown and described.

ELIEL. L. SHARPNECK.

Witnesses:

L. M. HOPKINS,
A. S. MEGUIRE.