

May 27, 1930.

O. E. CLARK

1,760,582

HOLE CLEANING APPARATUS

Filed Sept. 4, 1923

2 Sheets-Sheet 1

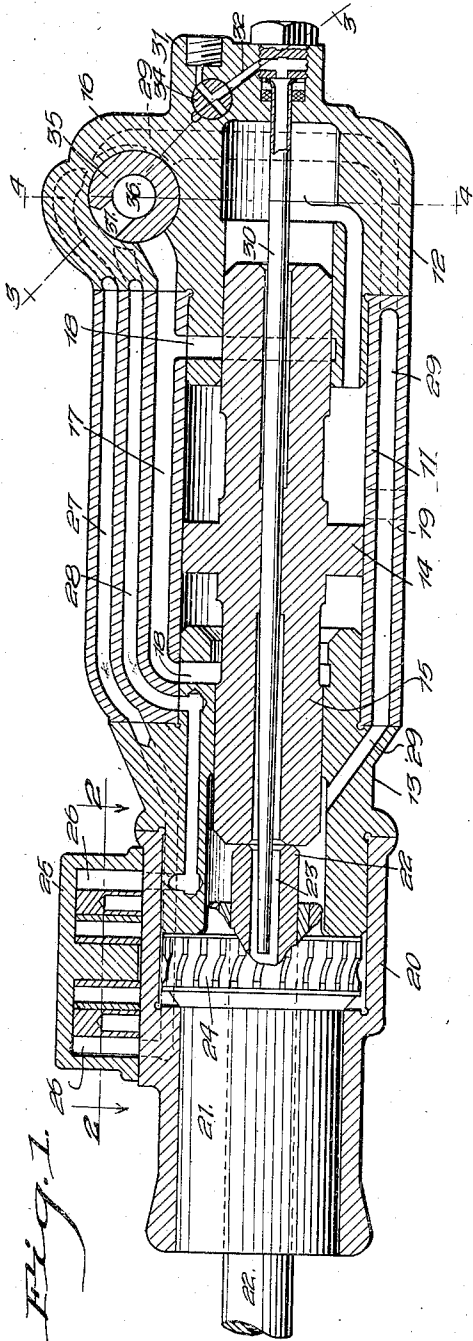


Fig. 1.

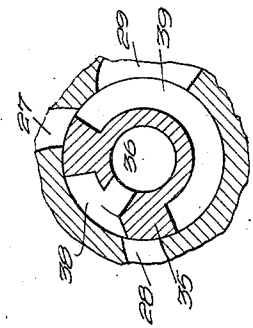


Fig. 5.

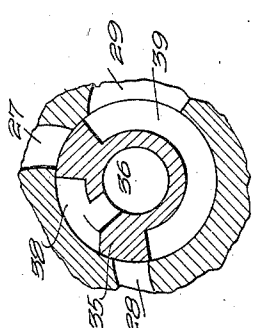


Fig. 6.

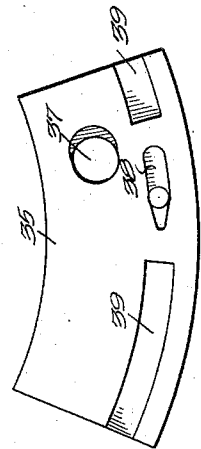


Fig. 16.

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2 Sheets-Sheet 2

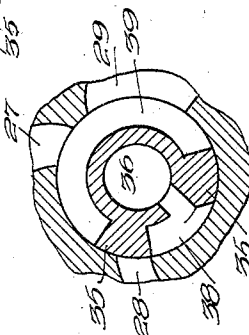
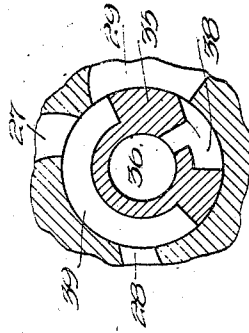
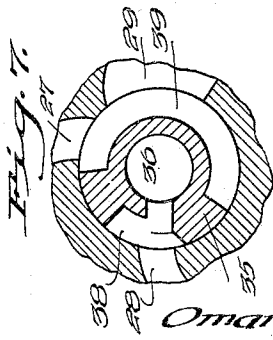
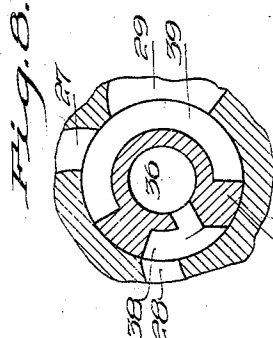
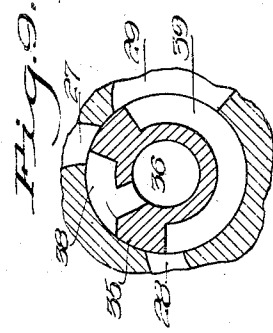
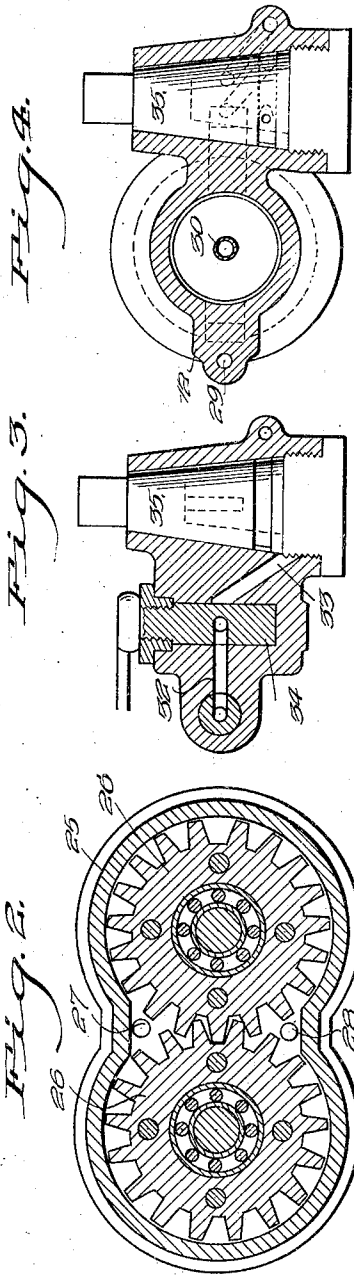


Fig. 11

Fig. 10

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UNITED STATES PATENT OFFICE

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HOLE-CLEANING APPARATUS

Original application filed April 19, 1918, Serial No. 229,500. Patent No. 1,538,421, dated May 19, 1925. Divided and this application filed September 4, 1923. Serial No. 660,837.

The present invention relates to drilling apparatus, and particularly to that type in which the drill steel is automatically rotated by a motor independent of the drilling motor.

5 One of the objects is to provide novel means for supplying cleansing fluid to the drill steel or bit to eject the cuttings, this means being so constructed that fluid under different pressures may be supplied.

10 The present application is a division of application, Serial No. 229,500, and filed April 19, 1918, Patent No. 1,538,421, May 19, 1925.

15 One embodiment of the invention is illustrated in the accompanying drawings, wherein

Figure 1 is a longitudinal sectional view of a rock drill with the improvements thereon, and shown somewhat diagrammatically,

20 Figure 2 is a horizontal sectional view through the drill steel rotating motor and taken on the line 2—2 of Figure 1,

Figures 3 and 4 are sectional views taken respectively on the lines 3—3 and 4—4 of Figure 1,

Figures 5—11 inclusive are detail sectional views through the throttle or controlling valve, showing the various control positions,

30 Figure 12 is a development of said valve. In the embodiment disclosed, a drilling motor is employed, comprising a barrel 11 having a rear head 12 and a front head 13. In the cylinder member thus provided is located a reciprocatory hammer piston 14, having a forward extension 15 that operates in the head 13. The rear head 12 is provided with a valve casing 16, from which extends a passageway 17, having ports 18 that open into the interior of the cylinder member and are controlled by the piston in its operation. The exhaust takes place through a port, indicated in dotted lines at 19.

45 The front head 13 has fitted thereon a sleeve 20, in which a rotatable chuck 21 is journaled. This chuck is adapted to detachably receive the rear end of a drill steel 22, having a bore 23 therethrough. This steel is adapted to be hammered upon by the extension 15 of the piston 14. The chuck 21 is provided on its rear portion with a worm

wheel 24, which is engaged by suitable gearing, not shown, driven from a rotary motor 25 that is located on one side of the sleeve 20. This motor includes intermeshing gear pistons 26. The motor is reversible, that is to say, it may be continuously operated in either of opposite directions, and for this purpose, separate passageways 27 and 28 lead from the interior of the valve casing, and open, as shown in Figure 2, on opposite sides of the intermeshing portions of the gear piston 26. An exhaust passageway 29, also opens from the interior of the valve casing 16, and extends longitudinally through the barrel 11, its discharge end opening into the head 13 in rear of the chuck, and consequently being in communication with the bore 23 of the drill steel 22.

Extending through the piston 14 is a tube 30 secured at its rear end in the rear head 12, its front end delivering into the bore 23 of the drill steel 22. Water is supplied to the rear end of this tube 30 from any suitable source by a conduit coupled in a socket 31 formed in the rear head 12, a passageway 32 extending from the socket to the rear end of the tube. Another passageway 33, shown in Figure 3, extends from the valve casing 16, in advance of the valve therein, and communicates with the passageway 32. A three-way rotary valve 34 is located at the juncture of the passageways 32 and 33.

50 The interior formation of the valve casing 16 provides a tapered valve seat in which is located a rotary tapered valve 35 having a central bore 36, to which fluid under pressure is admitted from a suitable source of supply in the well-known manner. This valve 35 is provided with a lateral port 37 communicating with the bore 36 and movable into and out of communication with the passageway 17, by which motive fluid is supplied to the drilling motor. Another lateral port 38 is formed in the valve 35 near the larger end thereof, and is also in communication with the bore 36. It is movable into and out of communication with the inlet ends of the passageways 27 and 28.

Still another port or channel 39 is formed in the external portion of the valve 35 and

is movable into and out of communication with the passageways 27 and 28, and is also arranged to bring said passageways into communication with the exhaust passageway 29.

5 The operation of the valve is as follows:
 When the valve is in the position illustrated in Figures 1 and 5, it is closed, or in other words, the supply of motive fluid is cut off from the various passageways, the port 37, being out of communication with the pas-
 10 sageway 17 and the port 38 being out of communication with both the passageways 27 and 28. If now the valve is turned toward the left, it will be noted that the port 38 is first brought into communication with the
 15 passageway 28, and therefore motive fluid will enter said passageway and be delivered to the rotary motor on one side of the pistons. The drill rotating motor can therefore be started slowly in operation and the exhaust
 20 will flow back through the passageway 27, which is now in communication with the channel 39, as illustrated in Figure 6, this channel being also in communication through
 25 the exhaust passageway 29, and thus delivering the exhaust from the rotary motor to the bore of the drill steel. As the valve 35 is further turned to the left, the port 38 is more and more opened to the passageway 28, gradu-
 30 ally increasing the supply of fluid to the chuck rotating motor until said valve comes to the position shown in Figure 7. When so positioned motive fluid is being also admitted to the drilling motor and the hammer piston
 35 is therefore started in operation.

As is well known to those skilled in this art, it is a very common occurrence for a drill steel to become lodged or stuck in the drill hole, and at times it becomes so firmly fixed
 40 that it has been necessary to turn the entire apparatus in order to free it. This involves the stopping of the motor and heretofore the custom has been to apply a wrench to the structure and operate it manually. With
 45 the present apparatus, this can be done mechanically. The drilling motor is stopped by turning the valve 35 to the position shown in Figures 1 and 5, and said valve is then oscillated between the position shown in Fig-
 50 ures 8 and 9, which brings the port 38 alternately into communication with the passageways 27 and 28. As a consequence the motive fluid being alternately directed into such passageways will operate alternately in op-
 55 posite directions against the chuck rotating motor, thus causing the same to be turned in opposite directions. During this movement the channel 39 is alternately brought into communication with the passageways 27 and
 60 28, permitting the alternate exhaust through the passageway 29, and thus the opposite actuation communicates a powerful turning movement to the drill steel in opposite direc-
 65 tions for freeing the same.

As will be evident, during the normal op-

eration of the drilling apparatus the ex-
 70 haust from the chuck rotating motor pass-
 ing down through the bore 23 of the drill
 steel 22 will exhaust at the bit end, or in other
 words, at the bottom of the drill hole, and
 will eject the cuttings. Water may also be
 75 supplied to the bore of the drill steel for
 cleansing purposes through the tube 30. It
 sometimes happens that because of the collec-
 tion of material, this exhaust is insufficient
 to expel the cuttings and whenever a suppl-
 80 mental supply of greater force is desired it is
 only necessary to turn the valve 34 to a posi-
 tion to effect a communication between the
 passageways 33 and 29, whereupon the sup-
 ply of live motive fluid will augment the
 weaker force of the exhaust and expel the
 85 detritus. The water may be admitted only
 with the supplemental supply or cut off dur-
 ing such supply by operating the said valve
 34, as may be desired.

From the foregoing, it is thought that the
 construction, operation and many advantages
 of the herein described invention will be ap-
 90 parent to those skilled in the art, without
 further description and it will be understood
 that various changes in the size, shape, pro-
 portion and minor details of construction,
 may be resorted to without departing from
 the spirit or sacrificing any of the advan-
 95 tages of the invention.

What I claim, is:—

1. In apparatus of the character set forth, the combination with a drilling motor, in-
 100 cluding a barrel and a hammer piston oper-
 ating therein, of a tool receiving chuck, a
 tube extending through the piston for deliv-
 ering fluid to a drill steel placed in the
 chuck, a passageway in the barrel for deliver-
 105 ing fluid to a drill steel placed in the chuck,
 a chuck rotating motor, means for supplying
 the exhaust from said motor to the passage-
 way in the barrel, means for supplying live
 fluid to the tube, and a common valve for con-
 110 trolling the supply of fluid to the drilling
 motor and to the chuck rotating motor, said
 valve also controlling the passage of exhaust
 to the passageway.

2. In apparatus of the character set forth, the combination with a drilling motor, of a
 115 drill rotating motor, means for supplying
 motive fluid to both motors, means for direct-
 ing the exhaust fluid from the drill rotating
 motor to the bore of a steel operated by both
 motors, and valve mechanism for controlling
 120 the supply of fluid to the motors and the ex-
 haust of the drill rotating motor to the drill
 steel.

3. In apparatus of the character set forth, the combination with a drilling motor, of a
 125 drill rotating motor, means for supplying
 motive fluid to both motors, a valve mecha-
 nism on the rear end of the drilling motor for
 controlling the motive fluid supply, and
 means for conducting the exhaust fluid from
 130

one of the motors through the valve to the bore of a drill steel operated on by the motors.

4. In apparatus of the character set forth, the combination with a drilling motor, of a drill rotating motor, means for supplying motive fluid to both motors, a valve mechanism on the rear end of the drilling motor for controlling the motive fluid supply, and means for conducting the exhaust fluid from the drill rotating motor through the valve to the bore of a drill steel operated on by the motors.

In testimony whereof, I affix my signature.
OMAR E. CLARK.

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