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BLOWING DEVICE

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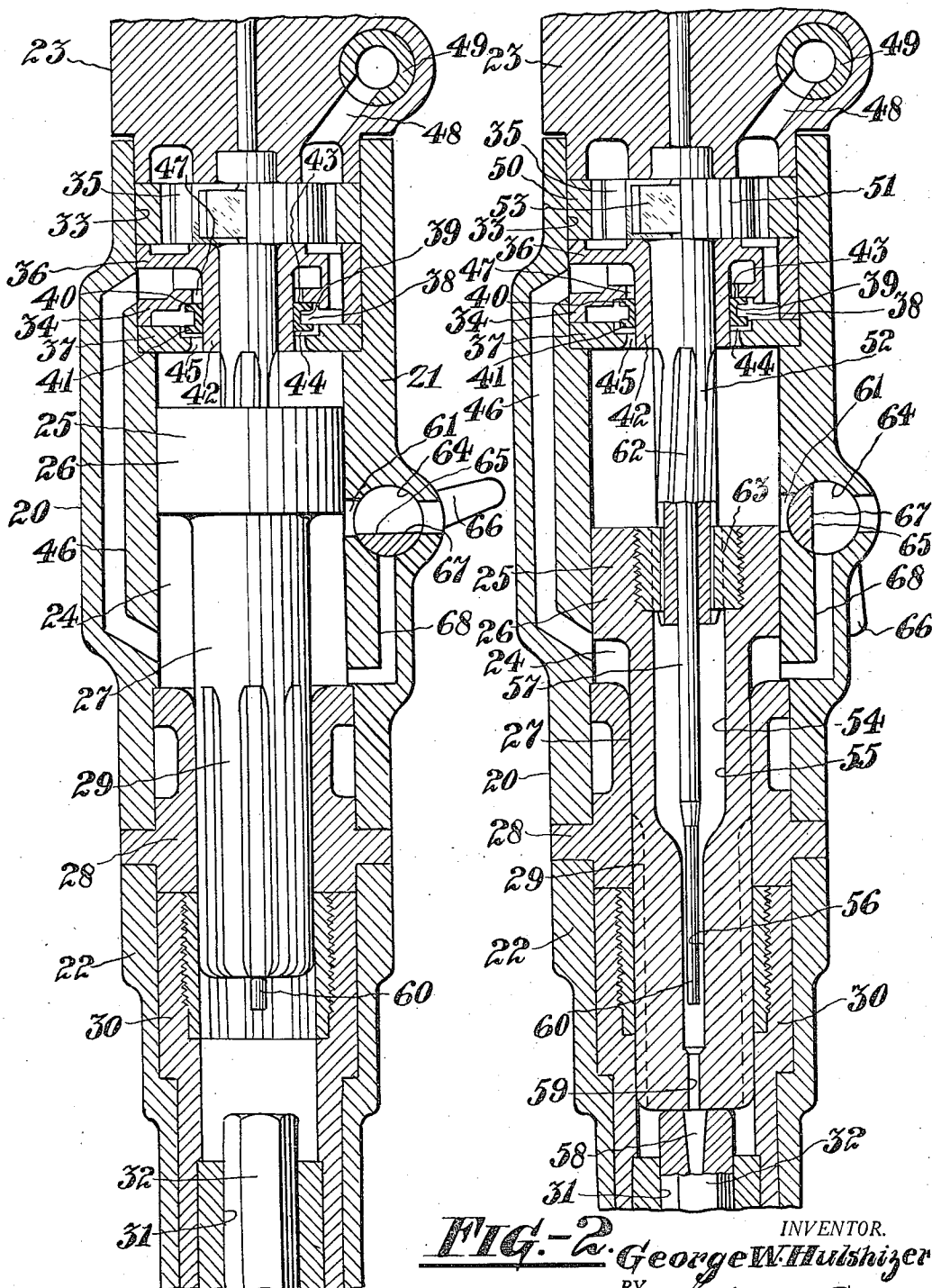


FIG.-1.

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UNITED STATES PATENT OFFICE

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BLOWING DEVICE

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4 Claims. (Cl. 121—10)

This invention relates to rock drills, but more particularly to a blowing device for fluid actuated rock drills of the hammer type.

One object of the invention is to permit the introduction of an uninterrupted volume of pressure fluid, under full line pressure, into the drill hole to remove the cuttings therefrom.

Another object is to establish an uninterrupted and direct path for pressure fluid from the rear end of the cylinder to the drill hole and thereby prevent leakage of pressure fluid through the front end parts of the drill.

Other objects will be in part obvious and in part pointed out hereinafter.

In the drawing accompanying this specification and in which similar reference numerals refer to similar parts,

Figures 1 and 2 are sectional elevations of a rock drill constructed in accordance with the practice of the invention and showing the parts in the normal running and blowing positions, respectively.

Referring more particularly to the drawing, 20 designates a rock drill including in its organization a cylinder 21 and front and back heads 22 and 23, respectively. These parts constitute the casing of the rock drill and may be clamped securely together in the correct assembled relationship by the usual side rods (not shown).

The cylinder 21 is bored to provide a piston chamber 24 for the accommodation of a reciprocatory hammer piston 25, of the differential type, comprising a head 26 and a stem 27 at the front end of the head 26. The stem 27 extends through and is guided by a front cylinder washer 28 which forms a closure for the front end of the piston chamber 24.

On the front portion of the stem 27 are longitudinal ribs 29 which slidably engage chuck mechanism 30 rotatable in the front head 22. The chuck mechanism 30 may be of any well known type and is shown as being provided, in the present instance, with a polygonal bore 31 for the accommodation of a working implement of corresponding shape of which only the shank 32 is shown.

In the rear end of the cylinder 21 is an enlarged recess 33 for the accommodation of valve mechanism 34, whereby the distribution of pressure fluid to the piston chamber is effected, and rotation mechanism 35 for causing rotary movement of the working implement 32. The valve mechanism selected for the purpose of illustration comprises a valve chest 36 which seats upon a plate

37 serving as a closure for the rear end of the piston chamber 24.

The valve chest 36 and the plate 37 are suitably recessed to provide a valve chamber 38 for the accommodation of a distributing valve 39 consisting of a sleeve having lateral flanges 40 and 41 at its rear and front ends, respectively. The valve 39 is guided by a hollow stem 42 on the front end of the valve chest. The rear and front ends of the valve constitute actuating surfaces 43 and 44, respectively, against which compression acts to initiate movement of the valve.

In the plate 37 is an inlet passage 45 which encircles the stem 42 and opens directly into the rear end of the piston chamber. The pressure fluid for the front end of the piston chamber is conveyed thereto by a front inlet passage 46 in the cylinder and communicating with an annular port 47 at the rear end of the valve chamber 38 and controlled by the adjacent end of the valve. Pressure fluid distributed by the valve is conveyed to the valve chamber 38 by a supply passage 48 leading from a throttle valve 49 in the back head 23.

The rotation mechanism 35 may be of a well known type comprising a ratchet ring 50 which is seated upon the valve chest 36 and pressed thereagainst by the back head 23. Within the ratchet ring 50 is the head 51 of a rifle bar 52 extending through the valve chest and interlockingly engaging the piston 25. The head 51 carries the usual spring-pressed pawls 53 which cooperate with the ratchet ring 50 to hold the rifle bar stationary during one of the strokes of the piston 25 and thus cause the piston to describe a partial revolution for rotating the working implement.

The aperture or bore 54 in the piston 25 and into which the rifle bar 52 extends consists of a number of portions of different diameters including one designated 55 wherein the rifle bar lies. The portion 55 is of sufficient length to prevent impact of the piston against the rifle bar, and forwardly thereof is a reduced portion 56 for the accommodation of a water tube 57 extending from the back head, through the drill, to supply cleansing fluid to a passage 58 in the working implement for cleansing the drill hole.

The portion 56 is only of slightly larger diameter than the body of the water tube 57 and the front end 59 of the bore 54 is still further reduced to accommodate a reduced nozzle 60 constituting the front end of the water tube.

The portions of different diameter of the water tube and the bore 54 are preferably so arranged

that throughout the accelerating portion of the working stroke of the piston there will be no loss of motivating fluid through the piston but that substantially effective seals will be maintained between the water tube and the restricted portions of the bore 54 until the rear end of the piston 25 uncovers a free exhaust port 61 of the piston chamber and which is normally controlled by the head 26 of the piston. Pressure fluid may, however, pass freely into the enlarged portion 55 of the bore 54 through the usual clearances existing between the ribs 62 of the rifle bar 52 and those of a rifle nut 63 threaded into the rear end of the piston and engaged by the rifle bar.

In accordance with the present invention means are provided for periodically effecting a thorough cleansing of the drill hole whenever the detritus resulting from drilling accumulates and interferes with the progress of the work. To this end the cylinder 21 is provided with a bore 64 which bisects the free exhaust port 61 and contains a blower valve 65 having a lever 66 for its manipulation. In the side of the valve 65 is a recess 67 to communicate the inner and outer ends of the exhaust port 61. In the same longitudinal plane as the recess 67 and leading from the bore 64 to the front end of the piston chamber 24 is a passage 68 through which the front end of the piston chamber may be communicated with the atmosphere but which, during normal drilling, is sealed by the valve 65.

The operation of the device is as follows: During normal drilling the blower valve 65 occupies the position illustrated in Figure 1. In this position of the blower valve the inner and outer ends of the free exhaust port 61 are in communication with each other through the recess 67 so that the pressure fluid used for actuating the piston 27 may exhaust freely to the atmosphere near the end of each stroke of the piston, as is customary.

Whenever drilling progress is being impeded by accumulated cuttings in the drill hole the blower valve 65 is shifted to the position illustrated in Figure 2 to close the free exhaust port 61 and to open the passage 68. The front end of the piston chamber 24 and the port 47 at the rear end of the valve 39 will then be communicated with the atmosphere. In consequence, the valve 39 will be caused to assume its rearmost position in the valve chamber to prevent the admission of pressure fluid to the front end of the piston chamber and to communicate the valve chamber with the rear end of the piston.

In this position of the distributing valve pressure fluid flows into the rear end of the piston chamber and actuates the piston forwardly and holds it firmly against the working implement. Pressure fluid will then flow through the bore 54 and the passage 58 to the drill hole for freeing it of detritus. The parts will remain in these positions as long as the blower valve 65 remains closed. After the drill hole has been cleansed the blower valve may be shifted to open the exhaust port 61 and to close the passage 68, after which normal drilling will be resumed.

As will be readily apparent, by venting the front end of the piston chamber the pressure fluid in the rear end of the piston chamber, and a portion of which is utilized for cleansing the drill hole, will maintain the piston seated firmly against the working implement. There will, therefore, be a direct path from the source of pressure fluid supply to the drill hole and the loss of pressure fluid through clearances resulting from wear of the chuck and associated parts will, therefore, be eliminated.

I claim:

1. In a fluid actuated rock drill, a cylinder having inlet and exhaust ports, a hollow piston therein, a hollow working implement to receive the blows of the piston, means for distributing pressure fluid to the ends of the cylinder, and means for selectively venting the front end of the cylinder and closing the exhaust port to enable the pressure fluid in the rear end of the cylinder to hold the piston stationary against the drill steel and thereby establish an uninterrupted path for pressure fluid from the rear end of the cylinder to the hole being drilled.

2. In a fluid actuated rock drill, a cylinder having inlet and exhaust ports, a hollow piston therein, a hollow working implement to receive the blows of the piston, a valve to distribute the pressure fluid to the ends of the cylinder, an atmospheric vent for the front end of the cylinder, and a valve normally closing the vent and being shiftable to close the exhaust port and to open the vent for communicating the front end of the cylinder with the atmosphere, thereby enabling the pressure fluid in the rear end of the cylinder to hold the piston stationary against the drill steel to establish an uninterrupted path for pressure fluid from the rear end of the cylinder to the hole being drilled.

3. In a fluid actuated rock drill, the combination of a cylinder having an exhaust port and a hollow piston in the cylinder normally controlling the exhaust port, a hollow working implement to receive the blows of the piston, a valve to distribute the pressure fluid to the ends of the cylinder, an atmospheric vent for the front end of the cylinder, and a valve to simultaneously close the exhaust and open the vent, thereby entrapping pressure fluid in the rear end of the cylinder to press the piston against the drill steel and to supply pressure fluid through the piston and the drill steel to the drill hole and venting the front end of the cylinder to the atmosphere.

4. In a fluid actuated rock drill, a cylinder having inlet and exhaust ports, a hollow piston reciprocable therein, valve means to distribute pressure fluid alternately to each end of the cylinder, a vent for the forward end of the cylinder, and means to close the exhaust port and open the vent whereby the reciprocation of the piston is arrested at the end of its forward stroke and pressure fluid in the rear part of the cylinder is forced through the hollow piston.

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