

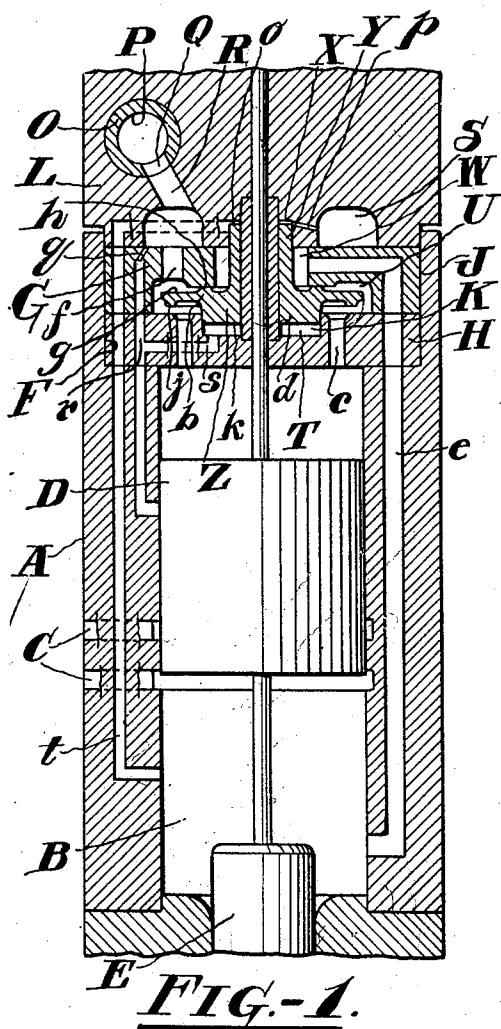
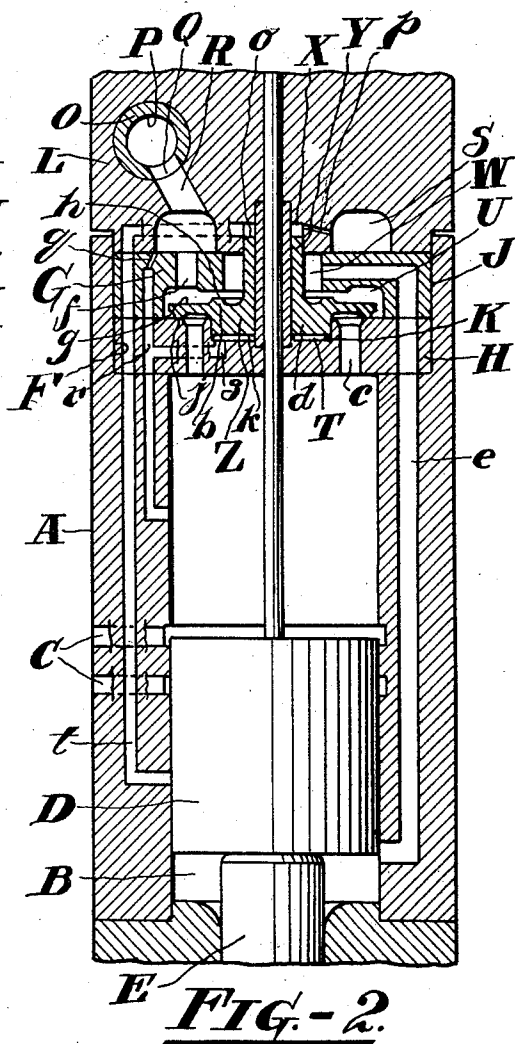
Sept. 2, 1930.

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1,774,572

VALVE FOR ROCK DRILLS

Filed Nov. 20, 1929



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VALVE FOR ROCK DRILLS

Application filed November 20, 1929. Serial No. 408,510.

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

5 The objects of the invention are to assure a rapid and positive action of the valve, to reduce the pressure fluid consumption of the drill to which the valve may be applied to a minimum, and in general to improve upon valve mechanism of this type.

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,

15 Figure 1 is a sectional elevation of so much of a rock drill as will serve to illustrate the invention and showing the valve in position to admit pressure fluid into the rear end of the piston chamber for actuating the piston in a forward direction, and

Figure 2 is a similar view showing the valve in its other limiting position.

Referring more particularly to the drawings, A designates a cylinder of a rock drill having a piston chamber B which is provided with a free exhaust port or ports C. Disposed within the piston chamber B is a hammer piston D which controls the exhaust port C and is adapted to deliver blows of impact to a working implement, only the shank E of which is shown extending into the front end of the piston chamber B.

35 In the rearward end of the cylinder A is an enlarged bore F to receive a valve chest designated generally by G and comprising a pair of plates H and J which are suitably bored to form a valve chamber K. The plate H is disposed adjacent the piston chamber B for the rearward end of which it forms a closure, and on the plate J is seated a back head L which forms a closure for the rearward end of the cylinder A.

45 The back head L serves as a casing for a throttle valve O having a chamber P which may be in constant communication with a source of pressure fluid supply through a suitable conduit (not shown). In the wall of the throttle valve O is a port Q which

may register with a passage R in the back head and leading to a supply reservoir S in the front end of the back head.

In accordance with the present invention the valve chamber K is formed in the plates H and J and in the back head L. It comprises a forward portion T located in the plate H and an enlarged portion U which is formed in the plate J and opens with its rearward end into a somewhat reduced portion W also in the plate J. The rearmost portion X of the valve chamber K is formed in the back head L and is of somewhat smaller diameter than the portion W of the valve chamber to slidably receive a rearward extension Y of a pressure fluid distributing valve Z. The extension Y is of the same diameter throughout its length as the portion X of the valve chamber and is therefore of smaller diameter than the portion W through which it extends, so that the extension Y is guided only by the portion X of the valve chamber.

At the forward end of the extension Y is a lateral flange b which lies within the enlarged portion U of the valve chamber. The flange b is of smaller diameter than the portion U to permit the pressure fluid to flow around and over the edge of said flange to rear inlet passages c in the plate H and by which passages pressure fluid is conveyed to the piston chamber B for impelling the piston D forwardly against the working implement.

At the forward end of the flange b is an extension d which extends slidably into the portion T of the valve chamber to assist in guiding the valve.

Leading from the portion W of the valve chamber to the front end of the piston chamber B is an inlet passage e for conveying pressure fluid to the front end of the piston chamber to actuate the piston D rearwardly.

The pressure fluid distributed by the valve Z is admitted into the enlarged portion U of the valve chamber through a supply passage f in the plate J which affords constant communication between the reservoir S and the valve chamber.

On the rearward end of the flange *b* of the valve is a pressure surface *g*, an outer annular portion of which is constantly exposed to pressure fluid tending to actuate the valve forwardly. Between the outer annular portion of the pressure surface *g* and the extension *Y* is a ring portion *h* which is adapted to seat against the plate *J* to limit the rearward movement of the valve. The forward end of the flange *b* constitutes a pressure surface *j* which is intermittently exposed to compression from the rear end of the piston chamber for throwing the valve *Z* rearwardly.

Additional means are provided to assist in actuating the valve from one limiting position to the other. To this end the extension *d* is provided with an actuating surface *k* and on the rear end of the extension *Y* is an opposing actuating surface *o* of considerably smaller area than the actuating surface *k*.

The actuating surfaces *k* and *o* are in constant communication with a source of pressure fluid supply, such as the supply reservoir *S*. Such pressure fluid is conveyed into the rear end of the portion *X* of the valve chamber through a leak passage *p* in the back head *L*. That to the forward end of the portion *T* of the valve chamber is conveyed thereto by a leak passage *q* communicating at one end with the supply reservoir *S* and opening with its other end into a trip passage *r* which leads to the piston chamber *B* into which it opens at a point rearwardly of the exhaust ports *C*.

From the trip chamber *r* to the front end of the valve chamber *K* leads a branch channel *s* for delivering pressure fluid from the trip passage *r* to the actuating surface *k*. The cylinder *A* is further provided with a trip passage *t* which opens with one end into the piston chamber *B* at a point forwardly of the exhaust ports *C* and with its other end into the rearward end of the portion *X* of the valve chamber.

The operation of the device is as follows: With the valve in its rearmost position as illustrated in Figure 1, pressure fluid will flow over the edge of the flange *b* of the valve and through the inlet passage or passages *e* into the rear end of the piston chamber *B* to impel the piston *D* forwardly.

During the time that the piston *D* occupies a position rearwardly of the exhaust ports *C*, the trip passage *r* will be covered by the piston so that pressure fluid flowing through the leak passage *q* will be trapped in the trip passage *r*, the channel *s* and in the front end of the valve chamber to act against the actuating surface *k* for momentarily maintaining the valve in the rearmost position. The rear end of the valve chamber will then be open to the atmosphere through the trip passage *t*, the piston chamber *B* and the exhaust ports *C*.

As the piston *D* proceeds forwardly, and shortly prior to the time it delivers its blows against the working implement, the said piston will uncover the exhaust ports *C* so that the pressure fluid utilized for actuating the piston *D* forwardly, together with that acting against the actuating surface *k*, will be exhausted to the atmosphere.

Upon the exhausting of such pressure fluid to the atmosphere there will be an abrupt drop in pressure beneath the pressure surface *j*, and the pressure fluid flowing over the edge of the flange *b* of the valve will tend to throw the valve forwardly.

At the same time the piston *D* will form a closure for the trip passage *t* so that the pressure fluid flowing through the leak passage *j* into the rear end of the valve chamber will act against the actuating surface *o* to assist the pressure fluid acting against the pressure surface *f* to throw the valve forwardly to the position illustrated in Figure 2.

The entire pressure surface *f*, including the ring portion *h*, will be exposed to pressure fluid for holding the valve forwardly and pressure fluid will then flow across the rear surface of the flange *b* into and through the portion *W* of the valve chamber, thence through the inlet passage *e* to the front end of the piston chamber *B* to return the piston.

During its rearward movement the piston *D* will uncover the exhaust ports *C* thus causing a drop in pressure rearwardly of the flange *b* and also opening the rearward end of the valve chamber to the atmosphere. At the same time the piston *D* will cover the trip passage *r* so that pressure fluid will again be entrapped in the front end of the valve chamber to act against the actuating surface *k* for assisting the compression acting against the pressure surface *j* to throw the valve to its initial position.

I claim:

1. In a fluid actuated rock drill, the combination of a cylinder and a hammer piston therein, an exhaust port for the cylinder controlled by the piston, a valve chest having a valve chamber, inlet passages leading from the valve chamber to the cylinder, a distributing valve in the valve chamber having a flange intermediate its ends and around which pressure fluid flows to one inlet passage, a pressure surface on the rear end of the flange constantly exposed to pressure fluid tending to throw the valve in one direction and to hold the valve momentarily stationary, an opposed pressure surface on the flange intermittently exposed to compression for throwing the valve in the opposite direction, actuating surfaces on the ends of the valve, leak passages affording constant communication between a source of pressure fluid supply and the ends of the valve chamber, and trip passages affording communication between

the ends of the valve chamber and the cylinder and controlled by the piston for entrapping pressure fluid in the valve chamber to act against the actuating surface for actuating the valve.

5 2. In a fluid actuated rock drill, the combination of a cylinder and a hammer piston therein, an exhaust port for the cylinder controlled by the piston, a valve chest having a
10 valve chamber, front and rear inlet passages leading from the valve chamber to the cylinder, a distributing valve in the valve chamber having a flange around which pressure fluid
15 flows to the rear inlet passage, a pressure surface on the rear end of the flange constantly exposed to pressure fluid tending to throw the valve forwardly and to hold the valve, a pressure surface on the front end of the flange
20 intermittently exposed to compression for throwing the valve rearwardly, an actuating surface on the front end of the valve, an opposed actuating surface on the rear end of the valve and of smaller area than the first said
25 actuating surface, leak passages affording constant communication between a source of pressure fluid supply and the ends of the valve chamber, and trip passages affording communication between the ends of the valve
30 chamber and the cylinder and controlled by the piston for entrapping pressure fluid in the valve chamber to act against the actuating surfaces for actuating the valve.

3. In a fluid actuated rock drill, the combination of a cylinder and a hammer piston
35 therein, an exhaust port for the cylinder controlled by the piston, a valve chest having a valve chamber, front and rear inlet passages leading from the valve chamber to the cylinder, a distributing valve in the valve chamber
40 having a flange around which pressure fluid flows to the rear inlet passage, a pressure surface on the rear end of the flange constantly exposed to pressure fluid tending to throw the valve forwardly and to hold the
45 valve, a pressure surface on the front end of the flange intermittently exposed to compression for throwing the valve rearwardly, front and rear extensions on the flange slidable in the valve chamber, an actuating surface on
50 the front extension, an actuating surface on the rear extension and of smaller area than the first said actuating surface, leak passages affording constant communication between a source of pressure fluid supply and the ends
55 of the valve chamber, and trip passages affording communication between the ends of the valve chamber and the cylinder and controlled by the piston for entrapping pressure fluid in the valve chamber to act against the
60 actuating surfaces for actuating the valve.

In testimony whereof I have signed this specification.

WILLIAM A. SMITH, JR.