

C. T. McCORMICK.
ROCK DRILL.

APPLICATION FILED APR. 11, 1904.

2 SHEETS—SHEET 1.

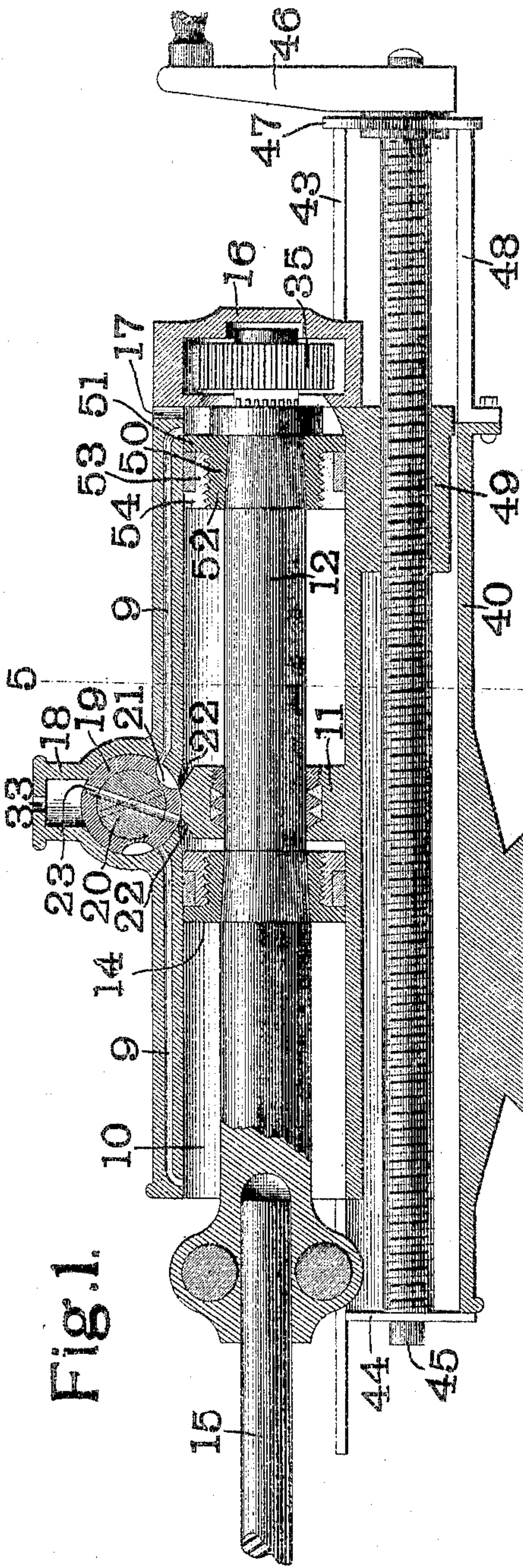


Fig. 1.

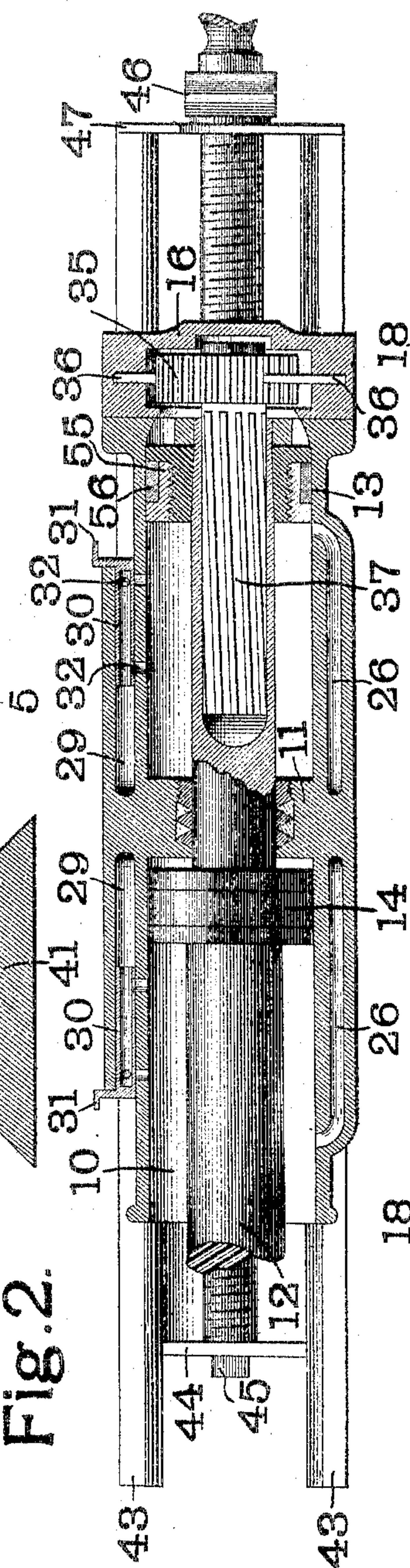


Fig. 2.

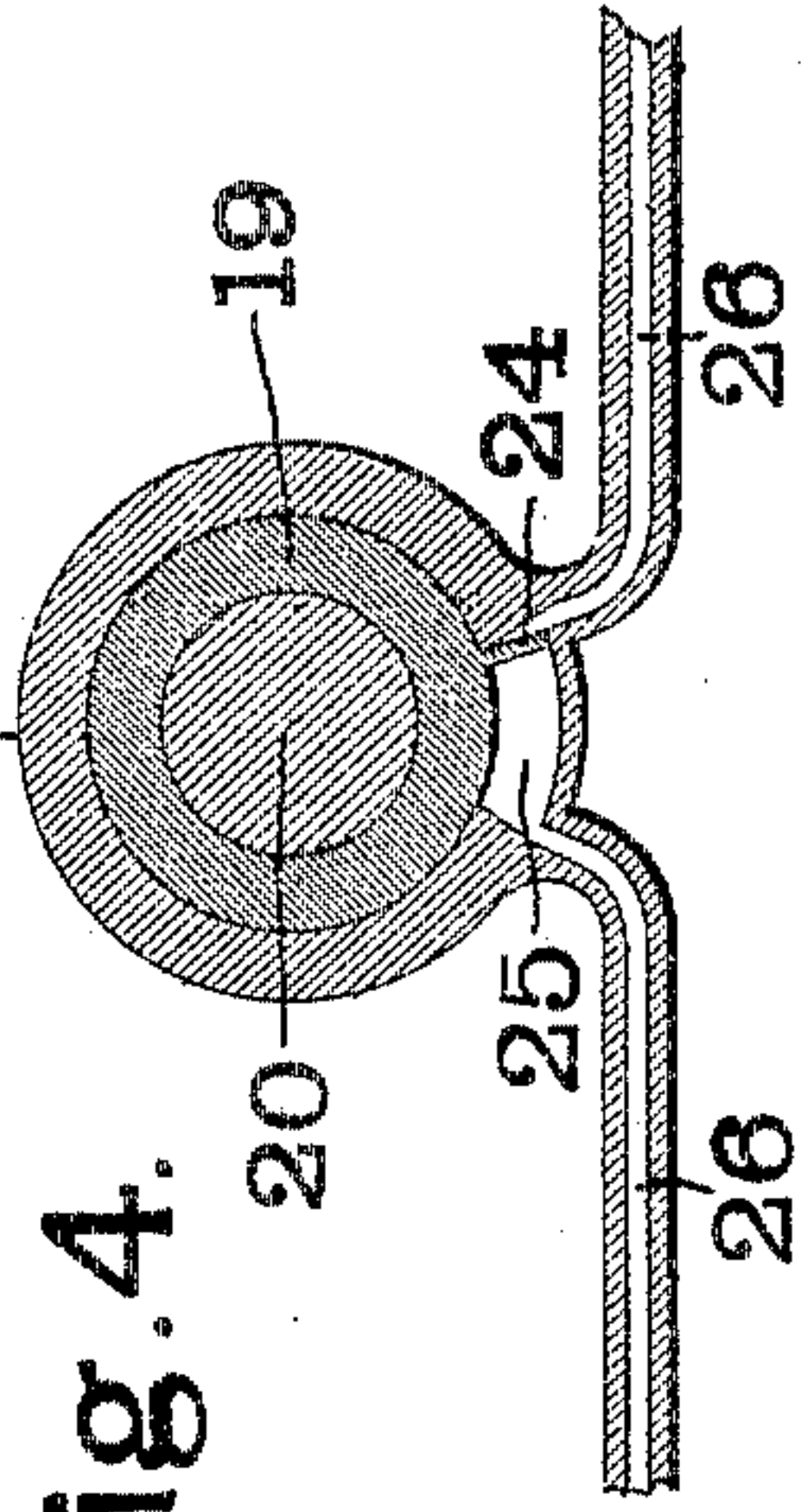


Fig. 3.

Fig. 4.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 5.

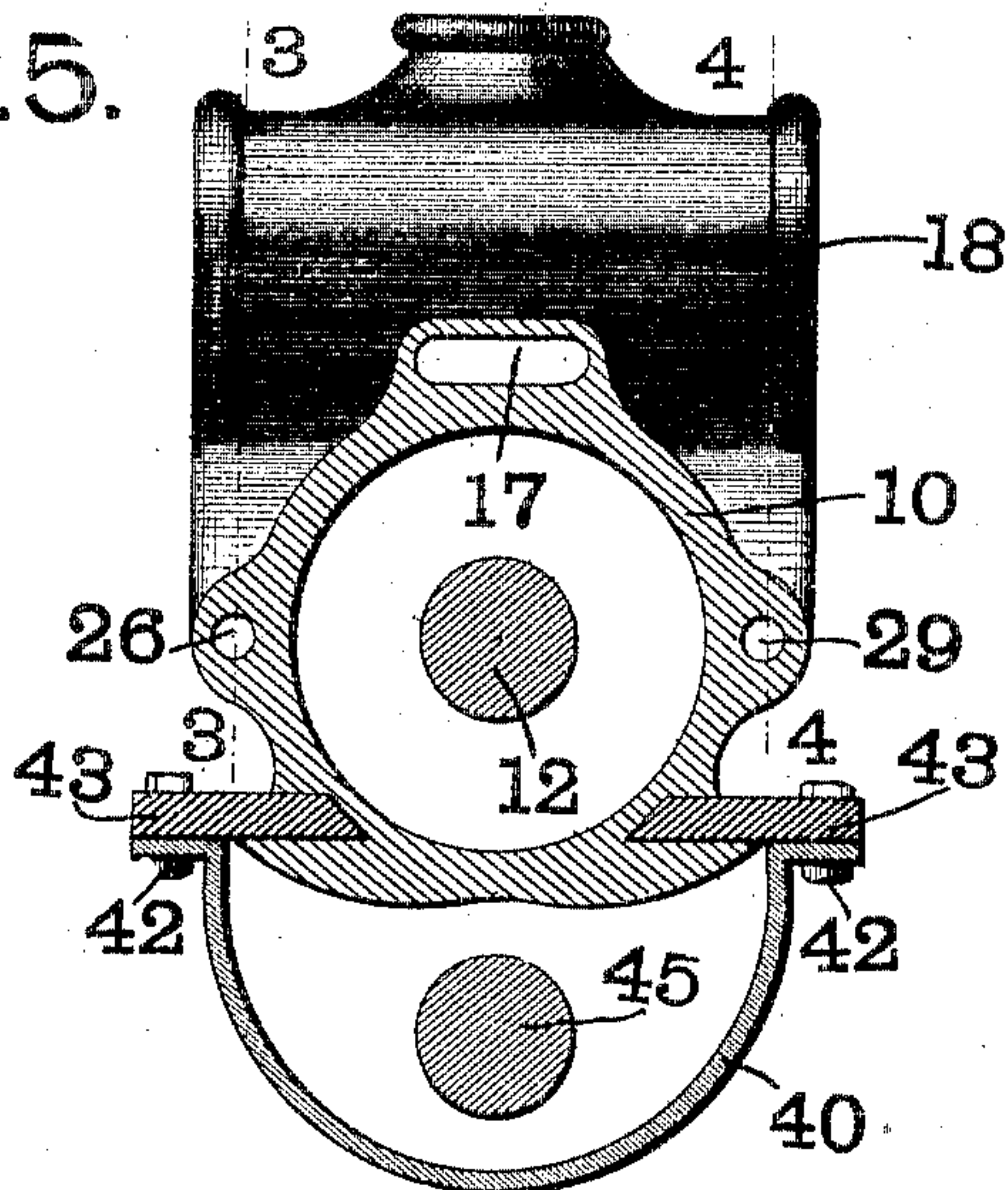
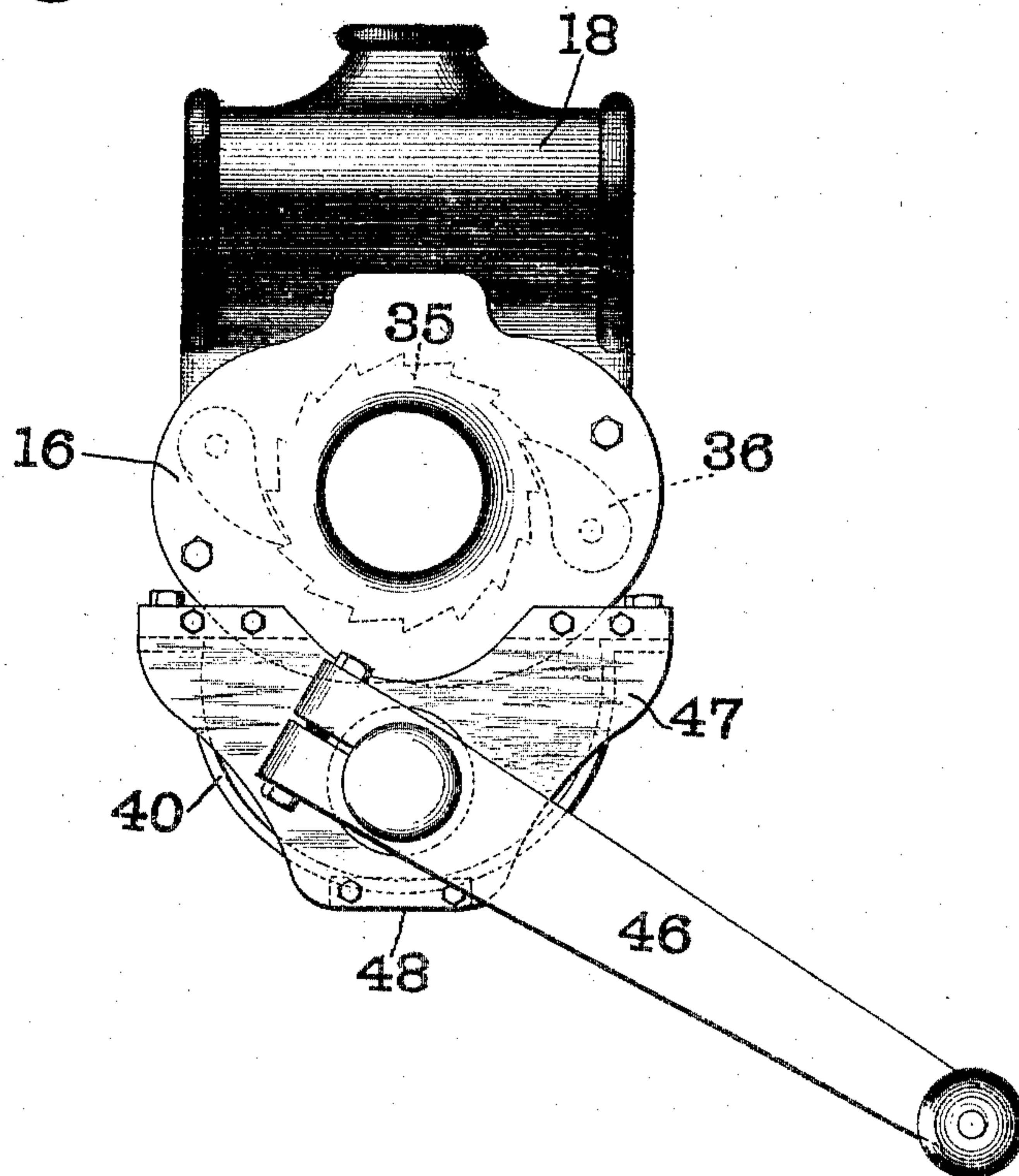


Fig. 6.



Witnesses

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UNITED STATES PATENT OFFICE.

CYRUS T. McCORMICK, OF FREDERICKTOWN, MISSOURI.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 784,173, dated March 7, 1905.

Application filed April 11, 1904. Serial No. 202,578.

To all whom it may concern:

Be it known that I, CYRUS T. McCORMICK, a citizen of the United States, residing at the city of Fredericktown, county of Madison, in the State of Missouri, have invented a certain new and useful Rock-Drill, of which the following is such a full, clear, and exact description as will enable any one skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to rock-drills, and more particularly to that class of drills in which reciprocating motion is imparted to the tool by a piston or pistons driven by compressed air, steam, or other suitable motive fluid.

My invention consists in part in the combination with a cylinder provided with a piston and having an open end at one side of said piston, of means for exhausting motive fluid from the other side of said piston and discharging it into the side of said cylinder having the open end.

My invention also consists in part in the combination with a cylinder, of a piston in said cylinder, a valve composed of two parts, an exhaust-port in one of said parts, a supply-port extending through both of said parts, a by-pass for actuating one of said parts, a plurality of openings to said by-pass, and a second by-pass for operating the other of said parts.

My invention also consists of certain other novel features and details of construction, all of which are described in the following specification and pointed out in the claims affixed thereto.

In the accompanying drawings, which illustrate one form of drill made in accordance with my invention, Figure 1 is a longitudinal central section. Fig. 2 is a section at right angles to Fig. 1. Figs. 3 and 4 are sections on the lines 3-3 and 4-4, respectively, of Fig. 5. Fig. 5 is an enlarged section on the line 5-5 of Fig. 1, and Fig. 6 is an enlarged end view.

Like marks of reference refer to similar parts in the several views of the drawings.

10 is the cylinder or casing of the drill. This cylinder is divided by a partition 11 into two

substantially equal parts. Passing through the partition 11 is a piston-rod 12, bearing an upper piston 13 and lower piston 14. The lower end of the piston-rod 12 is arranged to receive and secure a drill 15. The cylinder 10 is open both at the top and bottom end, the bottom end being completely open, while the top end is partly closed by means of a cap 16 for the ratchet mechanism, hereinafter to be described. An opening 17 for the passage of air is left, however, so that the cylinder is substantially open at both ends. In order to prevent particles of dust and other foreign matter from being drawn into the open ends of the cylinder by the movement of the pistons therein, I provide discharge-ports 9, which discharge the exhaust motive fluid into the open ends of the cylinders. The inner ends of the discharge-ports 9 communicate with a valve-casing 18, extending across the cylinder 10. Within this valve-casing 18 is a cylindrical valve composed of an outer part 19 and inner part 20. In the outer part 19 are formed two exhaust-ports 21, which are adapted to place the inner ends of the exhaust-port 9 in communication with the ports 22, leading to the cylinder. Passing through both parts 19 and 20 is a supply-port 23.

In order to independently operate the parts 19 and 20 of the valve, I provide the part 19 at one end with a wing 24, moving in a chamber 25, and leading from this chamber 25 to points near the ends of the cylinder are by-passes 26. I provide the part 20, at the opposite end of the valve, with a wing 27, working in a chamber 28, which chamber communicates with by-passes 29. In each of the by-passes 29 is a hollow cylindrical member 30, provided with a handle 31 or other means for rotating it. By moving this hollow cylindrical member 30 the by-pass 29 is placed in communication with the cylinder through one or the other of ports 32. The motive fluid is supplied to the valve mechanism through an inlet 33, Fig. 1.

Carried in the cap 16, hereinbefore referred to, is a ratchet-wheel 35, cooperating with pawls 36, which allow the said wheel to move partly in one direction, but prevent its movement in the opposite direction. Extending downwardly from the ratchet-wheel 35 is a

spirally-ribbed stem 37, which enters the hollow upper end of the piston-rod, and thus causes the said rod to turn a slight distance upon each upward stroke, so as to prevent the edge of the drill from striking in the same plane in the various strokes.

40 is the supporting member, which is preferably semicylindrical in form and is provided with a projecting portion 41 for securing the drill in position. Secured to the supporting member by means of bolts 42 are a pair of guides 43. These guides 43 engage with suitable recesses in the cylinder 10. Carried by the lower end of the supporting member 40 and the guides 43 is a bearing 44, in which is journaled one end of a screw-threaded rod 45. The opposite end of this rod 45 is provided with a handle 46, and adjacent to the handle is a bearing 47, attached to the upper ends of the guides 43. This bearing 47 is also connected to the upper end of the supporting member 40 by means of a brace 48. The rod 45 passes through a threaded lug 49 on the cylinder or casing 10, and thus feeds the said cylinder or casing up or down by the movement of the handle 46.

In order to thoroughly pack the pistons 13 and 14, I construct them in the manner now to be described.

Each of the pistons consists of a main part 50, sliding over the piston-rod and provided with a shoulder 51 and a reduced threaded portion 52. Fitting over this reduced threaded portion 52 is an internally-threaded annular member 53, provided with a shoulder 54 and with a reduced portion 55. In this reduced portion 55 and between the shoulders 51 and 54 is a packing-ring 56. By this construction a very heavy packing-ring may be used, such as could not be sprung into position in the ordinary manner.

The operation of my drill is as follows: Supposing the parts to be in the position shown in Fig. 1, the motive fluid will be admitted from the supply-opening 33, through the port 23, into the lower end of the cylinder through the port 22, and the piston-rod will be driven downward. At the same time the air will pass out through the port 22 and the exhaust-port 21 in the outside part of the valve to the upper exhaust-port 9, whence the air will pass into the open upper end of the cylinder 10 and prevent suction in the said upper end of the cylinder. As soon as the piston-rod has traveled down a sufficient distance for the piston to uncover the port 32, leading into the by-pass 29, air will be admitted through said port and by-pass to the chamber 28 and acting upon the wing 27 will move the inner part 20 of the valve so as to bring the part of the port 23 passing through the said inner part of the valve into the position shown in dotted lines in Fig. 1. This will cut off the supply of fluid to the lower piston, but will leave the exhaust of the upper end of the piston

open, and the piston will continue its travel through the expansion of the motive fluid. As soon as the piston has reached the end of its travel it will uncover the end of the by-pass 26 and by the action of the fluid on the wing 24 will move the outside part of the valve so as to place the lower exhaust-port 9 in communication with the lower end of the cylinder and also bring the two parts of the port 23 into alinement to supply motive fluid to the upper end of the cylinder. The same operations are repeated on the upward stroke by the piston 13.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a drill or the like, the combination with a cylinder provided with a piston and having an open end at one side of said piston, of a piston-rod for and of less diameter than said piston projecting through the open end of said cylinder, and means for exhausting motive fluid from the other side of said piston and discharging it into the side of said cylinder having the open end.

2. In a drill or the like, the combination with a cylinder open at both ends and provided with a partition, of a piston-rod passing through said partition, a piston carried by said rod at each side of said partition, said piston-rod being of less diameter than said pistons and projecting beyond one of said pistons through one of the open ends of the cylinder, and means for exhausting the motive fluid from the spaces between said pistons and partition and discharging it into the open ends of said cylinder.

3. In a drill or the like, the combination with a cylinder provided with a piston and open at one side of said piston, of a piston-rod for and of less diameter than said piston projecting through the open end of the cylinder, a port opening into the closed side of said cylinder, a supply-port, an exhaust-port opening in the open side of said cylinder, and a valve for placing said first-named port alternately in communication with the supply and exhaust ports.

4. In a drill or the like, the combination with a cylinder open at both ends and provided with a partition, of a piston-rod passing through said partition, a piston carried at each side of said partition, said piston-rod being of less diameter than said pistons and projecting beyond one of said pistons through one of the open ends of the cylinder, a port leading into the closed end of each side of the cylinder, a supply-port, an exhaust-port leading from the closed end of each side of the cylinder to the open end thereof, and a valve for placing each of said first-named ports alternately in communication with the supply and the corresponding exhaust port.

5. In a drill or the like, the combination with a cylinder open at both ends and provided

with a partition, of a piston in said cylinder at each side of said partition, a valve composed of two parts one within the other and arranged adjacent to said partition, exhaust-ports in one of said parts communicating with the exhaust-passages terminating in the open ends of the cylinder, a supply-port extending through both of said parts, and means for independently moving the parts of said valve.

6. In a drill or the like, the combination with a cylinder provided with a partition, of a piston in said cylinder at each side of said partition, a rotary valve composed of two parts one within the other and arranged adjacent to said partition, exhaust-ports in one of said parts, a supply-port extending through both of said parts, and means for independently moving each of said parts.

7. In a drill or the like, the combination with a cylinder, of a piston in said cylinder, a valve composed of two parts, an exhaust-port in one of said parts, a supply-port extending through both of said parts, and by-passes controlled by said piston for independently operating the parts of said valve.

8. In a drill or the like, the combination with a cylinder, of a piston in said cylinder, a valve composed of two parts, an exhaust-port in one of said parts, a supply-port extending through both of said parts, a by-pass for actuating one of said parts, a plurality of openings to said by-pass, and a second by-pass for operating the other of said parts.

9. In a drill or the like, the combination with a cylinder provided with a partition, of a piston in said cylinder at each side of said partition, a single valve composed of two independently-movable but coöperative parts arranged adjacent to said partition, a pair of by-passes controlling the movement of one part of said valve, and a second pair of by-

passes controlling the movement of the other part of said valve.

10. In a drill or the like, the combination with a cylinder provided with a partition, of a piston in said cylinder at each side of said partition, a valve composed of two parts arranged adjacent to said partition, a pair of by-passes controlling the movement of one of said parts, means for varying the point of admission of motive fluid to said by-passes, and a second pair of by-passes controlling the other of said parts.

11. In a drill or the like, the combination with a cylinder provided with a partition, of a piston in said cylinder at each side of said partition, a valve composed of two parts arranged adjacent to said partition, a pair of by-passes controlling the movement of one of said parts, rotary members in said by-passes for varying the point of admission of motive fluid to said by-passes, and a second pair of by-passes controlling the movement of the other of said parts.

12. In a drill or the like, the combination with a cylinder provided with a partition, of a piston in said cylinder at each side of said partition, a rotary valve composed of two parts one within the other and arranged adjacent to said partition, a pair of exhaust-ports in the outer part of said valve, a supply-port extending through both parts of said valve, and by-passes for independently operating the parts of said valve.

In testimony whereof I have hereunto set my hand and affixed my seal in the presence of the two subscribing witnesses.

CYRUS T. McCORMICK. [L. s.]

Witnesses:

H. W. WARD,
L. E. TOLER.