April 16, 1929. A. H. KATTERJOHN 1,709,024

ROCK DRILL

Filed Dec. 24, 1923 3 Sheets-Sheet 1

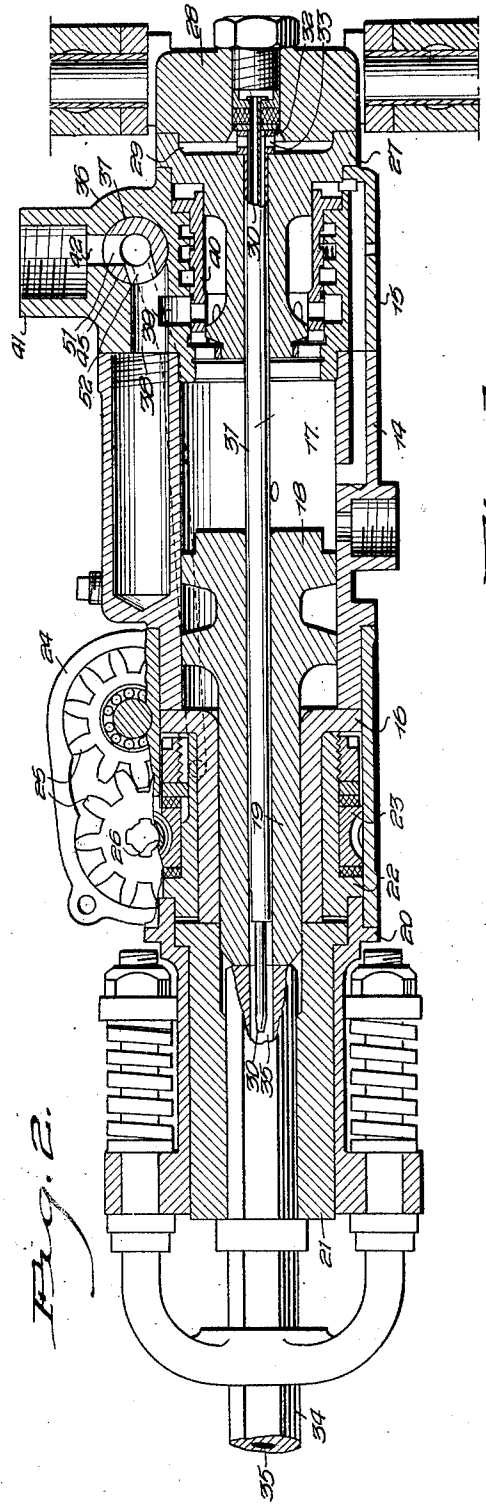

Fig. 2.

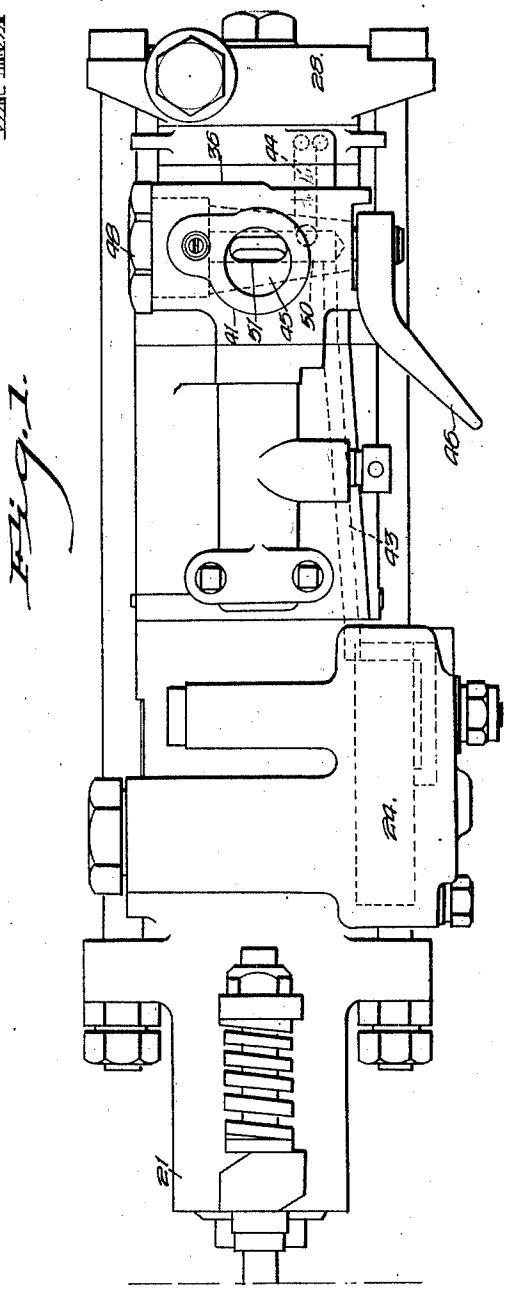

Fig. 1.

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ROCK DRILL

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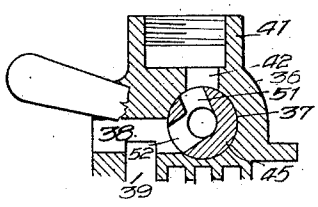


Fig. 13.

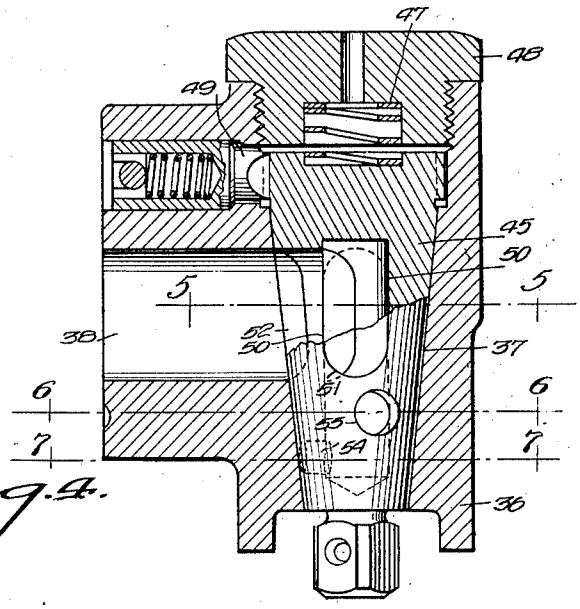
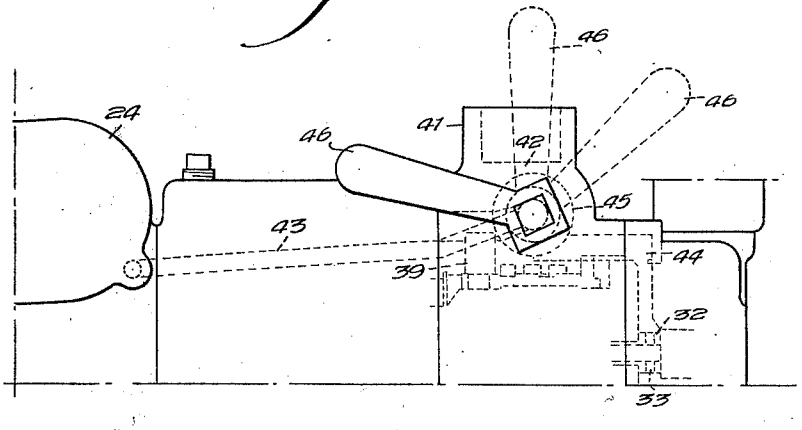


Fig. 4.

Fig. 3.



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ROCK DRILL

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Fig. 5.

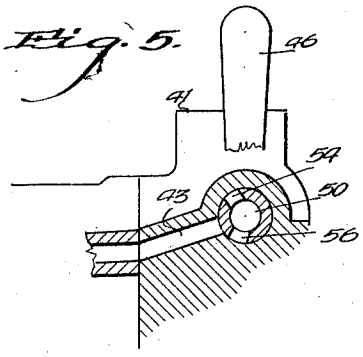


Fig. 8.

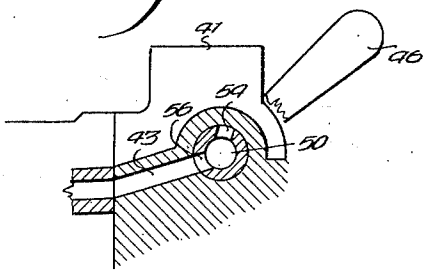


Fig. 6.

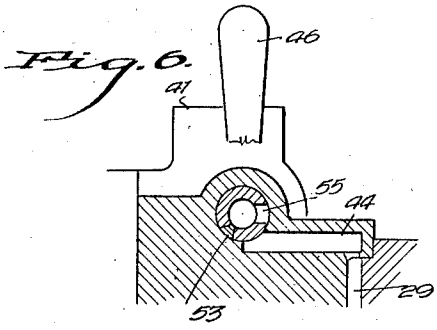


Fig. 9.

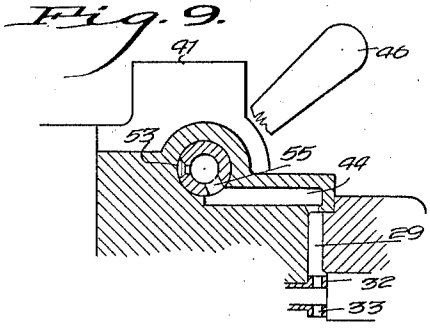


Fig. 7.

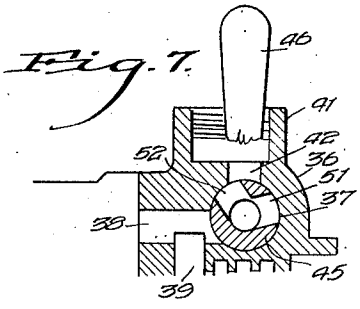


Fig. 10.

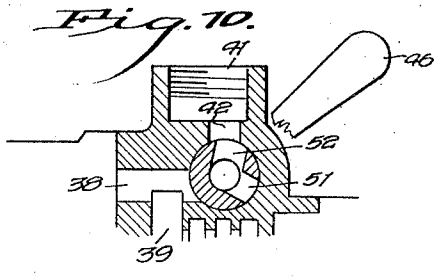


Fig. 11.

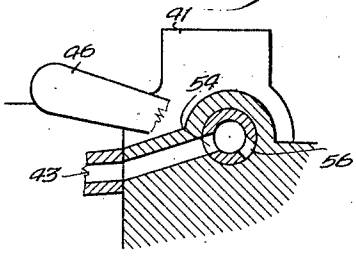
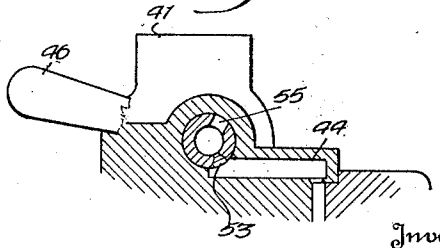


Fig. 12.



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UNITED STATES PATENT OFFICE.

AUGUST H. KATTERJOHN, OF DENVER, COLORADO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE GARDNER-DENVER COMPANY, OF QUINCY, ILLINOIS, A CORPORATION OF DELAWARE.

ROCK DRILL.

Application filed December 24, 1923. Serial No. 682,513.

The present invention relates to means for controlling the supply of air or other motive fluid to the different instrumentalities of rock drills, the object being to have a simple valve mechanism by which the motive fluid to the drilling and chuck rotating motors and to the means for supplying cleansing fluid to the drill steel can be easily controlled and varying supply of fluid can be admitted to the delivery tube for the cleansing supply.

In the accompanying drawings:—

Figure 1 is a plan view of a rock drill equipped with the preferred embodiment of the invention,

Figure 2 is a longitudinal sectional view therethrough,

Figure 3 is a detail side elevation of the rear end carrying the valve,

Figure 4 is a horizontal sectional view,

Figures 5, 6 and 7 are views taken respectively on the lines 5—5, 6—6 and 7—7 of Figure 4, showing the valve in completely closed position,

Figures 8, 9 and 10 are corresponding views but showing the valve in a reversed position with the supply to the drilling motor cut off and supplies open to the other instrumentalities,

Figures 11, 12 and 13 are views corresponding to Figures 5, 6 and 7, but illustrating the valve in its completely open position.

In the drawings, a drilling motor is disclosed, comprising a cylinder member 14 having a rear head 15 and a front head 16. In the piston chamber 17 of the cylinder member reciprocates a hammer piston 18 having an extension 19 that operates through the head 16.

A housing 20 at the front end of the head 16 carries a rotatable chuck sleeve 21, having its rear end coupled to a second sleeve 22, journaled in the head 16 and having a worm gear 23. A chuck rotating motor 24, mounted on the front end of the drilling motor, includes a pair of intermeshing piston gears 25 driving a worm 26 that is in mesh with the worm gear 23, said motor 24 thus constituting means for rotating the chuck sleeve 21.

Fitted into the rear head 15 of the drilling motor is a plug 27 having mounted on its rear end a cap 28, the plug and cap having formed between them a chamber 29. Mounted in the cap 28 is a liquid-conducting tube 30 that extends longitudinally through the plug 27, piston chamber 17, and piston 18, its front end projecting into the rear end of the chuck sleeve 21. Mounted in the plug 27 is an air tube 31 having a rear head 32 clamped between the rear end of the plug 27 and cap 28. This tube 31 surrounds the water tube 30 and extends into the bore of the piston 18, but terminates short of the front end of the tube 30, as will be clear by reference to Figure 1. The head 32 of the tube 31 has lateral ports 33 affording communication between the interior of the tube and the chamber 29.

A portion of a drill steel 34 is shown, the rear end of this drill steel being loosely fitted in the rotatable chuck sleeve 21 and the water tube 30 projects into the bore 35 of the said steel, while air delivered through the tube 31 will pass around the projecting end of the water tube 30 and into the bore 35 of the drill steel 34.

The rear head 15 of the drilling motor has an enlargement, forming a valve casing 36 provided with a tapered valve chamber 37. Leading from one side of this valve chamber and at its larger end, is a passageway 38 having a port 39 opening into the chamber of an automatic valve 40, also mounted in the rear head 15. The valve casing 36 has an outstanding nipple 41, to which may be coupled an air supply hose, and a port 42, opens from this nipple into the valve chamber 37, substantially at right angles to the passageway 38, and preferably in the plane thereof. From the smaller end of the chamber 37 a passageway 43 leads to the drill rotating motor 24, as indicated in Figures 1 and 3. A third passageway 44 leads from the valve chamber 37 between the passageways 38 and 43 and opens into the chamber 29.

A rotary tapered valve 45 is journaled in the valve chamber 37 and is provided on its projecting smaller end with a handle 46. Its larger end is preferably pressed against by a seating spring 47 interposed between said end and a plug 48 that closes the larger end of the valve chamber 37. A suitable spring-pressed positioning device 49 operates against the larger end of the valve to hold it in its different positions, as hereinafter explained. The valve 45 has an internal chamber 50 provided with an intake port 51 that is movable

into and out of register with the supply port 42 of the nipple 41.

A set of ports, designated respectively 52, 53 and 54, is formed in the valve and said ports open into the internal chamber 50. These ports are so arranged with respect to one another that when the handle 46 is in its foremost position, as illustrated in Figures 11, 12 and 13, the port 52 will be in register with the passage 38 leading to the automatic distributing valve 40 of the drilling motor, the port 53 will be in communication with the passageway 44 leading to the chamber 29, and thence to the air tube 31 and the port 54 will be in communication with the passageway 43 leading to the drill rotating motor. At the same time the port 51 will register with the supply port 42. As a consequence, air or other motive fluid delivered to the nipple 41 will pass through the passageways 38, 43 and 44, resulting in the operation of the drilling motor and the drill steel rotating motor, and a supply of air will pass through the tube 31 and thence into the drill steel and escape from the cutting end so as to blow out the cuttings from the drill hole. It will be noted that the port 53 is relatively small, so that a moderate amount of air for cleansing purposes is utilized.

The rotary valve 45 is also provided with another set of ports 55 and 56 which are so related to the first-mentioned set that when the valve handle 46 is in its rearmost position, as shown in Figures 8, 9 and 10, the port 55 will afford communication between the internal chamber 50 of the valve 45 and the passageway 44 leading to the air tube 31, while the port 56 will establish communication between the said chamber 50 and the passageway 43, leading to the drill steel rotating motor. When the valve is so positioned as illustrated in Figure 10, the passageway 52 is in communication with the supply port 42 and consequently motive fluid will be supplied to the drill steel rotating motor and to the cleansing fluid delivery tube 31, while the drilling motor is cut off from supply. It is to be noted that the port 55 is materially greater in area than the port 53, so that a much larger supply of air is admitted to the tube 31 for cleansing purposes. This arrangement of ports is peculiarly desirable where there has become an accumulation of cuttings in the drill hole, which the normal supply through the port 53 will not take care of. The drilling operation is stopped, but the drill steel continues to rotate while a larger amount of cleansing fluid is delivered to secure the elimination of the accumulation which causes the steel to stick, thereby serving to free the steel.

When the valve is turned so that the handle is in a right angular position, or a position between the two extremes above described, as shown in Figures 5, 6 and 7, all three passageways 38, 43 and 44 are cut off from the supply and all the instrumentalities are inactive.

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.

What I claim, is:—

1. In a rock drill, the combination with a drilling motor and means for distributing motive fluid thereto, a drill rotating motor, and means independent of said distributing means for delivering cleansing fluid to a drill steel operated on by said motor, of motive fluid supply means having passageways communicating with the motors and cleansing fluid delivery means, and a common valve having individual ports movable into and out of communication with said passageways.

2. In a rock drill, the combination with a drilling motor and means for distributing motive fluid thereto, a drill rotating motor, and means independent of said distributing means for delivering cleansing fluid to a drill steel operated on by said motor, of passageways leading from a common intake of fluid supply to the respective motors and to the cleansing fluid delivery means, and a common valve at said intake of fluid supply and having a plurality of ports movable into and out of communication with the passageways.

3. In a rock drill, the combination with a drilling motor, of a drill rotating motor mounted on the front portion thereof, a tube mounted in the rear end of the drilling motor and extending to the front end thereof for delivering cleansing fluid to a drill steel operated on by the motors, a valve casing and passageways leading therefrom to the different motors and to the rear end of the tube, a common supply means for the motors and tube, communicating with the valve casing, and a rotary fluid supply controlling valve in the casing having supply ports movable into and out of communication with the different passageways.

4. In a rock drill, the combination with a drilling motor, of a drill rotating motor mounted on the front portion thereof, a tube mounted in the rear end of the drilling motor and extending to the front end thereof for delivering cleansing fluid to a drill steel operated on by the motors, a valve casing and separate passageways leading therefrom respectively to the different motors and to the rear end of the tube, a common fluid supply means opening into the valve casing and a rotary fluid supply controlling valve in the

casing having supply ports movable to positions to simultaneously maintain and cut off communication between the supply means and the different passageways.

5. In a rock drill, the combination with a drilling motor, of a drill rotating motor mounted on the front portion thereof, a tube mounted in the rear end of the drilling motor and extending to the front end thereof for delivering cleansing fluid to a drill steel operated on by the motors, a valve casing and passageways leading therefrom to the different motors and to the rear end of the tube, a common supply means opening into the casing and a rotary fluid supply controlling valve in the casing having a set of ports affording simultaneous communication with the different passageways and another set movable into and out of communication with the passageways leading to the drill rotating motor and the tube only.

6. In a rock drill, the combination with a drilling motor, of a drill rotating motor mounted on the front portion thereof, a tube for cleansing fluid mounted in the rear portion of the drilling motor and extending to the front portion thereof, a valve chamber with separate passageways leading therefrom respectively to the motors and to the tube, a fluid supply means opening into the valve chamber, and a valve in the chamber controlling the passage of fluid from the supply means to the various passageways.

7. In a rock drill, the combination with a drilling motor, of a drill rotating motor mounted on the front portion thereof, a tube for cleansing fluid mounted in the rear portion of the drilling motor and extending to the front portion thereof, a valve chamber with passageways leading therefrom respectively to the motors and tube, a fluid supply means opening into the valve chamber, and a valve in the chamber controlling the passage of fluid from the supply means to the various passageways, said valve having a position affording communication between the supply means and all the passageways simultaneously and another position affording communication between the supply means and the drill rotating motor and tube passageways, while cutting off the passageway to the drilling motor.

8. In a rock drill, the combination with a drilling motor, of a drill rotating motor mounted on the front portion thereof, a tube for cleansing fluid mounted in the rear portion of the drilling motor and extending to the front portion thereof, a valve chamber with separate passageways leading therefrom to the motors and tube, a fluid supply means opening into the valve chamber, and a rotary valve in the chamber controlling the passage of fluid from the supply means to the various passageways, said valve having a position affording communication between the supply means and all the passageways simultaneously and another position affording communication between the supply means and the drill rotating motor and tube passageways while cutting off the passageway to the drilling motor, and a position between said two positions when all communication is cut off.

9. In a rock drill, the combination with a drilling motor, of a drill rotating motor mounted on the front portion thereof, a tube for cleansing fluid mounted in the rear portion of the drilling motor and extending to the front portion thereof, a valve chamber with passageways leading therefrom to the motors and tube, a fluid supply means opening into the valve chamber, and a rotary valve in the chamber controlling the passage of fluid from the supply means to the various passageways, said valve having a set of ports that afford communication between the supply means and all the passageways simultaneously and another port that affords communication between the supply means and the tube when the valve is in a different position and allows a greater flow of fluid to the tube.

10. In a rock drill, the combination with a drilling motor, of a rotatable steel holding chuck at the front end thereof, a chuck rotating motor at the front portion of the drilling motor and geared to the chuck, a cleansing fluid conducting tube mounted in the rear end of the drilling motor and extending to the front portion of the same, a valve chamber on the drilling motor, passageways leading from the chamber to the drilling motor, to the chuck-rotating motor and to the tube respectively, fluid supply means opening into the chamber, and a rotary valve having an internal chamber that communicates with the supply means, said valve having a set of ports which when the valve is in one position affords simultaneous open communication between its internal chamber and the passageways, and another set of ports which when the valve is in another position affords communication between its internal chamber and the passageways leading to the chuck-rotating motor and to the tube, said latter set of ports allowing a greater flow of fluid to the tube than the first set.

11. In a rock drill, the combination with a drilling motor, a drill rotating motor, means for delivering cleansing fluid to a steel operated on by said motors, and a valve chamber, of passageways leading from said valve chamber respectively to the motors, a passageway leading from the valve chamber to the cleansing fluid delivering means and separate from the aforementioned passageways, and a common valve having individual ports movable into and out of communication with said passageways.

12. In a rock drill, the combination with a drilling motor, a drill rotating motor, means

for delivering cleansing fluid to a steel operated on by said motors, and a valve chamber, of passageways leading from said valve chamber respectively to the motors, a passageway leading from the valve chamber to the cleansing fluid delivering means and separate from the aforementioned passageways, and a common valve having individual ports movable into and out of communication with said passageways, said ports being so disposed that when the valve is in one position fluid will be supplied to the motors and cleansing fluid supply means simultaneously and when the valve is in another position fluid will be cut off from the drilling motor, supplied to the drill rotating motor and supplied to the cleansing fluid supply means in greater quantity than when the valve is in its said first mentioned position.

In testimony whereof, I affix my signature.

AUGUST H. KATTERJOHN.