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VALVE FOR ROCK DRILLS

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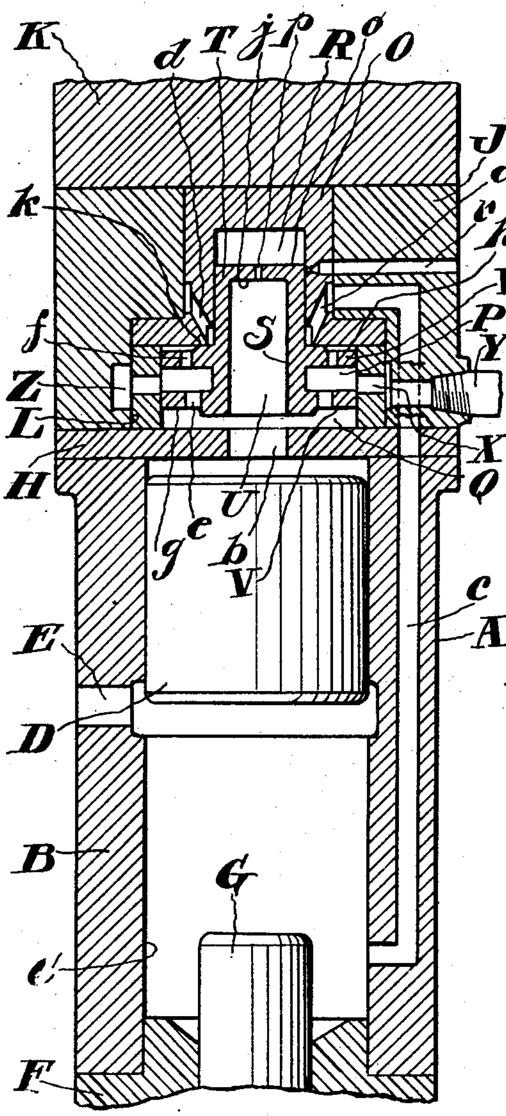

FIG.-1.

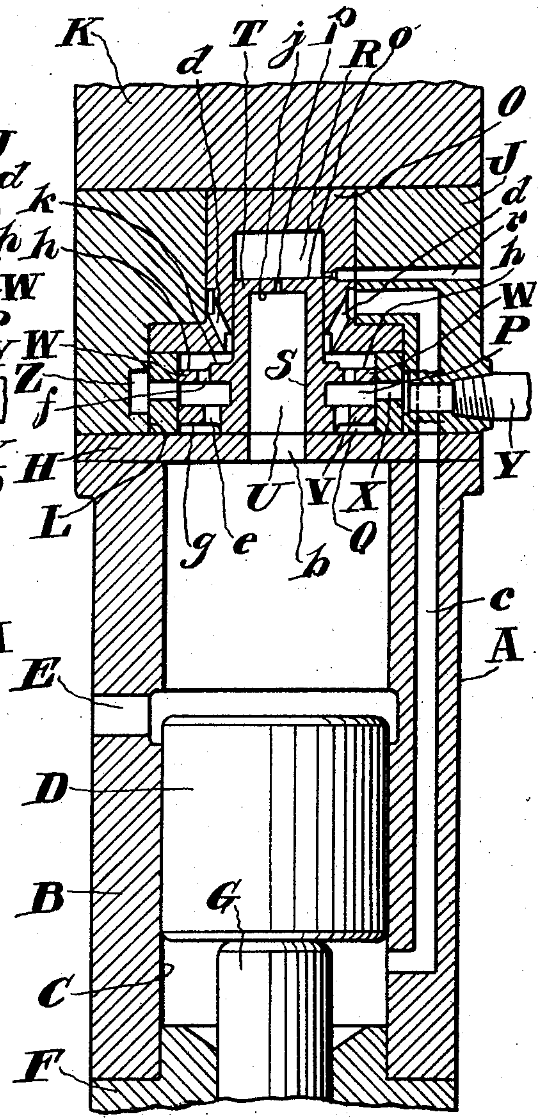

FIG.-2.

INVENTOR.
John C. Curtis.
BY Chester A. Adee
HIS ATTORNEY.

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UNITED STATES PATENT OFFICE

JOHN C. CURTIS, OF EASTON, PENNSYLVANIA, ASSIGNOR TO INGERSOLL-RAND COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY

VALVE FOR ROCK DRILLS

Application filed January 16, 1930. Serial No. 421,164.

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

The objects of the invention are to obtain a quick and positive action of the valve, to assure a heavy blow of the hammer piston against the working implement, and to control the supply of pressure fluid to the ends of the piston chamber in such manner that the hammer piston will strike heavily against the working implement on its forward stroke and that the hammer piston is actuated rearwardly without causing the objectionable jar or shock which usually takes place in machines of this character.

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

In the accompanying drawings forming part of this specification and in which similar reference characters refer to similar parts,

Figure 1 is a sectional elevation of a rock drill equipped with a valve constructed in accordance with the practice of the invention, the valve being shown in position to supply pressure fluid to the rearward end of the piston chamber, and

Figure 2 is a similar view showing the valve in a position to supply pressure fluid to the front end of the piston chamber.

Referring more particularly to the drawings, A designates generally a rock drill comprising a cylinder B wherein is formed a piston chamber C to accommodate a reciprocatory hammer piston D. In the wall of the cylinder B is a piston controlled exhaust port E to afford communication between the piston chamber C and the atmosphere.

A suitable closure is provided for the front end of the piston chamber C in the form of a head F which may also act as a guide for a working implement G shown as extending with its rearward end into the piston chamber to receive the blows of the hammer piston D.

A closure is provided for the rearward end of the piston chamber in the form of a plate H whereon is seated a head block J which in turn serves as a seat for a back head K. The cylinder B, the head F and the elements designated by H, J and K form the casing parts of the rock drill and such parts may be held in assembled relationship in any suitable and convenient manner, as for instance, by the usual side bolts (not shown).

In accordance with the practice of the invention the head block J is provided with a bore L to receive a valve chest O having a bore to form a valve chamber P. The valve chamber P comprises an enlarged portion Q and a reduced portion R to accommodate a distributing valve S having a hood or stem T which extends slidably into the reduced portion R to form a bearing portion for the valve.

The valve S may be provided with a recess or cavity U to reduce its weight. Near the forward end of the valve is an integral flange V which lies in the enlarged portion Q and spaced slightly rearwardly of the flange V is another flange W which also lies within the enlarged portion Q.

The pressure fluid intended to be distributed by the valve is introduced between the flanges V and W by a port or ports X in the valve chest O and the ports X communicate with a supply conduit Y through an annular passage Z in the head block J.

The pressure fluid utilized for impelling the piston D forwardly is admitted into the rearward end of the piston chamber C through a rear inlet passage *b* in the plate H and coaxially with the valve S. The pressure fluid utilized for driving the piston D rearwardly is conveyed to the front end of the piston chamber by a front inlet passage *c* which extends through the cylinder B, the plate H and the head block J and communicates with the rearward end of the enlarged portion Q of the valve chamber through ports *d* in the valve chest O.

In the flange V are a series of ports *e* through which the pressure fluid flows to the rear inlet passage *b* and the pressure fluid supplied to the front inlet passage *c* flows through ports *f* in the flange W. The ports *e* are preferably of greater area than the ports *f* so that a greater amount of pressure fluid may be supplied to the rearward end of the piston chamber within a given time than to the front end. This is desirable for the reason that the forward stroke of the piston is the working stroke.

Convenient means are provided for actuating the valve S from one limiting position to the other. To this end the flange V is provided at its forward end with an annular pressure area *g* against which the pressure fluid flowing through the ports *e* may act to throw the valve rearwardly. Similarly a pressure area *h* is formed on the rearward end of the flange W so that pressure fluid flowing through the ports *f* will act thereagainst to throw the valve to its forward limiting position.

Additional means are, however, provided to assist the pressure fluid acting against the pressure areas *g* and *h* in throwing the valve. The valve is accordingly provided with an actuating surface *j* against which compression from the rearward end of the piston chamber may act to assist the pressure fluid acting against the pressure area *g* to throw the valve rearwardly. At the rearward end of the flange W is an annular actuating surface *k* which is subjected to compression from the front end of the piston chamber C to assist the pressure fluid acting against the actuating surface *h* in throwing the valve forwardly.

The rear end of the stem T constitutes an actuating surface *o* against which pressure fluid may act intermittently and simultaneously with the admission of pressure fluid to the rear end of the piston chamber C to assist the forces acting against the actuating surface *k* and the pressure surface *h* to move the valve S forwardly. The pressure fluid is supplied to the actuating surface *o* by a port *p* in the end wall Q of the valve S.

In order to assure an immediate drop in the pressure fluid acting against the actuating surface *o* after the valve S has been moved forwardly, the valve chamber P is provided with an exhaust passage *r* which leads through the valve chest O and the head block to the atmosphere and is controlled by the rear end of the stem T. The exhaust passage *r* is preferably so located that it will be only uncovered by the stem T of the valve when the valve reaches its foremost position in the valve chamber P.

The operation of the device is as follows: With the valve in the rearmost position illustrated in Figure 1 pressure fluid will flow through the ports *e* into and through the front end of the valve chamber P, thence through the rear inlet passage *b* into the back end of the piston chamber to drive the piston D forwardly.

During the admission of pressure fluid into this end of the piston chamber pressure fluid will also pass through the port *p* in the end wall *q* of the valve to act against the actuating surface *o*. At the same time pressure fluid will be acting against the pressure surfaces *h* and *g* and against the actuating surface *j*.

Inasmuch that the actuating surface *k* will be exposed to atmospheric pressure through the inlet passage *c*, the piston chamber C and the exhaust port E, the areas exposed to pressure fluid for holding the valve rearwardly will be somewhat in excess of those exposed to pressure fluid tending to throw the valve in the opposite direction.

The piston D will then continue forwardly and at the instant the rear end of the piston D starts to uncover the exhaust port E there will be a decided drop in pressure against the pressure area *g* and the actuating surface *j* so that the pressures acting against the pressure area *h* and the actuating surface *o* will immediately start the valve forwardly. After the valve starts in this direction the actuating surface *k* will also be exposed to pressure fluid so that the valve will be quickly moved forwardly where it will be held by the pressure acting against the pressure area *h* and the actuating surface *k*.

As the valve S approaches its foremost position in the valve chamber P the exhaust passage *r* will be uncovered by the stem T of the valve and the pressure fluid which previously acted against the actuating surface *o* will then be exhausted to the atmosphere.

This forward movement of the valve will take place at about the time the piston delivers its blow to the working implement. In the new position of the valve pressure fluid will flow through the ports *f*, the ports *d* and the front inlet passage *c* to the front end of the piston chamber C to actuate the piston D rearwardly.

After the exhaust port E is covered by the piston D the air in the rear end of the piston chamber C will be compressed by the piston D. Such compression will then act against the actuating surface *j* to assist the pressure fluid acting against the pressure area *g* to throw the valve to its initial position when the front end of the piston D uncovers the exhaust port E. The valve will then be held in its rearmost position by the pressures acting against the entire front area of the valve as well as against the actuating surface *j*.

I claim:

1. In a fluid actuated rock drill, the combination of a cylinder having a piston chamber and a piston in the piston chamber, an exhaust port in the cylinder, a valve chest having a valve chamber, inlet passages leading from the ends of the valve chamber to the piston chamber, a valve in the valve chamber controlling the inlet passages and having a pair of flanges, a supply passage in the valve chest for supplying pressure fluid to the valve chamber between the flanges, pressure areas on the flanges, ports in the flanges to supply pressure fluid to the pressure areas and to the inlet

passages, and opposed actuating surfaces on the valve, one of said actuating surfaces being intermittently exposed to pressure fluid to assist the pressure fluid acting against one pressure area to throw the valve in one direction and the other actuating surface being intermittently exposed to compression to assist the pressure fluid acting against the other pressure area to return the valve.

2. In a fluid actuated rock drill, the combination of a cylinder having a piston chamber and a piston in the piston chamber, an exhaust port in the cylinder, a valve chest having a valve chamber, inlet passages leading from the ends of the valve chamber to the piston chamber, a valve in the valve chamber having a pair of flanges, annular pressure areas on the flanges, ports in the flanges to supply pressure fluid to the pressure areas for throwing the valve and to supply pressure fluid to the inlet passages, a supply passage in the valve chest to introduce pressure fluid into the valve chamber between the flanges, a hollow stem on the valve and having an end wall to form opposed actuating surfaces, one of said actuating surfaces being intermittently exposed to compression to assist in throwing the valve in one direction, and a port in the end wall supplying pressure fluid to the other actuating surface to assist in throwing the valve in the opposite direction.

3. In a fluid actuated rock drill, the combination of a cylinder having a piston chamber and a piston in the piston chamber, an exhaust port in the cylinder, a valve chest having a valve chamber, inlet passages leading from the ends of the valve chamber to the piston chamber, a valve in the valve chamber having a pair of flanges, annular pressure areas on the flanges, ports in the flanges to supply pressure fluid to the pressure areas for throwing the valve and to supply pressure fluid to the inlet passages. a supply passage in the valve chest to introduce pressure fluid into the valve chamber between the flanges, a hollow stem on the valve and having an end wall to form opposed actuating surfaces, one of said actuating surfaces being intermittently exposed to compression to assist in throwing the valve in one direction, a port in the end wall to supply pressure fluid from the rear end of the piston chamber to the other actuating surface to assist in throwing the valve in the other direction, and an exhaust port leading from the valve chamber to the atmosphere and controlled by the stem to exhaust the fluid acting against the last said actuating surface.

In testimony whereof I have signed this specification.

JOHN C. CURTIS.