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W. A. MORRISON

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BLOWING DEVICE

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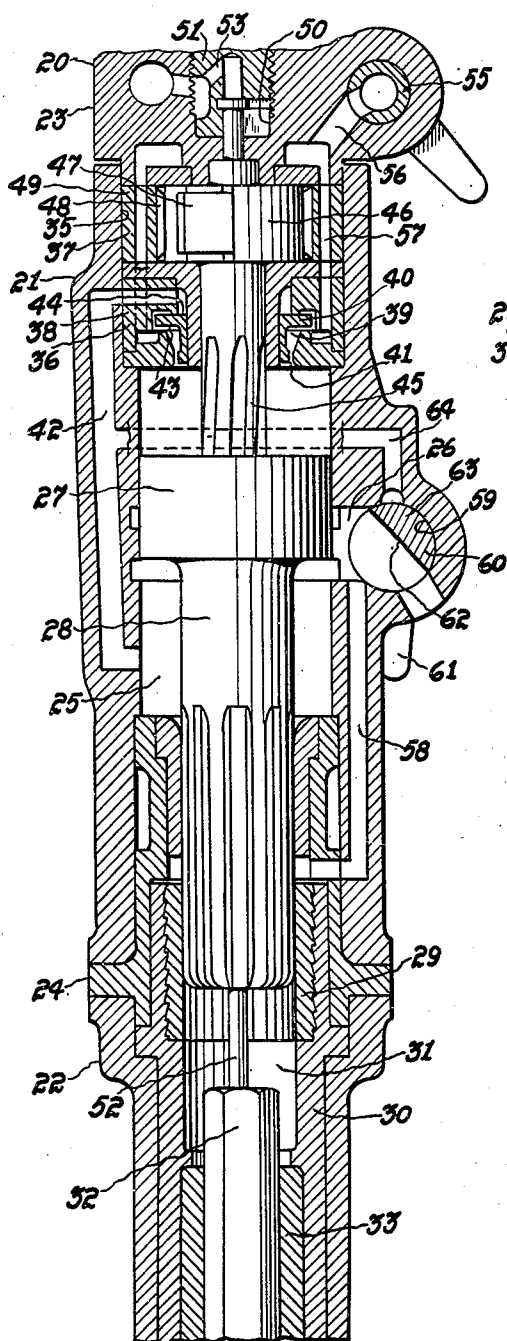


FIG. 1.

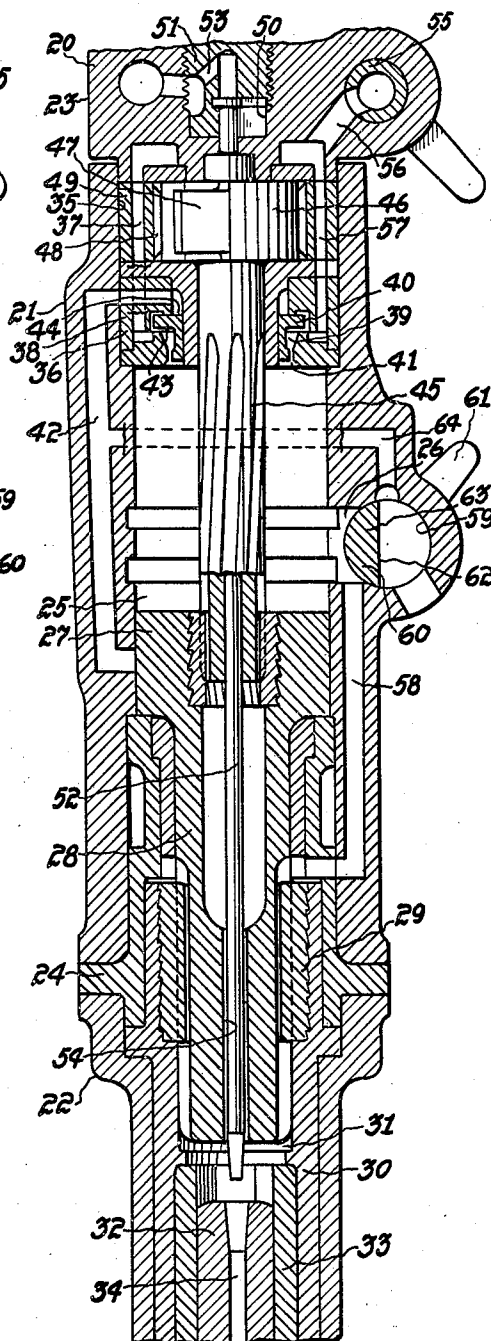


FIG. 2.

INVENTOR
William A. Morrison
BY *Charles*
HIS ATTORNEY.

UNITED STATES PATENT OFFICE

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BLOWING DEVICE

William A. Morrison, Easton, Pa., assignor to
Ingersoll-Rand Company, New York, N. Y., a
corporation of New Jersey

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4 Claims. (Cl. 121-10)

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

One object of the invention is to assure an uninterrupted flow of pressure fluid under full line pressure into a drill hole for removing the rock cuttings whenever the means ordinarily performing the cleansing function prove inadequate for maintaining a clean working surface.

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,

Figure 1 is an elevation, partly in section, of a rock drill equipped with a blowing device constructed in accordance with the practice of the invention and showing the valve and piston elements of the rock drill in positions which they may assume during the normal operation of the rock drill, and

Figure 2 is a similar view showing the valve and piston elements in the positions which they will occupy when the blowing device is in operation.

Referring more particularly to the drawing, 20 designates a rock drill comprising, as casing parts, a cylinder 21, front and back heads 22 and 23, respectively, and a front cylinder washer 24 interposed between the cylinder and the front head 22 and extending part way into each to centralize them with respect to each other.

The cylinder 21 is suitably bored to provide a piston chamber 25 having a free exhaust port 26 and containing a reciprocatory hammer piston 27 that controls the exhaust port 26. The piston 27 is of the differential type, having a fluted extension 28 at its front end which extends slidably through the front cylinder washer 24 and is interlockingly engaged, in a well known manner, with a chuck nut 29 threaded into a hollow chuck 30 rotatable in the front head 22.

The interior of the chuck nut 29 and the adjacent portion of the interior of the chuck 30 constitute a cavity 31 into which extends the shank end 32 of a working implement, such as a drill steel, to receive the blows of the hammer piston 27. The drill steel is suitably guided by a bushing 33 within the chuck 30 and has an opening 34 extending axially therethrough for conveying cleansing medium into the hole being drilled.

In the rearward end of the cylinder 21 is an enlarged bore 35 to accommodate a valve mechanism 36 and a rotation mechanism 37, the valve

mechanism 36 being arranged in the bottom of the bore 35 to form a closure for the rearward end of the piston chamber 25. The rotation mechanism, in turn, seats upon the valve mechanism and serves as a seat for the back head 23 which may be clamped in assembled position in any well known manner.

The valve mechanism 36 is of the type shown in United States Patent No. 1,975,229 to G. W. Hulshizer and accordingly comprises a valve chest 38 having a valve chamber 39 to accommodate a valve 40 that serves to distribute the pressure fluid to the ends of the piston chamber 25 for actuating the piston 27. The pressure fluid used for this purpose flows into the rearward end of the piston chamber through an inlet passage 41 in the front end of the valve chest 38, and pressure fluid is conveyed to the front end of the piston chamber by an inlet passage 42 leading from the rearward end of the valve chamber 39 to the front end of the piston chamber 25. The inlet passages 41 and 42 also serve, respectively, to convey actuating fluid to front and rear pressure surfaces 43 and 44 on the valve 40 for moving said valve to its limiting positions.

The rotation mechanism 37 may also be of a well known type comprising a rifle bar 45 that extends through the valve mechanism and into the piston 27 wherewith it is slidably interlocked. The rifle bar carries the usual head 46 having pawls 47 for cooperation with the teeth 48 of a ratchet ring 49, encircling the head 46, to determine the rotative and stationary periods of the rifle bar, and therefore, of the piston and the elements interlockingly connected with the piston.

The ratchet ring 49 is held firmly against the valve chest 38 by the back head, and in the latter is a cavity 50 to accommodate a plug 51 that serves as an anchor for an end of a water tube 52 to which water is conveyed by a supply passage 53. The water tube extends through the rifle bar 45 and the piston 27 and, normally, into the rearward end of the passage 34 in the working implement. Preferably the restricted portion 54 of the bore in the piston 27 through which the tube 52 extends is sufficiently larger than the tube so that pressure fluid passing through the flutes in the rifle bar 45 into the piston may also flow readily through the restricted portion 54 into the cavity 31 and into the passage 34 in the working implement.

The pressure fluid thus passing through the piston flows from the rearward end of the piston chamber and its flow must, therefore, be inter-

mittent since in the normal operation of the rock drill the ends of the piston chambers are charged alternately for actuating the piston.

The back head also serves as a housing for a throttle valve 55, of a well known type, for controlling communication between pressure fluid supply (not shown) and the distributing valve mechanism. Such pressure fluid passes from the throttle valve through a supply passage 56 in the back head and through branch passages 57 leading from the supply passage to the valve chamber 39 for distribution to the piston chamber.

In practice, it has been found that in rock drills in which intermittent puffs of fluid medium are delivered to the drill hole for cleansing it, the volume of such pressure fluid is not sufficient under all conditions of operation to maintain the working surface free of detritus. It is, therefore, desirable that means be provided to enable the introduction of an unrestricted and, if required, a prolonged supply of pressure fluid into the drill hole to expel any undue accumulation of cuttings therein. In furtherance of this end the cylinder is provided with a cleansing fluid supply passage 58 that extends, in the form of construction shown, from the exhaust port 26 to the rearward end of the cavity 31. The cylinder 21 is, moreover, provided with a bore 59 that intersects the exhaust port 26 and contains a rotary valve 60 which may be turned to its controlling positions by a lever 61.

A notch 62 is formed in the side of the valve 60 to afford communication between the innermost and outermost portions of the exhaust port 26, and the remaining or wall portion 63 of the valve 60 located in the same transverse plane as the notch 62 serves to blank off the inner portion of the exhaust port 26 from the bore 59 in what may be termed the closed position of the valve 60. The bore 59 is located outside of the point of communication of the passage 58 with the exhaust port 26 so that, in the limiting positions of the piston, the passage 58 will at all times be in communication with the piston chamber 25.

In order to assure a continuous flow of pressure fluid to the piston chamber through the passage 58 into the cavity 31 it is contemplated to hold the piston and the valve 40 stationary in limiting positions. This is brought about by venting the rearward end of the valve chamber 39 to the atmosphere through a conduit 64 leading from the inlet passage 42 to the exhaust port 26. The conduit 64 opens into the exhaust port 26 at a point where it will be normally covered by the wall portion 63 of the valve 60 when said valve is in position to permit the free passage of fluid from the piston chamber to the atmosphere.

The point of communication of the conduit 64 with the bore 59 is thus also so located that when the valve 60 occupies a position to blank off the inner portion of the exhaust port the pressure surface 44 will be in direct communication with the atmosphere.

During the normal operation of the rock drill, and with the manually operable valves 55 and 60 in the positions shown in Figure 1 of the drawing, pressure fluid will be distributed by the valve 40 to the ends of the piston chamber for actuating the piston 27. At the same time water will flow through the tube 52 and the passage 34 in the working implement into the drill hole, and upon each forward stroke of the piston a portion of pressure fluid will flow from the rearward end of the piston chamber through the piston into

the cavity 31 and through the working implement to augment the pressure of the cleansing water.

Whenever it is found that the intermittent puffs of pressure fluid through the piston are of insufficient volume to maintain the drill hole free of cuttings the valve 60 is rotated, to the position shown in Figure 2, to prevent the exhaust of pressure fluid from the piston chamber through the exhaust port 26 to the atmosphere and to uncover the conduit 64. The pressure fluid acting against the pressure surface 43 of the valve 40 will then move said valve rearwardly to cut-off the flow of pressure fluid from supply to the inlet passage 42 and to effect a full area of communication between pressure fluid supply and the inlet passage 41 for charging the rearward end of the piston chamber 25.

Under these conditions the pressure fluid in the rearward end of the piston chamber will hold the piston 27 stationary in its foremost limiting position. The portion of the exhaust port 26 lying between the piston chamber and the bore 59 will then be fully uncovered and pressure fluid will flow from the rearward end of the piston chamber through the passage 28 into the cavity 31, thence through the working implement into the drill hole. After the drill hole has been cleansed the valve 60 is again returned to its initial position and the rock drill may then resume operation to drive the working implement.

I claim:

1. In a fluid-actuated rock drill, the combination of a casing having a piston chamber and a free exhaust port therefor, a reciprocatory piston in the piston chamber to control the exhaust port, a valve for effecting the distribution of pressure fluid to the piston chamber to actuate the piston, a cavity in the casing, a passage to afford constant communication between the intermediate portion of the piston chamber and the cavity, and means for selectively preventing the exhaust of fluid from the piston chamber through the exhaust port to the atmosphere and to cause the valve and the piston to respectively assume positions for charging an end of the piston chamber and to permit the flow of pressure fluid from such end of the piston chamber into and through the passage to the cavity.

2. In a fluid-actuated rock drill, the combination of a casing having a piston chamber and a free exhaust port therefor, a reciprocatory piston in the piston chamber to control the exhaust port, a valve for effecting the distribution of pressure fluid to the piston chamber for actuating the piston, a cavity in the casing, a passage in the casing to afford constant communication between the cavity and the intermediate portion of the piston chamber, and means for selectively closing the exhaust port and to cause the valve to assume a position to charge the rear end of the piston chamber for holding the piston stationary in the front end of the piston chamber to uncover the passage and permit the flow of pressure fluid from the piston chamber into the cavity.

3. In a fluid-actuated rock drill, the combination of a casing having a piston chamber and a free exhaust port therefor, a reciprocatory piston in the piston chamber to control the exhaust port, a valve for effecting the distribution of pressure fluid to the piston chamber for actuating the piston and having a pressure surface, a cavity in the casing, a passage in the casing leading from the cavity to the exhaust port and being in constant communication with the piston

chamber through the exhaust port, a conduit in the casing to afford communication between the pressure surface and the exhaust port, and a manually operable valve to control the exhaust port and the conduit to cause the valve to assume a position to charge only one end of the piston chamber and thereby hold the piston stationary in a position to permit the flow of pressure fluid from the piston chamber through the passage into the cavity.

4. In a fluid actuated rock drill, the combination of a casing having a piston chamber and a free exhaust port therefor, a reciprocatory piston in the piston chamber to control the exhaust port, a valve for effecting the distribution of pressure fluid to the piston chamber to actuate the piston and having a pressure surface, a cavity

5 in the casing, a passage leading from the exhaust port to the cavity and being in constant communication with the piston chamber through the exhaust port, a conduit in the casing to afford communication between the pressure surface and the atmosphere, and control means for selectively preventing the exhaust of fluid from the piston chamber through the exhaust port to the atmosphere and to communicate the conduit with the atmosphere to cause the valve to assume a position for charging one end of the piston chamber to hold the piston in position to uncover the exhaust port and thereby permit the flow of pressure fluid from the piston chamber through the passage into the cavity.

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WILLIAM A. MORRISON.