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No. 811,791. PATENTED FEB. 6, 1906.

O. S. PROCTOR.

MEANS FOR OPERATING DRILLS.

APPLICATION FILED APR. 29, 1905.

2 SHEETS—SHEET 1.

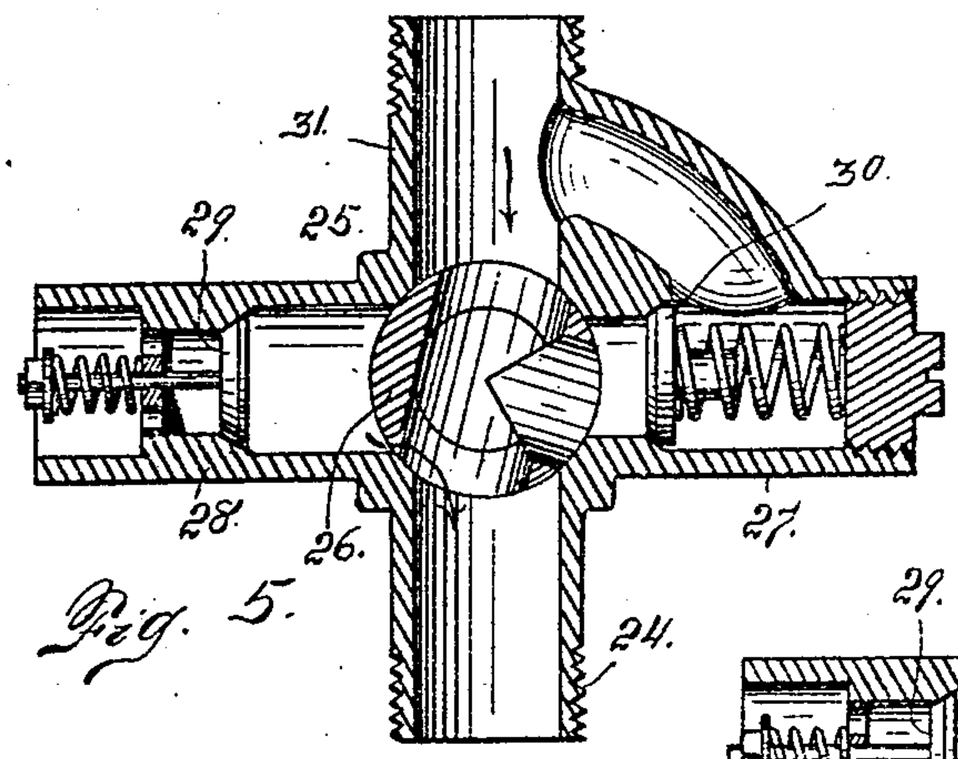

Fig. 5.

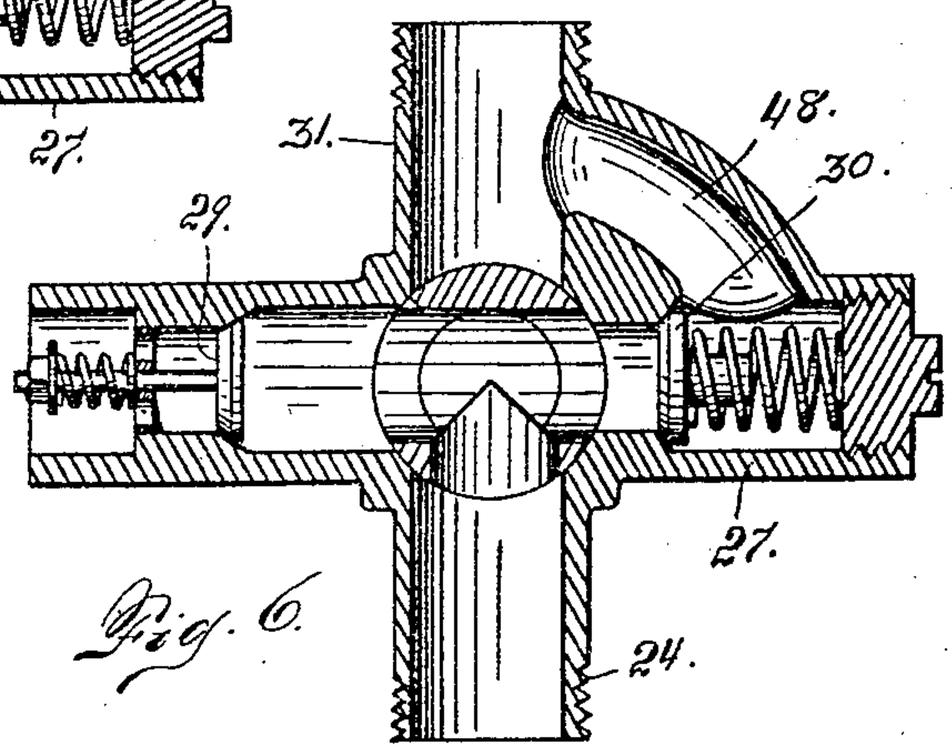

Fig. 6.

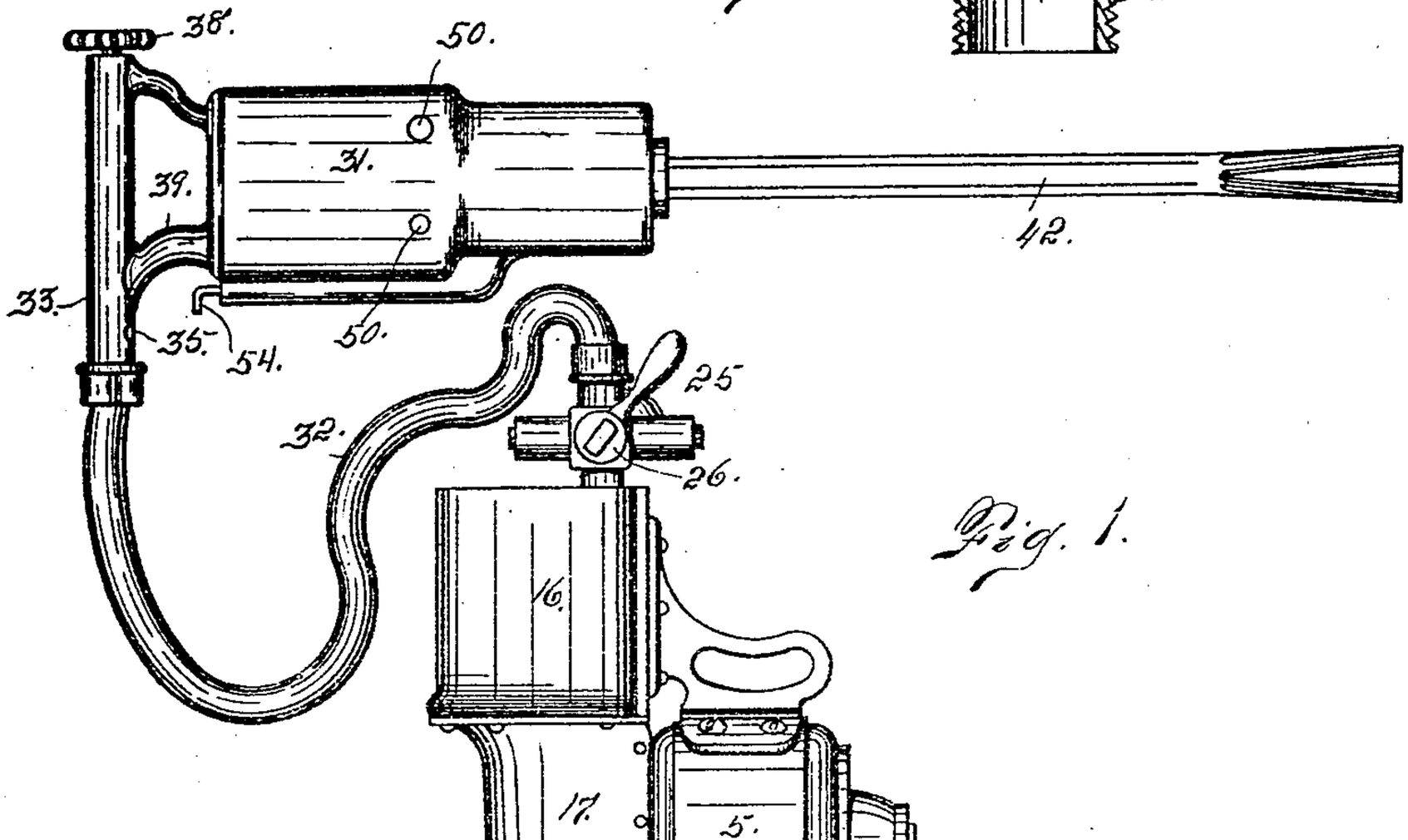

Fig. 1.

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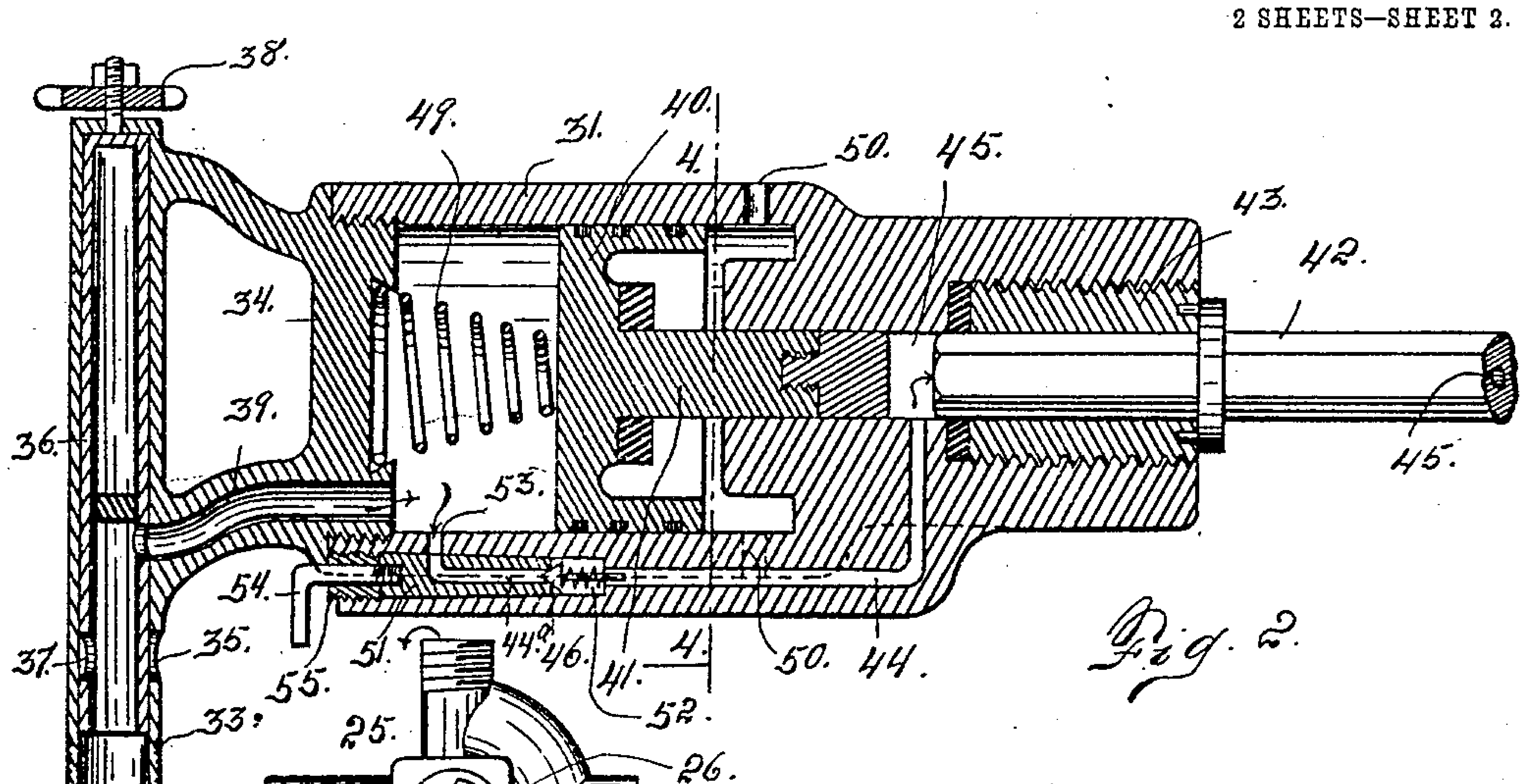

Fig. 2.

Fig. 4.

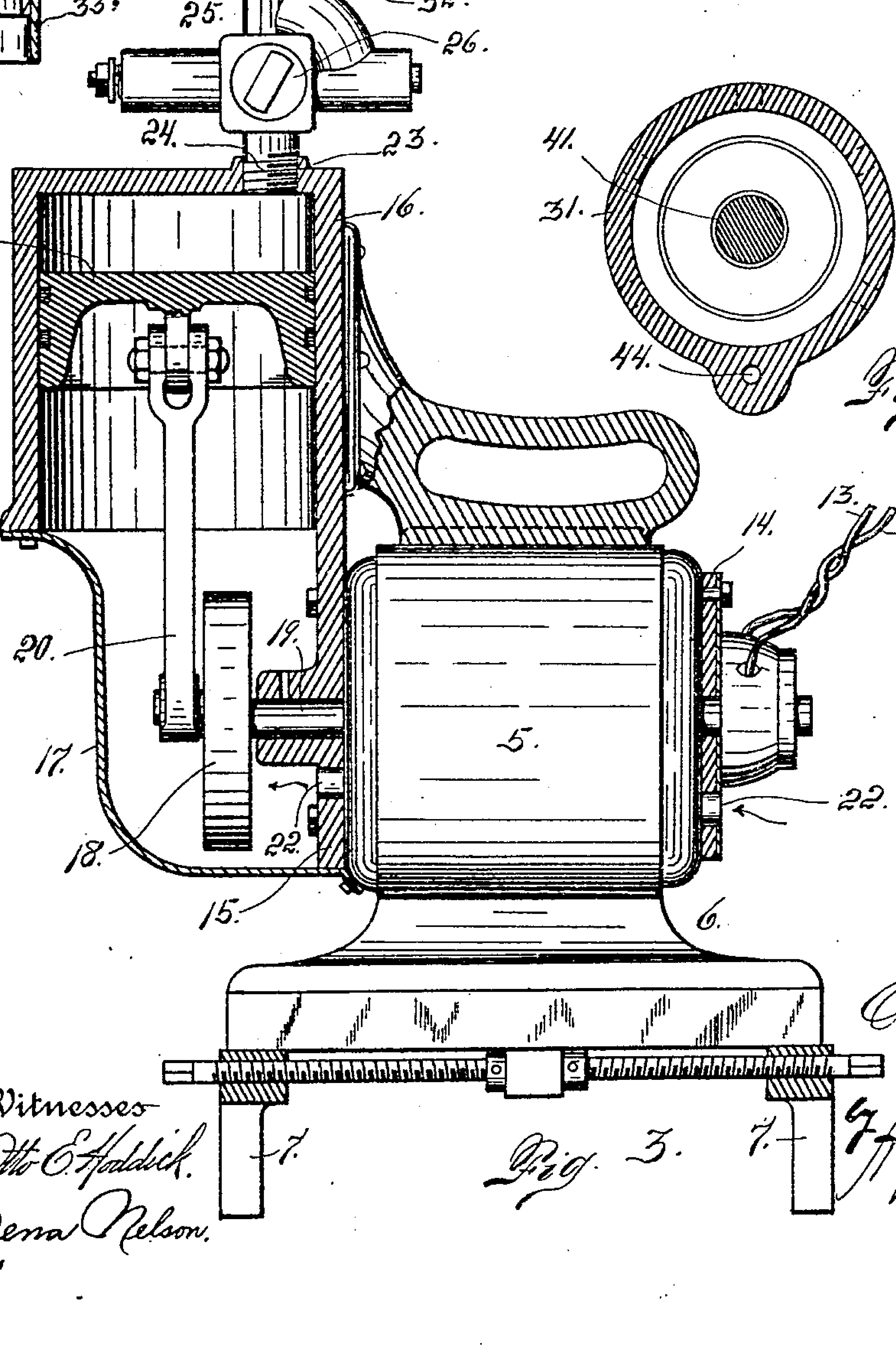

Fig. 3.

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UNITED STATES PATENT OFFICE.

OLIN S. PROCTOR, OF DENVER, COLORADO.

MEANS FOR OPERATING DRILLS.

No. 811,791. Specification of Letters Patent. Patented Feb. 6, 1906.

Application filed April 29, 1905. Serial No. 258,101.

To all whom it may concern:

Be it known that I, OLIN S. PROCTOR, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Means for Operating Drills; and I do 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 appertains to make and use the same, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to means for operating drills or other reciprocating devices employed in mining or similar work where it becomes necessary to form holes in rock for blasting or other purposes.

In my improved apparatus I employ an electric motor with whose armature is connected a crank disk or wheel, with which is connected a piston located in a cylinder mounted on the frame of the motor, the portion of the cylinder in front of the piston being connected, by means of a suitable conduit, with the drill-cylinder, in which is located a piston which may operate either as a hammer upon the drilling-tool, or it may be a piston with which the drilling-tool is connected, as may be desired. As the motor-piston moves in one direction the operating-fluid—as air—is compressed in the drill-cylinder behind the drilling-piston, whereby the latter is driven forwardly. As the motor-piston makes the reverse movement the air is rarefied sufficiently in the drill-cylinder to cause the piston of the latter to make the backward movement. In this way the reciprocating movement is imparted to the drill-piston in a thoroughly practicable and economical manner. The drill-cylinder is provided with a by-pass leading from the piston-chamber in the rear of the piston to a point in the rear of the drilling-tool, whereby fluid may be supplied to the drill-hole through a longitudinal passage in the drilling-tool for the purpose of removing the rock cuttings. Suitable valve mechanism is connected with the motor-cylinder, whereby a certain amount of air may be taken from the atmosphere during each rearward movement of the motor-piston, if desired. This valve mechanism is also of such structure that instead of forcing the air or other operating fluid directly from the motor-cylinder through the conduit into the drill-cylinder the valve may be adjusted to cause the fluid to pass from the motor-cylinder through a by-pass and thence into the drill-cylinder. In this case the return of the air through the by-pass is prevented by a check-valve, which while it allows the air to pass freely from the motor-cylinder to the drill-cylinder prevents its return. In this event the drill-piston is moved forwardly, but no rearward movement is imparted thereto, and hence it remains in the forward position, and all of the air forced into the drill-cylinder is delivered through the by-pass in the drill-cylinder and through the longitudinal passage in the drill-tool to the drill-hole for the purpose of thoroughly cleaning out the latter. When the valve is arranged as just explained, a new supply of air is drawn into the motor-cylinder from the atmosphere through a check-valve which opens during the rearward movement of the motor-piston.

Having briefly outlined my improved construction, as well as the function it is intended to perform, I will proceed to describe the same in detail, reference being made to the accompanying drawings, in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a side elevation of my improved apparatus, the parts being connected in operative relation. Fig. 2 is a longitudinal section of the drill mechanism shown on a larger scale than in Fig. 1. Fig. 3 is a similar view of the motor and motor-cylinder. This view, however, is only partly in section. Fig. 4 is a section taken on the line 4 4, Fig. 2. Figs. 5 and 6 are sectional views of the valve mechanism connected with the motor-cylinder, the parts being shown on a larger scale than in the other views.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate a motor mounted on a base 6, provided with clamping-legs 7, adapted to be secured to a supporting plank or board 8 by means of a screw 9, provided with right and left threads passing through threaded openings formed in the legs 7. The screw 9 is provided with an adjusting device 10 for purposes of manipulation.

12 and 13 are the conductors, leading from the motor to any suitable source of electrical supply. The motor-armature is journaled in plates 14 and 15, located at opposite ends of the motor. The plate 15, as shown in the

drawings, is formed integral with the cylinder 16, whose rear portion is provided with a housing 17, inclosing a crank-wheel 18, mounted on the armature-shaft 19. Connected with a wrist-pin of the wheel 18 is a pitman 20, whose opposite extremity is connected with a piston 21, located in the motor-cylinder 16. The cylinder-chamber in the rear of the piston communicates with the amtosphere through one or more openings 22, formed in the plates 14 and 15 at the opposite ends of the motor, thus permitting atmospheric air to enter freely and exhaust from the motor-cylinder in the rear of the piston during the operation of the apparatus.

The motor-cylinder is provided with a threaded opening 23, into which is screwed a nipple 24, connected with a casing 25, in which is located a valve 26. This nipple 24 communicates with the valve-chamber, which is also provided with branches 27 and 28, located on opposite sides of the valve 26. In the passage 28 is located a check-valve 29, adapted to open inwardly in response to suction. Within the branch-pipe 27 is located a check-valve 30, adapted to open outwardly under pressure. This part 27 is connected with a branch 31, leading from the valve-casing and with which is connected a conduit 32, which leads to an upright tubular part 33, formed integral with the head 34 of the drill-casing cylinder 40. Within this tubular device 33, which is provided with an outlet-orifice 35, is located a tubular valve 36, provided with an orifice 37, adapted to register with the orifice 35 when it is desired that the air delivered to the device 36 shall pass to the atmosphere, as when it is desired to stop the reciprocating movement of the drill-piston, without stopping the motor. At other times or when the drill-piston is in operation the valve 36 is adjusted by means of a hand-wheel 38, connected with its upper extremity to throw the port 37 out of register with the port 35, in which event the fluid from the motor-cylinder after leaving the flexible conduit 32 will enter the part 33 and pass through the hollow valve into the passage 39 and thence into the cylinder 40 in the rear of the piston 41 and drive the latter forwardly, causing it to strike the rear extremity of the drilling-tool 42, which is slidably fitted in the chuck 43, inserted in the forward extremity of the casing connected with the drill-cylinder. In this event it is assumed that the valve mechanism is in the position shown in Fig. 5 of the drawings. The valve 26 in this event is so adjusted that during the rearward movement of the motor-piston a small amount of air may be drawn into the motor-cylinder through the check-valve 29 for the purpose of compensating for the loss of fluid through leaks in the mechanism or otherwise. Now as the motor-piston makes the reverse movement the operating fluid in the rear of the drill-piston will become sufficiently rarefied to cause the drill-piston to make the reverse movement. In this way a reciprocating movement may be constantly imparted to the piston, which, as shown in the drawings, constitutes a hammer whose forward extremity engages the rear end of the drilling-tool.

Leading from the rear portion of the drill-cylinder is a by-pass 44, leading to an opening 45, located in the rear of the drilling-tool 42, the latter being provided with a longitudinal passage 45. In this passage 44 is located a small spring-actuated check-valve 46, which allows the air to pass freely through the passage in one direction, but prevents its return.

Now if it is desired to deliver all of the operating fluid to the drill-hole while the drill-piston remains stationary the valve 26 is adjusted to occupy the position shown in Fig. 6, in which event direct communication between the motor-cylinder and the flexible conduit through the said valve is cut off and the fluid is compelled to pass through the branch 27 by opening the check-valve 30, and thence through a by-pass 47 into the branch 31, and thence into the flexible conduit 32, and finally into the drill-cylinder in the rear of the piston, driving the piston forwardly. As the motor-piston continues its movement it will be understood that the suction incident to the reverse movement of the motor-piston does not act on the drill-cylinder. Consequently the drill-piston will remain at its forward limit of movement. The suction of the motor-piston will draw air from the atmosphere through the check-valve 29, which opens in response to the rearward movement of the motor-piston. It will thus be seen that as the motor-piston continues its reciprocation the air will be alternately drawn from the atmosphere and forced into the drill-cylinder in the rear of the latter's piston, and thence through the by-pass 44 and the longitudinal opening of the drilling-tool into the drill-hole, whereby the latter may be thoroughly cleaned out while the drill-piston remains stationary.

Attention is called to the fact that a weak coil-spring 49 is located in the chamber of the drill-cylinder in the rear of the piston and acts as a buffer to prevent the said piston from striking too hard against the head of the cylinder during the rearward movement of the piston. The drill-cylinder chamber in front of the piston exhausts to the atmosphere through ports 50.

The passage 44 is formed partly in a tapering valve-plug 51, loosely mounted in an opening 52, formed in the wall of the drill-cylinder. The passage in this valve-plug may be made to register with a port 53, formed in the wall of the cylinder. The plug 51 is provided with an exposed handle 54, passing through a nut 55, threaded into

the wall of the drill-cylinder, whereby the valve-plug may be tightened in its tapered bore in case it becomes too loose. When it is desired to shut off the escape of fluid from the piston-chamber of the drill into and through the passage 44 to the drill-hole, the valve-plug 51 is turned so that the opening 44ª therein shall not register with the port 53. From this explanation it will be readily understood that the fluid may be made to pass from the drill-cylinder into the drill-hole simultaneously with the operation of the drill-piston or separately therefrom, as may be desired.

Having thus described my invention, what I claim is—

1. A rock-drill of the class described, including a cylinder, a piston, and means for introducing motive fluid to the cylinder, of a by-pass leading from the drill-cylinder to a point forward of the piston for delivering fluid to the drill-hole, and a check-valve located in said by-pass and adapted to allow fluid to pass therethrough to the drill-hole but arranged to prevent the return of the rock cuttings into the cylinder.

2. The combination of a motor cylinder and piston, a drill-cylinder and piston, a conduit connecting the two cylinders, a by-pass leading from the drill-cylinder to a point forward of the piston for delivering fluid to the drill-hole, and means for controlling the passage of air from the motor-cylinder whereby the air is forced into the drill-cylinder during the forward movement of the motor-piston, but rarefaction of the air in the drill-cylinder prevented during the backward movement of the motor-piston, whereby the only outlet for the air from the drill-cylinder is by way of the said by-pass, substantially as described.

3. The combination of a motor-cylinder, a piston therein, a drill-cylinder piston constituting a hammer, a drilling-tool located forward of the hammer and having a longitudinal passage therethrough for delivering fluid to the drill-hole, a conduit between the two cylinders, a by-pass leading from the drill-cylinder to a point in front of the drilling-tool, a valve for controlling the said by-pass, valve mechanism for controlling the passage of air between the two cylinders, said mechanism being constructed to allow the air to pass freely from the motor-cylinder to the drill-cylinder during the forward movement of the motor-piston while the rarefaction of the air in the drill-cylinder is prevented during the return movement of the motor-piston, the motor-cylinder being supplied with air from the atmosphere during the reverse movement of its piston, and adjustable means connected with the drill-cylinder whereby the air may be allowed to escape from the conduit into the atmosphere, or compelled to pass to the drill-cylinder as desired.

In testimony whereof I affix my signature in presence of two witnesses.

OLIN S. PROCTOR.

Witnesses:
DENA NELSON,
A. J. O'BRIEN.