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VALVE FOR ROCK DRILLS

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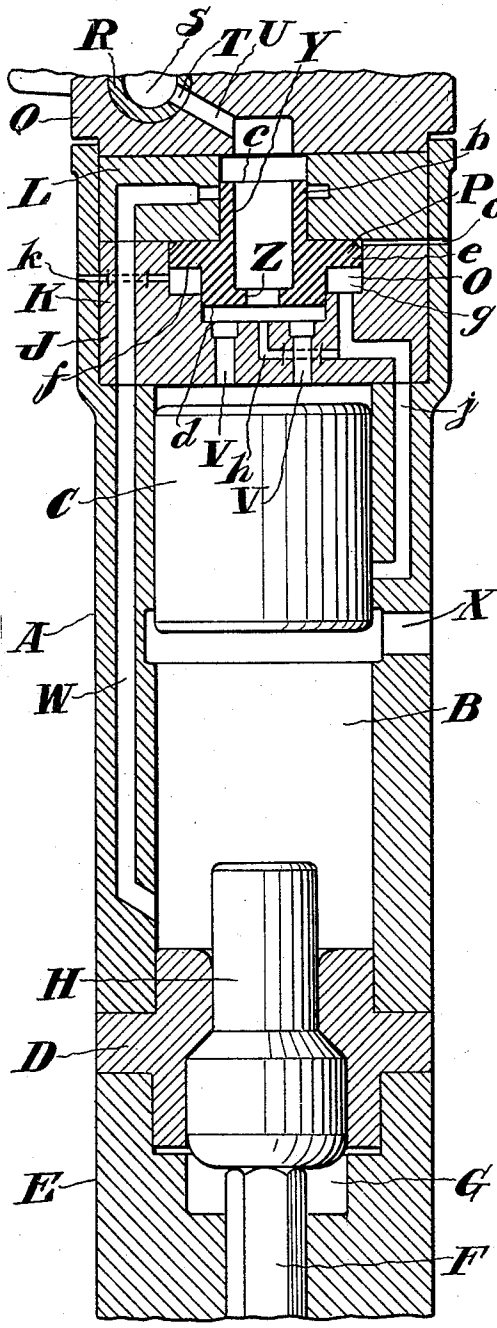

FIG.-1.

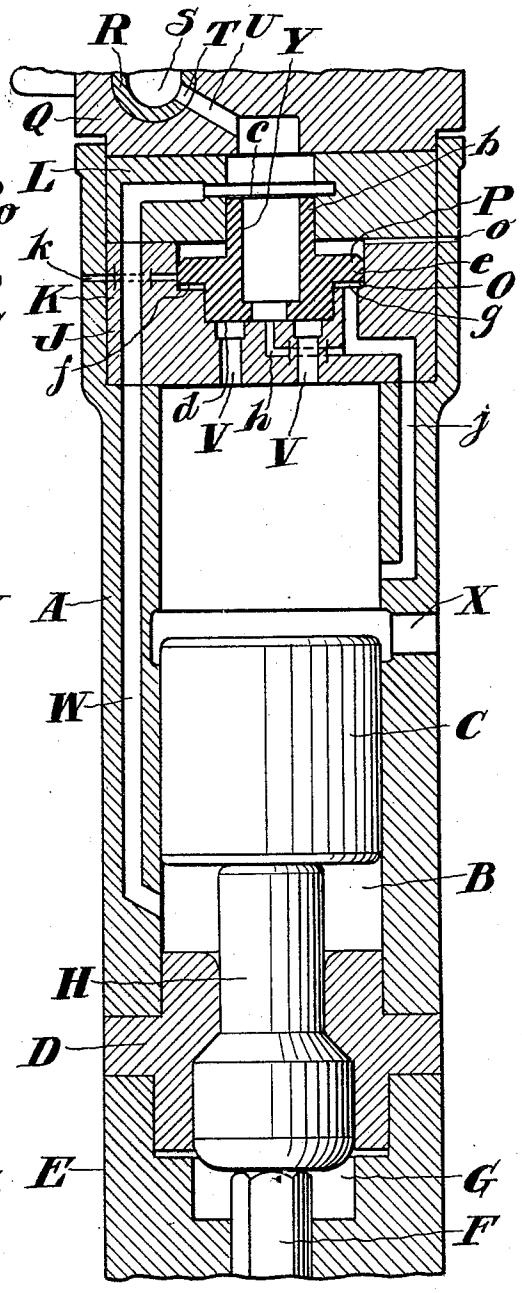

FIG.-2.

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VALVE FOR ROCK DRILLS

Application filed December 12, 1929. Serial No. 413,535.

This invention relates to fluid actuated rock drills, but more particularly to a distributing valve for drills of this type.

One object of the invention is to obtain a quick and positive action of the valve and consequently a rapid distribution of pressure fluid to the cylinder for actuating the piston.

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

In the drawings illustrating the invention and in which similar reference characters refer to similar parts,

Figure 1 is a sectional elevation of a portion of a rock drill equipped with a valve constructed in accordance with the practice of the invention and showing the valve in one of its limiting positions, and

Figure 2 is a view similar to Figure 1 showing the valve in another limiting position.

Referring more particularly to the drawings, A designates a cylinder having a piston chamber B in which is disposed a reciprocatory hammer piston C.

A front cylinder washer D forms a closure for the front end of the piston chamber B and also serves to centralize a front head E with respect to the cylinder A.

The front head E is suitably bored to guide a working implement F, the rear end of which extends into a cavity G in the rear end of the front head E to receive the blows of the hammer piston C and which blows are in this instance transmitted to the working implement F by an anvil block H guided by the front cylinder washer D.

In the rear end of the cylinder A is a valve mechanism designated generally by J whereby the distribution of pressure fluid to the piston chamber B is effected. The valve mechanism J comprises a pair of plates K and L which form the valve chest and in said plates K and L is a valve chamber O to accommodate a distributing valve P.

The plate K is disposed adjacent the rear end of the piston chamber B to form a closure therefore. The plate L is seated on the plate K and in turn serves as a seat for a back head Q which may be suitably secured to the cylinder A as by means of the usual side bolts (not shown).

The back head Q serves as a closure for the extreme rear end of the cylinder A and also acts as a housing for a rotary throttle valve R having a chamber S into which pressure fluid may be constantly admitted from a suitable source of supply. In the wall of the throttle valve R is a port T which registers with a passage U located in the back head Q and opening into the rear end of the valve chamber O.

The pressure fluid utilized for actuating the piston C forwardly is conveyed to the rear end of the piston chamber B by rear inlet passages V which have their inlet openings in the front end of the valve chamber O. A front inlet passage W leads from a point near the rear end of the valve chamber O through the plates K and L and the cylinder A to the front end of the piston chamber B. The exhaust of fluid from the piston chamber to the atmosphere is effected through a free exhaust port X in the cylinder A and controlled by the piston C.

The valve P is of the hollow type through which pressure fluid flows to one of the inlet passages, in this instance to the rear inlet passage or passages V. The valve accordingly has a recess Y which is constantly supplied with pressure fluid from the rear end of the valve chamber O. In the front end or wall of the valve P is a port Z through which pressure fluid flows from the recess Y to the inlet passages V.

The rear end of the valve P is in the form of a stem *b* which controls the inlet passage W and on the rear end of the stem *b* is a pressure surface *c* which is constantly exposed to pressure fluid tending to throw the valve forwardly. The opposite or front end of the valve P constitutes a pressure surface *d* against which compression from the rear end of the piston chamber B may act tending to throw the valve P rearwardly.

Additional means are provided to assist in throwing the valve P rearwardly. To this end the valve P is provided with a flange *e* having an actuating and holding surface *f* at its front end against which pressure fluid

intermittently acts to assist the compression acting against the pressure surface *d* to throw the valve P rearwardly. The pressure fluid utilized for this purpose is conveyed to a pressure chamber *g* wherein the flange *e* is disposed through a constant leak passage *h* and through a trip passage *j* which opens with one end into the pressure chamber *g* and with its other end into the piston chamber B at a point slightly rearwardly of the exhaust port X.

The inlet opening of the leak passage *h* is so arranged that it is in constant communication with the port Z in the piston and said passage *h* opens with its other end into the trip passage *j*. Preferably the pressure acting against the actuating surface *f* is immediately reduced after the valve P has been thrown rearwardly and for this purpose an exhaust passage *k* is formed in the plate K and the cylinder A to afford communication between the pressure chamber *g* and the atmosphere. The passage *k* is so located that it will be uncovered by the flange *e* as the valve P approaches its rearmost position.

In order to prevent a cushioning effect against the rear surface of the flange *e* a vent *o* is formed in the plate K and in the cylinder A to constantly open the rear end of the pressure chamber *g* to the atmosphere.

The operation of the device is as follows: With the valve P and the piston C in their rearmost positions illustrated in Figure 1, pressure fluid will flow from the throttle valve R into and through the valve P and through the front end of the valve chamber O and the inlet passages V into the rear end of the piston chamber B to impel the piston C forwardly against the anvil block H.

During the time the piston is in its rearmost position and until slightly prior to the time it uncovers the exhaust port X the pressure fluid flowing through the leak passage *h* into the trip passage *j* will be entrapped therein since then the piston C will cover the trip passage *j*. Such pressure fluid will act against the actuating surface *f* and will assist the pressure fluid acting against the pressure surface *d* to hold the valve rearwardly.

As the piston C proceeds forwardly it will will uncover first the trip passage *j* and then the exhaust port X to permit the exhaust of pressure fluid from the rear end of the piston chamber B as well as that in the pressure chamber *g*, to the atmosphere.

Upon this reduction in pressure against the surfaces *d* and *f* the pressure fluid acting against the pressure surface *c* together with the suction created by the pressure fluid during its passage through the port Z will throw the valve forwardly to uncover the inlet passage W. Pressure fluid will then flow into the front end of the piston chamber B to return the piston C to its initial position.

During the rearward travel of the piston C said piston will again cover the trip passage *j* so that the pressure fluid flowing through the leak passage *h* into the trip passage *j* will be entrapped in the pressure chamber *g* to assist the compression acting against the pressure surface *d* to again throw the valve P rearwardly.

I claim:

1. In a fluid actuated rock drill, the combination of a cylinder and a piston therein, a valve chest having a valve chamber, inlet passages leading from the valve chamber to the cylinder, a valve in the valve chamber through which pressure fluid flows to one inlet passage, a stem on the valve and over which pressure fluid flows to the other inlet passage, a pressure surface on the valve against which pressure fluid constantly acts for throwing the valve in one direction, an opposed pressure surface on the valve against which compression acts tending to throw the valve in the opposite direction, an actuating surface on the valve, and a trip passage in constant communication with a source of pressure fluid supply and controlled by the piston to intermittently expose the actuating surface to pressure fluid to assist the compression in throwing the valve.

2. In a fluid actuated rock drill, the combination of a cylinder and a piston therein, a valve chest having a valve chamber, front and rear inlet passages leading from the valve chamber to the cylinder, a hollow valve in the valve chamber through which pressure fluid flows to the rear inlet passage, a stem on the valve and over which pressure fluid flows to the front inlet passage, a pressure surface on the stem constantly exposed to pressure fluid tending to move the valve to a position to uncover the front inlet passage, an opposed pressure surface subjected to compression tending to move the valve in the opposite direction to uncover the rear inlet passage, a flange on the valve having an actuating and holding surface, and a trip passage in constant communication with a source of pressure fluid supply and with the actuating surface and the cylinder and controlled by the piston to intermittently expose the actuating surface to pressure fluid to assist the compression in throwing the valve and for holding the valve momentarily stationary.

In testimony whereof I have signed this specification.

WILLIAM A. SMITH, JR.