June 3, 1930. E. B. LEAR 1,761,134

VALVE FOR ROCK DRILLS

Filed April 6, 1927 2 Sheets-Sheet 1

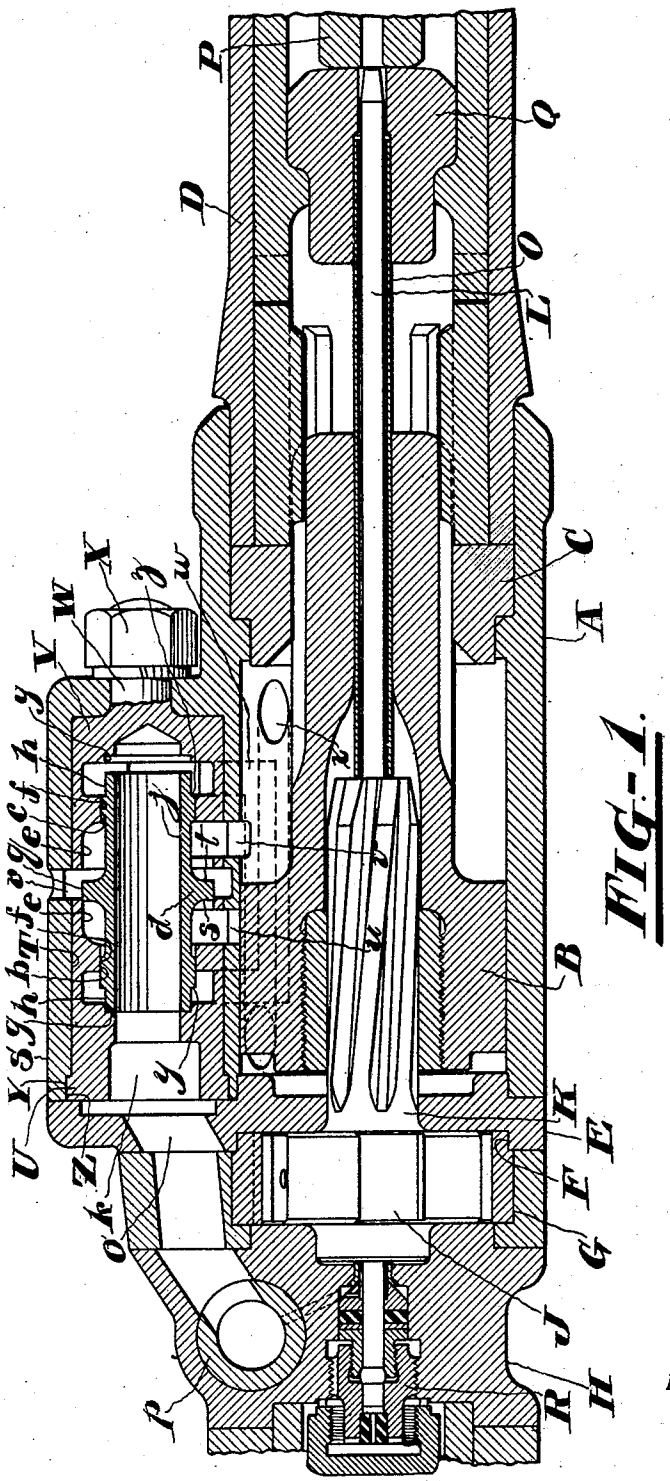


FIG. 1.

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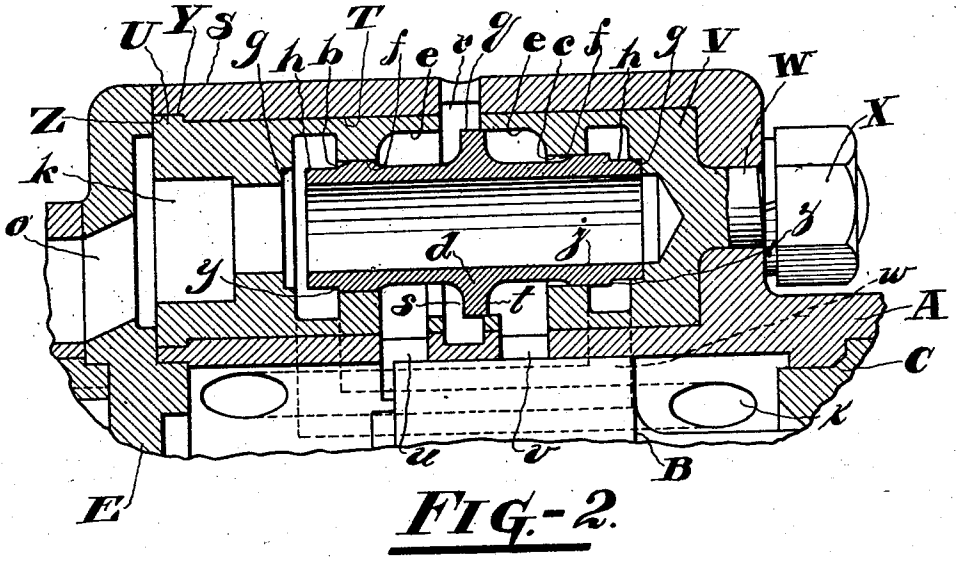


FIG.-2.

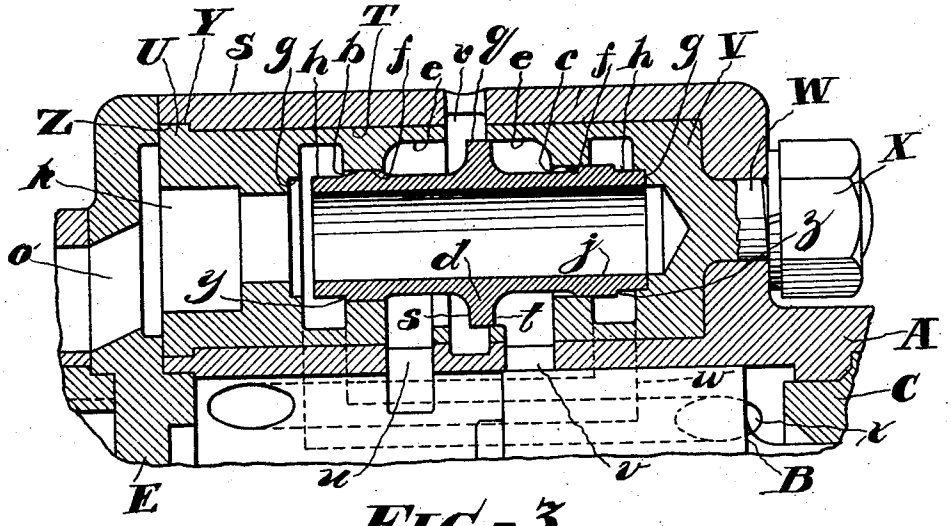


FIG.-3.

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# UNITED STATES PATENT OFFICE

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## VALVE FOR ROCK DRILLS

Application filed April 6, 1927. Serial No. 181,424.

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

The objects of the invention are to obtain rapid distribution of the pressure fluid to the cylinder and to obtain a positive action of the valve.

Other objects will appear hereinafter, and to all of these ends the invention consists of the combination of elements and arrangement of parts having the general mode of operation substantially as hereinafter described and claimed and illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal sectional view of a rock drill showing the valve in position to admit air to the rearward end of the cylinder,

Figure 2 is a longitudinal sectional elevation of the valve chest and a portion of the cylinder illustrating the manner in which the valve is actuated, and

Figure 3 is a view similar to Figure 2 showing the valve in position to admit pressure fluid to the front end of the cylinder.

Referring to the drawings, A designates a cylinder and B a hammer piston reciprocable in the cylinder. A closure is provided for the front end of the cylinder in the form of a bushing C which forms an abutment for a front head D. At the rearward end of the cylinder is disposed a plate E which forms a closure for the rearward end of the cylinder and is recessed as at F to centralize a rotation ring G on which is seated a back head H.

The rotation ring G may be of a well known type adapted to cooperate with spring pressed pawls J carried by a rifle bar K for holding said rifle bar stationary to impart rotary movement to the piston B which it engages in a well known manner.

The drill is provided with the usual water and air tubes L and O respectively for conveying cleansing liquid and pressure fluid from the back head to a working implement P which extends into the front head to receive the blows of the hammer piston B, such blows in this instance being transmitted through an anvil block Q in the front head D. A water plug R screwed into the back head H cooperates with the tubes L and O for holding said tubes firmly in position.

In accordance with the invention, a valve chest S is formed on the cylinder A and has a bore T for the reception of bushings U and V. The bushing V is provided with a stem W which projects through the front end of the valve chest S and is threaded to receive a nut X whereby the bushing V may be securely clamped in operative position.

In order to secure the bushing U in the bore T, said bushing is provided with a flange Y at its rearward end to seat in a recess Z formed in the end of the bore T. The rearward or outer end of the bushing U is preferably formed flush with the corresponding end of the valve chest S to enable the plate E to bear thereon for holding the bushing U against longitudinal movement.

The bushings U and V are provided with bores *b* and *c* respectively to form a valve chamber for a pressure fluid distributing valve *d*. In the present instance the bores *b* and *c* are formed of three diameters, the larger diameters *e* of which are located at the inner or adjacent ends of the bushings. The intermediate portions *f* of the bores *b* and *c* are of somewhat smaller diameter than the portions *e* and at the outer ends of the intermediate portions *f* are formed recesses *g* of smaller diameter than the portions *f* to receive the reduced ends *h* of the valve *d*.

As will be observed, the valve *d* is provided with a bore *j* which extends throughout the length of the valve. The bore *j* is in constant communication with the pressure fluid supply (not shown) through a passage *k* in the bushing U and a passage *o* leading from the passage *k* to a throttle valve *p* in the back head H.

Intermediate the ends of the valve *d* is formed an enlarged flange *q* which controls an exhaust port *r* in the valve chest S. The rearward and front faces *s* and *t* of the flange *q* constitute actuating surfaces against which pressure fluid issuing from rearward and front exhaust passages *u* and *v* respectively may act for actuating the valve. The rearward and front exhaust passages *u* and *v* lead from the cylinder A to the valve chamber

wherewith they communicate at points on opposite sides of the exhaust port *r*.

In the construction shown the pressure fluid for impelling the piston B forwardly flows over the front end of the valve *d* and through an inlet passage *w* leading to the rearward end of the cylinder A. In like manner pressure fluid flows over the rearward end of the valve *d* through an inlet passage *x* leading from the rearward end of the valve chamber to the front end of the cylinder for impelling the piston B in a rearwardly direction.

Suitable means are provided for insuring against trembling of the valve *d* after it has been thrown to its limiting positions. To that end the valve is provided at its rearward end with a shoulder *y* against which pressure fluid may act for holding the valve forwardly while the pressure fluid is being admitted to the front end of the cylinder. Similarly, a shoulder *z* is formed near the front end of the valve and is subjected to live pressure fluid for holding the valve rearwardly while pressure fluid is being admitted into the rearward end of the cylinder.

The operation of the device is as follows: With the valve in the position shown in Figure 1 pressure fluid flowing therethrough will pass over the front end thereof and through the inlet passage *w* into the rearward end of the cylinder and actuate the piston B forwardly to deliver its blow against the working implement. During the time pressure fluid is flowing to the rearward end of the cylinder the shoulder *z* of the valve will be exposed to such pressure fluid whereby the valve will be held firmly in its rearward limiting position.

Immediately prior to the delivery of the blow of the piston on the working implement the piston will uncover the exhaust passage *u* and the pressure fluid in the rearward end of the cylinder will then escape through the passage *u* into the valve chamber. The escaping pressure fluid acting against the actuating surface *s* will throw the valve forwardly to uncover the exhaust port *r* and will thence escape to the atmosphere through the exhaust port *r*.

In the forward position of the valve pressure fluid will flow over the rearward end of the said valve through the inlet port *x* to the front end of the cylinder to again drive the piston rearwardly. As the piston approaches the rearward end of the cylinder the forward exhaust passage *v* will be uncovered by the piston and the pressure fluid in the front end of the cylinder will flow through the said exhaust passage *v* into the valve chamber and, acting against the actuating surface *t* of the flange *q*, will again throw the valve *d* rearwardly to its initial position, thus completing the cycle of operations.

It will be observed that while the valve is in its forward limiting position, the pressure fluid admitted into the inlet passage *x* will also act against the shoulder *y* of the valve to hold the valve firmly in its forwardmost position.

I claim:

In a fluid actuated rock drill, the combination of a cylinder and piston, a valve chest having a valve chamber, crossed inlet passages leading from the valve chamber to the cylinder, an exhaust port in the valve chest, a hollow distributing valve through which the live motive fluid passes to the inlet passages, said valve having a central enlarged flange to control the exhaust port, actuating pressure areas on the flange, enlarged portions at the ends of the valve forming shoulders having holding pressure areas and reduced end extensions extending from the body of the valve, the valve chest being formed with recesses for receiving said extensions, the live motive fluid passing over the ends of the valve to each end of the cylinder and thereby producing holding pressure on that one of the holding areas subjected to live motive fluid, and exhaust passages for exhausting pressure fluid from the cylinder into the valve chamber to act against the actuating pressure areas for throwing the valve and opening the exhaust port to permit the escape of pressure fluid from the valve chest to the atmosphere.

In testimony whereof I have signed this specification.

EARL B. LEAR.