D. S. WAUGH.

ROCK DRILL.

APPLICATION FILED APR. 2, 1909.

984,171.

Patented Feb. 14, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

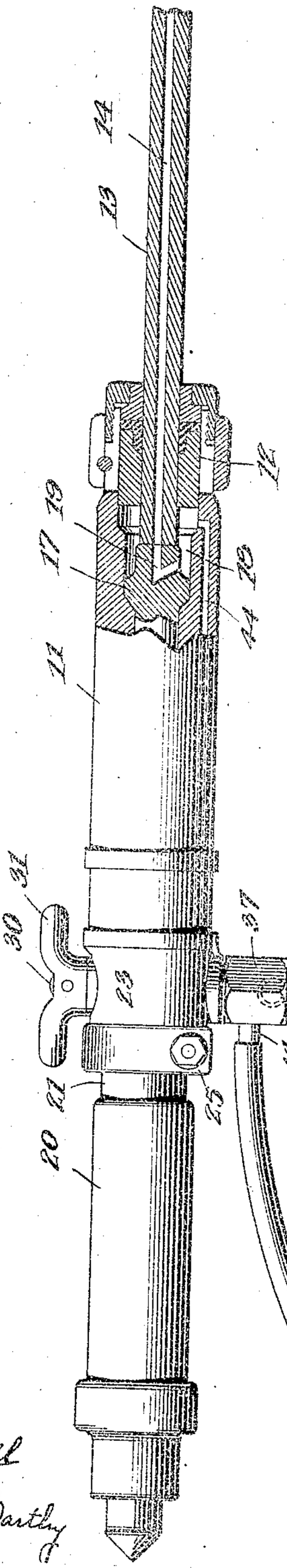


Fig. 7.

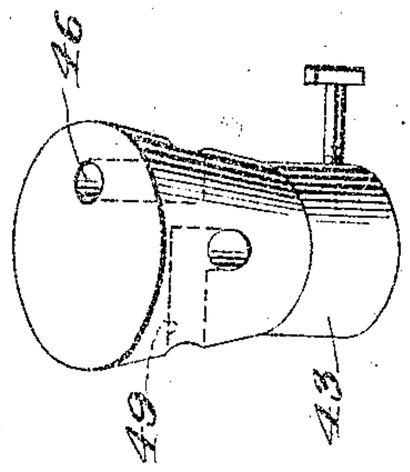
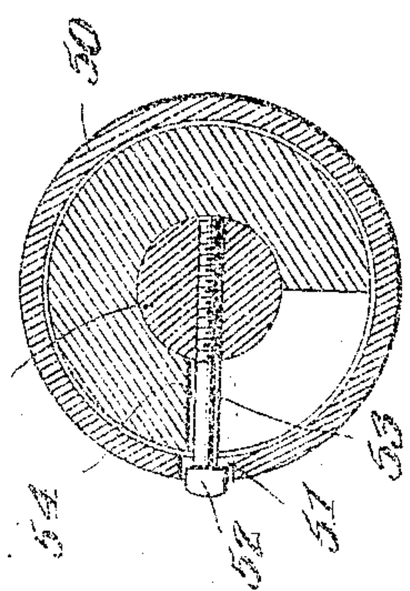


Fig. 6.



Witnesses

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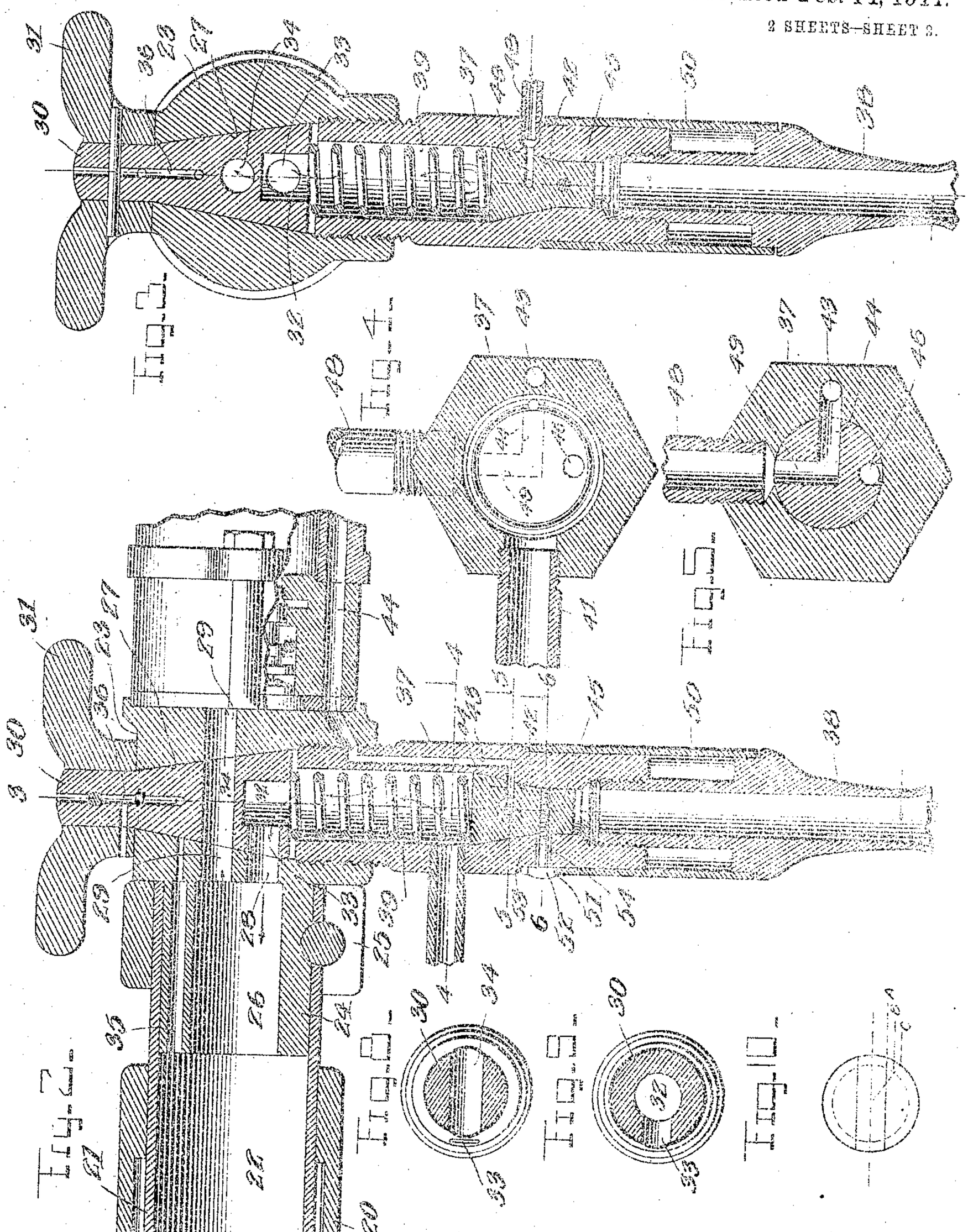

Fig. 1.

Fig. 4.

Fig. 5.

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Witnesses

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UNITED STATES PATENT OFFICE.

DANIEL SHAW WAUGH, OF DENVER, COLORADO, ASSIGNOR TO THE DENVER ROCK DRILL AND MACHINERY CO., OF DENVER, COLORADO.

ROCK-DRILL.

984,171. Specification of Letters Patent. **Patented Feb. 14, 1911.**

Original application filed May 26, 1908, Serial No. 435,113. Divided and this application filed April 2, 1909. Serial No. 487,464.

To all whom it may concern:

Be it known that I, DANIEL SHAW WAUGH, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Rock-Drills, of which the following is a specification.

The present invention relates more particularly to rock drills of the pneumatic hammer type, though there are features that may be of utility in drills of other characters.

The present application is a division of co-pending application Serial No. 435,113, filed May 26, 1908.

One of the primary objects of the invention is to provide a novel valve structure for governing the supply of cleansing fluid to the drill hole, whether said fluid is of the gaseous or liquid type or both, the actuating means for the valve structure being so located that it is at all times conveniently accessible to the operator of the drill.

A still further and important object is to provide mechanism for governing the supply of the motive fluid to the motor and drilling means whereby a smaller hose than is ordinarily employed can be successfully used, and dirt is to a great extent prevented from entering the motor and affecting its proper operation.

A still further object is to so arrange the controlling valve and ports that the pressure in the feeding means for the motor is reduced at the same time that the motive fluid pressure is reduced in the motor so that light operations of the drill can be made whenever desired.

The preferred embodiment of the invention is illustrated in the accompanying drawings, wherein:—

Figure 1 is a view, partially in elevation and partially in section, of the drill. Fig. 2 is a detail sectional view on an enlarged scale through the valve mechanism. Fig. 3 is a sectional view on the line 3—3 of Fig. 2. Figs. 4, 5 and 6 are respectively cross sectional views on the line 4—4, 5—5 and 6—6 of Fig. 2. Fig. 7 is a detail perspective view of the valve for controlling the supply of cleansing fluid. Figs. 8 and 9 are detail sectional views through the valve that controls the operation of the motor. Fig. 10 is a diagrammatic view indicating the relative positions of the controlling ports of said valve.

Similar reference numerals designate corresponding parts in all the figures of the drawings.

In the embodiment illustrated, a motor is employed, comprising a cylinder member 11 having a suitable chuck 12, in which is placed the usual drill bit 13, said drill bit having a channel 14 therethrough that conducts cleansing fluid to the bottom of the drill hole. A suitable hammer piston operates in the cylinder and actuates a tappet 17 that abuts against the drill bit 13, said tappet forming within the front end of the cylinder in rear of the chuck, a chamber 18. The tappet 17 has a channel 19 constituting means of communication between the chamber 18 and the drill steel channel 14.

Motive fluid operated feeding means is employed for the motor and drill, the same being generally of the well known type, as disclosed, for instance in my former patent, No. 897,231, dated August 25, 1908, and comprises a suitable cylinder member 20 within which operates a piston having a tubular piston rod 21. The interior of this piston rod forms a motive fluid receiving chamber or reservoir 22. A valve casing 23 is interposed between the feeding means and motor, and constitutes a connection between the same, said casing having a reduced portion 24 that is fitted within the piston rod 21, and is clamped thereto, as shown at 25. The reduced portion 24 has an internal bore 26 communicating with the chamber 22.

The valve casing 23 is provided with a tapered valve seat 27 having a rearwardly extending port 28 leading from the valve seat into the bore 26 and a passage 29 extending from said bore to the motor, the passage 29 intersecting the valve seat and constituting means for delivering motive fluid from the chamber 22 into the motor for actuating said motor. A rotary tapered valve 30 is arranged in the seat, and is provided with an exposed operating handle 31. This valve has in its larger end a bore 32 with a port 33 leading therefrom and movable into and out of register with the port 28. The valve also has a passage 34 extending entirely therethrough and movable into and out of register with the opposite sections of the passage 29 of the valve casing. The reduced

portion 24 of the valve casing furthermore is provided with a small exhaust channel 35 and the valve has an exhaust channel 36 that is movable into and out of communication with said channel 35, the arrangement being such that the exhaust channels 35 and 36 are in communication when the port 33 is out of communication with the port 28 and the passage 34 out of communication with the passage 29.

Threaded into the larger end of the valve seat 27 is a handle stem 37, which in turn has threaded into its outer end a handle grip 38. The handle stem is provided with an internal motive fluid receiving chamber 39 that receives a supply of motive fluid under pressure from any suitable source through a conduit 40 coupled, as shown at 41 to the handle stem and communicating with the chamber between the ends thereof. It will thus be evident that when the valve 30 is in the position shown in Fig. 2, motive fluid delivered to the chamber 39 by the conduit 40 will flow through the ports 33 and 28 into the reservoir or chamber 22, and will pass from said chamber 22 through the passages 29 and 34 into the motor for actuating the same.

There are a number of decided advantages for this particular arrangement. In the first place, it will be observed that a single valve is employed at the connection between the motor and the feeding means, said valve controlling the supply of motive fluid both to the feeding means and to the motor. In this particular structure, it will be observed that the motive fluid is first delivered into the feeding means, before it enters the motor, and is received in a comparatively large reservoir or chamber 22 in the feeding means. The amount of motive fluid under pressure is therefore comparatively great in said chamber, permitting the use of a smaller supply hose. Then again, it sometimes happens that considerable dirt is delivered by the motive fluid into the motor, and if such motive fluid is carried in a continuous stream directly into the motor, the dirt carried thereby is apt to interfere with the proper operation of the mechanism. In the present case, the chamber 22 constitutes a pocket that receives the dirt and prevents its entering into the valve mechanism of the motor. The tapered valve structure is also an important feature of the present mechanism, particularly in connection with the arrangement of the ports, as the said arrangement permits the reduction of the pressure in the feeding mechanism at the same time the pressure is reduced in the motor, permitting successful light operations of the drill. To explain this, attention is particularly invited to Figs. 2, 8, 9 and 10. It will be observed that the passage 34 is in a smaller portio nof the valve 30 than the port 28. Therefore upon rotating the valve, one of the ports will obtain a lead over the other. For instance, as indicated diagrammatically in Fig. 10, when the port on the smaller diameter has reached the position B, the port on the larger diameter will have reached the position C, and consequently while the port on the smaller diameter has thus moved substantially only the distance A B, the other port will have moved practically the distance A C.

Novel effective means is also provided for controlling the supply of cleansing fluid to the drill hole through the channel 14 in the drill bit 13'. In certain classes of work, it is desirable to use air or other gaseous fluid for cleansing, but wherever possible, the use of liquid for cleansing purposes is preferred, inasmuch as it lays the dust. In certain instances, however, it is quite impracticable to use the liquid, and moreover water cannot always be obtained in unlimited quantities. Novel mechanism is provided therefore for permitting the use of either the motive fluid in gaseous form or water or other liquid. To this end, the outer end of the chamber 39 within the handle stem 37 is formed into a tapered valve seat 42, and leading from one side of the same is a passage 43 that extends within the stem 37 and communicates with a conduit 44 arranged within the motor cylinder and communicating with the chamber 18. A rotary valve 45, arranged in the valve seat and having its axis of rotation coincident with the axis of the valve 30 and disposed longitudinally of the handle, controls the passage 43. This valve has two ports, one of which 46, communicates with the motive fluid chamber 39 and moves into and out of register with the passage 43. Consequently by turning the valve, it will be evident that motive fluid from the chamber 39 can be delivered through the passages 43 and 44 into the chamber 18, and thence through the drill bit to the drill hole. For the purpose of supplying water or liquid, a conduit 47 leading from any suitable source of supply is connected as shown at 48 to one side of the valve stem 37, and communicates with one side of the valve seat 42. The said valve has a port 49, which moves into and out of register with the coupling 48, and when in register therewith, is in communication with the passage 43. Consequently it will be obvious that the valve 45 can be turned so as to supply liquid to the passage 43, and consequently through the various communications above described, to the drill hole. In order to actuate the valve 45, a handle sleeve 50 is rotatably mounted on and surrounds the turning handle, said sleeve having a recessed seat 51 in its end that receives the head 52 of a stem 53 that extends through a slot 54 in the handle stem and is threaded into the valve. By rotating the sleeve 50,

the valve 45 can of course be revolved in order to supply either gaseous or liquid cleansing fluid to the drill hole or to cut off both therefrom. Inasmuch as the actuating sleeve 50 is located directly on the handle and is concentric thereto, it is always in convenient access to the operator of the drill.

From the foregoing, it is thought that the construction, operation and many advantages of the herein described invention will be apparent to those skilled in the art without further description, and it will be understood that various changes in the size, shape, proportion and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

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

1. In mechanism of the character set forth, the combination with a motor, of motive fluid operated means for feeding the motor to its work, and means located between the motor and feeding means for delivering motive fluid to the feeding means and conducting it therefrom to the motor.

2. In mechanism of the character set forth, the combination with a motor, of motive fluid operated means for feeding the motor to its work, a device interposed between and connecting the motor and feeding means, said device delivering motive fluid to the feeding means and conducting it therefrom to the motor.

3. In mechanism of the character set forth, the combination with a motor, of motive fluid operated means for feeding the motor to its work, said feeding means having a motive fluid chamber, and means located at the connection between the motor and feeding means for delivering motive fluid to the chamber and conducting such motive fluid from the chamber to the motor.

4. In mechanism of the character set forth, the combination with a motor, of motive fluid operated means for feeding the motor to its work, said feeding means including a cylinder member and a piston operating therein and having a tubular rod connected to the motor and forming a motive fluid chamber, and means located at the connection between the motor and feeding means for delivering motive fluid to the chamber and conducting said motive fluid therefrom to the motor.

5. In mechanism of the character set forth, the combination with a motor, of motive fluid operated feeding means therefor, a device having a supply port leading to the feeding means, and a passage leading from the feeding means to the motor to conduct motive fluid thereto, and a single valve controlling both the port and passage.

6. In mechanism of the character set forth, the combination with a motor, of motive fluid operated feeding means therefor, a device connecting the motor and feeding means, said device having a supply port communicating with the feeding means, and a passage leading from the feeding means to the motor to conduct motive fluid thereto, and valve mechanism controlling the port and passage.

7. In mechanism of the character set forth, the combination with a motor, of motive fluid operated feeding means therefor, a device connecting the motor and feeding means, said device having a supply port communicating with the feeding means and a passage leading from the feeding means to the motor to conduct motive fluid thereto, and a single valve controlling both the port and passage.

8. In mechanism of the character set forth, the combination with a motor, of motive fluid operated feeding means for said motor provided with a motive fluid chamber, a valve casing having a supply port leading to the chamber and a passage leading from the chamber to the motor to conduct motive fluid thereto, and a single valve operating in the casing and controlling both the port and passage.

9. In mechanism of the character set forth, the combination with a motor, of motive fluid operated feeding means therefor, including a cylinder member and a tubular piston located in the cylinder member and forming a motive fluid chamber, a connection between the motor and piston comprising a valve casing having a supply port leading to the chamber and a passage leading from the chamber to the motor to conduct motive fluid to the latter, and a rotary valve having a supply port that moves into and out of register with the supply port of the casing, and a passage that moves into and out of register with the passage from the chamber to the motor.

10. In mechanism of the character set forth, the combination with a motor [illegible] tive fluid operated [illegible] means therefor, a valve [illegible] interposed and constituting a [illegible] between the motor and feeding means, said casing having a transverse seat open at one end, a rearwardly extending port communicating with the feeding means and a passage leading from the feeding means to the motor and intersecting the valve seat, and a rotary valve located in the seat and having a port and passage that respectively move into and out of register with the port and passage of the seat, said passage of the seat conducting motive fluid from the feeding means to the motor to actuate the latter.

11. In mechanism of the character set forth, the combination with a motor and feeding means therefor, including a piston

and a cylinder, of a valve casing connecting the motor and feeding means and having a tapered valve seat, a rearwardly extending supply port communicating with the feeding means and a passage extending from the feeding means to the motor and delivering motive fluid to the latter for actuating said motor, a tapered rotary valve located in the valve seat and having an exposed actuating device, said valve having a supply port that registers with the supply port of the casing and having a passage movable into and out of communication with the passage of the casing, and a supply pipe coupled to the valve casing and delivering to the supply port of the valve.

12. A pressure fluid tool, fluid pressure feeding means therefor, a controlling device that closes direct communication between the pressure fluid supply and tool and having ports so arranged that when the device is in one position, it opens communication from the pressure fluid supply to the tool through the feeding means.

13. A pressure fluid tool, fluid pressure feeding means therefor, and a controlling valve located between the tool and feeding means and closing direct communication between the pressure fluid supply and tool, said valve having ports so arranged that when it is in one position, it opens communication from the pressure fluid supply to the tool through the feeding means.

14. In an air feed hammer drill, a hammer, a head block, an air supply, an air feeding means comprising a cylinder and its piston, and a manually operated controlling valve in the head block that closes direct communication between the air supply and hammer and having ports so arranged that when the valve is in one position, it opens communication from the air supply to the hammer through the air feeding means.

15. A pressure fluid tool, fluid pressure feeding means therefor, a head block between the tool and means, having passages, and a controlling device in the head block having ports so arranged that when the device is in one position, it opens communication through the ports and passages from the pressure fluid supply to the tool through the feeding means, and when in another position it closes communication between the pressure fluid supply and the feeding means and between the feeding means and tool.

16. A pressure fluid tool, fluid pressure feeding means therefor, a head block between the tool and means, having passages, and a controlling valve located in the head block and having ports so arranged that when the valve is in one position, it opens communication from the pressure fluid supply to the tool through the feeding means, and when in another position, it closes communication between the pressure fluid supply and feeding means and between the feeding means and tool.

17. In an air feed hammer drill, a head block having passages, an air supply, an air feeding means comprising a cylinder and its piston, and a manually operated valve in the head block, having ports so arranged that when the valve is in one position, it opens communication through the passages from the air supply to the hammer through the feeding means, and when in another position, it closes communication from the air supply to the feeding means and from the feeding means to the tool.

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

DANIEL SHAW WAUGH.

Witnesses:
W. H. LEONARD,
A. J. PHILPOTT.