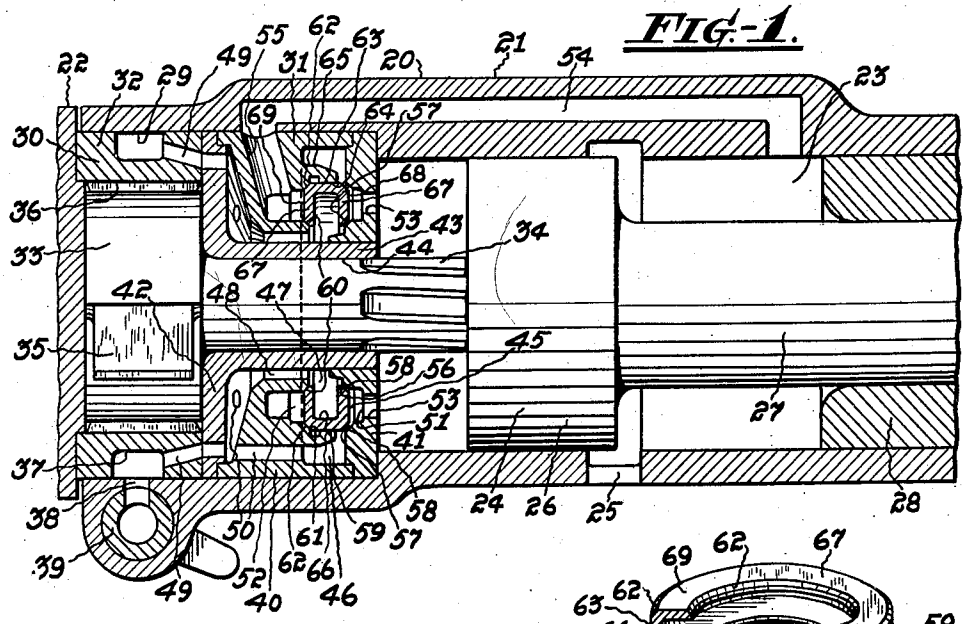
Feb. 20, 1945. W. E. CARR 2,369,714

VALVE FOR ROCK DRILLS

Filed Sept. 30, 1943

FIG.-1.



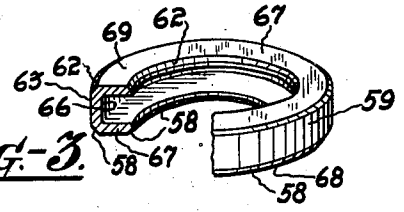


FIG.-3.

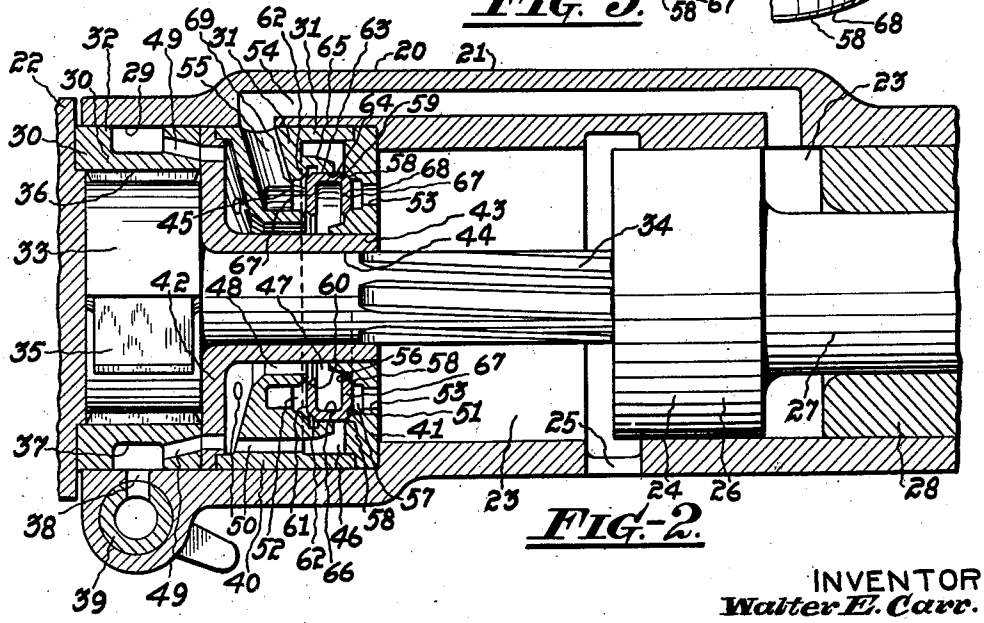


FIG.-2.

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VALVE FOR ROCK DRILLS

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Application September 30, 1943, Serial No. 504,388

9 Claims. (Cl. 121—19)

This invention relates to rock drills, and more particularly to a distributing valve for a fluid actuated rock drill of the reciprocatory piston type.

One object of the invention is to obtain a light weight valve capable of effecting a rapid distribution of pressure fluid to the piston chamber with a minimum lift of the valve.

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 longitudinal elevations, partly broken away, of a rock drill equipped with valve mechanism constructed in accordance with the practice of the invention and respectively showing the valve in positions to admit pressure fluid to the rear and front ends of the piston chamber, and

Figure 3 is a perspective view, partly broken away, of the distributing valve.

Referring more particularly to the drawing, 20 designates, in general, a rock drill comprising as casing parts, a cylinder 21 and a back head 22 that may be secured to the cylinder in any well known manner.

The cylinder 21 is bored to provide a piston chamber 23 for the accommodation of a reciprocatory hammer piston 24 and has a free exhaust port 25 that is controlled by the piston 24. The piston is shown as being of the differential type having a head 26 and a stem 27 that extends slidably through a front cylinder washer 28 forming a closure for the front end of the piston chamber.

In the rearward end of the cylinder is an enlarged bore 29 to accommodate rotation mechanism 30 and valve mechanism 31, the latter being arranged adjacent the rearward end of the piston chamber 23. The rotation mechanism is shown as being of a well known type including a ratchet ring 32 that rests upon the valve mechanism 31 and in turn serves as a seat for the back head 22. Within the ratchet ring 32 is a head 33 of a rifle bar 34 that extends through the valve mechanism and is in fluted engagement with the hammer piston 24, as is customary. The head 33 carries the usual pawls 35 to cooperate with teeth 36 on the inner surface of the ratchet ring 32 for determining the direction of rotation of the rifle bar 34 and thus of the piston 24.

In the outer surface of the ratchet ring 32 is an annular groove 37 that is in constant communication with a pressure fluid supply port 38 in the wall of the cylinder 21, and a throttle valve 39 rotatable in the adjacent portion of the cylinder 21 controls communication between the port 38 and a source of pressure fluid supply (not shown).

The valve mechanism 31 constructed in accordance with the practice of the invention comprises an intermediate plate 40 and front and rear plates 41 and 42, respectively. The rear plate 42, upon which the ratchet ring 32 rests, acts as a bearing for the forward surface of the head 33 and has an integral hollow stem 43 that extends through the plate 40 and into the plate 41 and serves as a bearing 44 for the rifle bar 34.

The front end of the plate 40 is recessed to provide an annular valve chamber 45 and supply chambers 46 and 47 that open into the valve chamber 45 and lie, respectively, outside and inside of said valve chamber. The supply chamber 47 is in constant communication with the annular groove 37 in the ratchet ring through an annular passage 48 defined by the plates 40—42 and the stem 43 and through passages 49 in the plate 42 and the ratchet ring 32. Pressure fluid is conveyed to the supply chamber 46 by passages 50 in the plate 40 leading from the annular passage 48 to said supply chamber.

In the front and rear ends of the valve chamber 45 are annular grooves 51 and 52, respectively, and from the groove 51 lead a plurality of inlet passages 53 to the rearward end of the piston chamber 23 to convey pressure fluid thereto for driving the piston 24 forwardly on its working stroke. The pressure fluid serving to actuate the piston rearwardly is conveyed to the front end of the piston chamber 23 by an inlet passage 54 in the wall of the cylinder 21 communicating with the annular groove 52 through a passage, or passages 55 in the plate 40.

The open side of the groove 51 adjacent the valve chamber 45 is flared having inner and outer bevelled surfaces 56 and 57 that constitute seats for correspondingly shaped surfaces 58 on the front end of a valve 59 reciprocable in the valve chamber for controlling the flow of pressure fluid to the inlet passages. In like manner, inner and outer bevelled surfaces 60 and 61 are formed around the mouth of the groove 52 to serve as seats for bevelled surfaces 62 on the rearward side of the valve 59.

In the form of the invention illustrated, the valve 59 consists of a ring-shaped member the peripheral surface 63 of which is slidable upon the interior surface 64 of a flange 65 depending

from the plate 40. The weight of the valve is preferably minimized by forming an internal groove 66 within the valve and when thus constructed the ends of the valve are in the form of introverted flanges 67. The internal groove 66 may, as indicated, be of large area and is in constant communication with the supply chamber 47 so that a large supply of pressure fluid will be constantly available adjacent the innermost seating surfaces 56 and 60 for charging the ends of the piston chamber.

The front and rear ends of the valve constitute actuating and holding surfaces 68 and 69, respectively. They are subjected to air compressed in the piston chamber by the piston for throwing the valve to its limiting position and to the pressure fluid flowing from the supply chambers to the inlet passages for holding the valve in such limiting positions.

The operation of the device is as follows: With the valve in the rearmost limiting position illustrated in Figure 1 of the drawing, pressure fluid flows from the supply chambers 46 and 47 through the groove 51 and the inlet passages 53 into the rearward end of the piston chamber and drives the piston 24 forwardly on its working stroke. The valve will remain in this position and pressure fluid will continue to flow into the rearward end of the piston chamber until the piston reaches a position where its rearward end will uncover the exhaust port 25. The pressure forwardly of the valve will then drop abruptly. At the same time the air forwardly of the exhaust port 25 will be compressed by the piston and such compression, acting against the actuating surface 69, will throw the valve forwardly against the seating surfaces 56 and 57.

In the new position of the valve, pressure fluid flows from the supply chamber 47 through the space defined by the surfaces 60 and 62 into the groove 52, thence through the passages 55 and 54 into the front end of the piston chamber to drive the piston rearwardly to its initial position. When, during its rearward stroke, the piston again uncovers the exhaust port 25 the pressure acting against the surface 69 will drop and the air compressed in the rearward end of the piston chamber by the piston and acting against the actuating surface 68 will then shift the valve rearwardly to its initial position against the seating surfaces 60 and 61. During the subsequent charging of the rearward end of the piston chamber the valve will be held stationary by the pressure fluid flowing across the actuating surface 68 into the inlet passage 53.

From the foregoing description, it will be apparent that the valve is particularly well suited for operation at low lift. This is due to the fact that a wide flow area may be provided between pressure fluid supply and the inlet passages, the passages 53 in the present instance, with a low lift of the valve. This is highly desirable, particularly during the charging of the rearward end of the piston chamber which is of large volume, as compared with the front end, and permits of said rearward end of the piston chamber being charged in a minimum period of time.

I claim:

1. A fluid actuated rock drill, comprising a casing having a piston chamber and an exhaust port therefor, a reciprocatory piston in the piston chamber, a valve chest having a valve chamber, inlet passages leading from the valve chamber to the piston chamber, a pair of annular supply chambers for pressure fluid in the valve chest, and a valve in the valve chamber to uncover one supply chamber to admit pressure fluid to one inlet passage in one position of the valve and to uncover both supply chambers to admit pressure fluid to another inlet passage in another position of said valve.

2. A fluid actuated rock drill, comprising a casing having a piston chamber and an exhaust port therefor, a reciprocatory piston in the piston chamber, a valve chest having an annular valve chamber, a supply chamber opening into the inner side of the valve chamber, a supply chamber opening into the outer side of the valve chamber, inlet passages leading from the ends of the valve chamber to the piston chamber, and a valve to alternately uncover one supply chamber to admit pressure fluid into one inlet passage and to uncover both supply chambers to admit pressure fluid into the other inlet passage.

3. A fluid actuated rock drill, comprising a casing having a piston chamber and an exhaust port therefor, a reciprocatory piston in the piston chamber, a valve chest having an annular valve chamber, inlet passages leading from the valve chamber to the ends of the piston chamber, inner and outer annular supply chambers lying respectively within and outside of the valve chamber and opening thereinto, and an annular valve to uncover the inner supply chamber to admit pressure fluid into one inlet passage in one position of the valve and to uncover both supply chambers to admit pressure fluid into the other inlet passage in another position of the valve.

4. A fluid actuated rock drill, comprising a casing having a piston chamber and an exhaust port therefor, a reciprocatory piston in the piston chamber, a valve chest having an annular valve chamber, front and rear inlet passages leading from the valve chamber to the front and rear ends of the piston chamber, inner and outer supply chambers lying respectively inside and outside of the valve chamber and opening thereinto, and an annular valve to alternately uncover the inner supply chamber to admit pressure fluid into the front inlet passage and to uncover both supply chambers to admit pressure fluid into the rear inlet passage.

5. A fluid actuated rock drill, comprising a casing having a piston chamber and an exhaust port therefor, a reciprocatory piston in the piston chamber, a valve chest having an annular valve chamber, front and rear inlet passages leading from the valve chamber to the front and rear ends of the piston chamber, inner and outer supply chambers in the same transverse plane as the valve chamber lying respectively inside and outside of the valve chamber and opening thereinto, a ring-shaped valve in the valve chamber to control communication between the outer supply chamber and the rear inlet passage, an introverted flange on the valve to control communication between the inner supply chamber and the rear inlet passage, and a second introverted flange on the valve to control communication between the inner supply chamber and the front inlet passage.

6. A fluid actuated rock drill, comprising a casing having a piston chamber and an exhaust port therefor, a reciprocatory piston in the piston chamber, a valve chest having a pair of concentrically arranged supply chambers and a valve chamber between the supply chambers and opening thereinto, inlet passages leading from the valve chamber to the piston chamber, a ring-shaped valve in the valve chamber to control

communication between the outermost supply chamber and one inlet passage, an introverted flange on the valve to control communication between the innermost supply chamber and the said one inlet passage, a second introverted flange on the valve to control communication between the innermost supply chamber and the other inlet passage, and actuating surfaces subjected to compression flowing from the piston chamber for throwing the valve to its limiting positions, said actuating surfaces being subjected to pressure fluid flowing to the inlet passages for holding the valve.

7. A fluid actuated rock drill, comprising a casing having a piston chamber and an exhaust port therefor, a reciprocatory piston in the piston chamber, a valve chest having a valve chamber and a pair of supply chambers opening into the valve chamber, a valve in the valve chamber to valve pressure fluid from one supply chamber to one inlet passage in one position of the valve and to valve pressure fluid from both supply chambers to the other inlet passage in another position of the valve, and opposed actuating surfaces on the valve intermittently subjected to compression flowing from the piston chamber for throwing the valve and subjected to pressure fluid flowing to the inlet passages for holding the valve in its limiting positions.

8. A fluid actuated rock drill, comprising a casing having a piston chamber and an exhaust port therefor, a reciprocatory piston in the piston chamber, a valve chest having a valve chamber and a pair of supply chambers opening thereinto, inlet passages leading from the valve chamber to the piston chamber, a ring-shaped valve to control communication between one supply chamber and one inlet passage and having a laterally extending flange to control communication between the other supply chamber and the said one inlet passage, and a second laterally extending flange on the valve to control communication between the said other supply chamber and another inlet passage.

9. A fluid actuated rock drill, comprising a casing having a piston chamber and an exhaust port therefor, a reciprocatory piston in the piston chamber, a valve chest having a valve chamber and a pair of supply chambers opening thereinto, inlet passages leading from the valve chamber to the piston chamber, a ring-shaped valve to control communication between one supply chamber and one inlet passage and having a laterally extending flange to control communication between the other supply chamber and the said one inlet passage, a second laterally extending flange on the valve to control communication between the said other supply chamber and another inlet passage, and opposed actuating surfaces on the valve subjected intermittently to compression flowing from the piston chamber for throwing the valve and subjected to pressure fluid flowing to the inlet passages for holding the valve in its limiting positions.

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