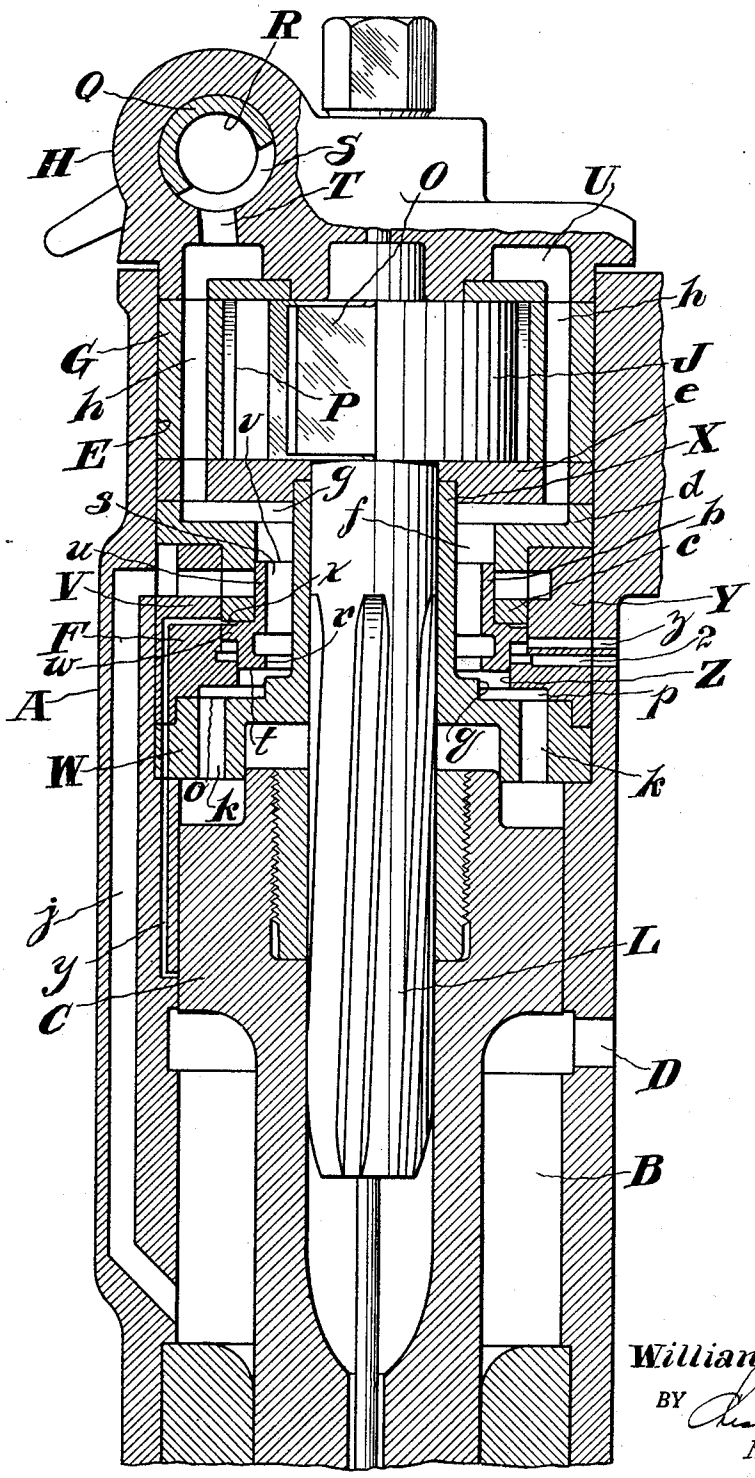
April 26, 1932. W. A. SMITH, JR 1,855,206

VALVE FOR ROCK DRILLS

Filed Nov. 9, 1929



INVENTOR.
William A. Smith Jr.
BY
HIS ATTORNEY.

Patented Apr. 26, 1932 1,855,206

UNITED STATES PATENT OFFICE

WILLIAM A. SMITH, JR., OF PHILLIPSBURG, NEW JERSEY, ASSIGNOR TO INGERSOLL-RAND COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY

VALVE FOR ROCK DRILLS

Application filed November 9, 1929. Serial No. 406,053.

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 rapid and positive action of the valve and to assure an abundant supply of pressure fluid to the ends of the piston chamber at the beginning of the working stroke of the piston.

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

The figure in the accompanying drawing forming a part of the specification is a sectional elevation of so much of a rock drill as will serve to illustrate the invention.

Referring more particularly to the drawing, A designates a cylinder having a piston chamber B wherein is disposed a reciprocatory hammer piston C to deliver blows of impact to a working implement (not shown) but which may be disposed in the front end of the drill in a well known manner to extend into the path of the hammer piston C. The cylinder A has a free exhaust port D which is controlled by the piston C.

In the portion of the cylinder rearwardly of the piston chamber B is an enlarged bore E to accommodate valve mechanism generally designated by F and rotation mechanism comprising a ratchet ring G which serves as a seat for a back head H disposed at the rearward end of the cylinder A. The back head H may be secured to the cylinder in any suitable manner.

Disposed rotatably within the ratchet ring G is a head J of a rifle bar L which extends through the valve mechanism F to interlockingly engage the piston C in a well known manner. The head J of the rifle bar L carries pawls O for engagement with teeth P on the ratchet ring G to obtain a step by step rotary movement of the piston C.

In addition to its function as a closure for the rearward end of the cylinder A the back head H also serves as a housing for a throttle valve Q of the rotary type having a central chamber R into which pressure fluid may be constantly introduced from a source of supply. In the wall of the throttle valve Q is a port S adapted to register with a passage T leading to a supply reservoir U, also in the back head H.

Disposed between the rearward end of the piston chamber B, for which it forms a closure, and the ratchet ring G is the valve mechanism F which includes a chest V consisting of a plate W which is disposed adjacent the rearward end of the piston chamber B and has a hollow rearward extension X to form a guide for the rifle bar and also to prevent leakage of pressure fluid along the rifle bar to the rearward end of the piston chamber B.

Seated on the plate W is a ring member Y having a bore Z which acts as a guide for the forward end of a distributing valve *b*. Extending into the rearward end of the ring member Y is a flange *c* of a plate *d* seated on the rearward end of the ring member Y and in turn forming a seat for a plate *e* which supports a ratchet ring G and the head J of the rifle bar.

The ring member Y and the plate *d* are suitably bored to form a valve chamber *f* wherein the valve *b* is adapted to reciprocate. The rearward end of the valve chamber *f* in this instance opens into a supply chamber *g* in the plate *d* and said supply chamber *g* is in constant communication with the supply reservoir U through supply passages *h* in the ratchet ring G and in the plate *e*.

Leading from a point intermediate the ends of the valve chamber *f* to the front end of the piston chamber B is an inlet passage *j*, and the pressure fluid for the rearward end of the piston chamber B is conveyed thereto by rear inlet passages *k* in the plate W. The rear inlet passages in this instance communicate at their inlet openings or ports *o* with an annular chamber *p* formed by the ring member Y and by the plate W. The plate W has a shoulder *q* which, when the valve *b* lies in its foremost position, extends into an opening *r* in the front end of the valve to form a closure therefore.

The interior of the valve *b* is in the form of a reservoir *s* to assure an abundant supply of pressure fluid to the rearward end of the piston chamber B and said reservoir *s* is in constant communication with the supply res-

ervoir U through the supply chamber *g* and the supply passages *h*.

The forward end of the valve *b* constitutes a pressure surface *t* against which compression from the rearward end of the piston chamber B may act for actuating the valve *b* rearwardly. This pressure surface also serves as a holding surface against which pressure fluid flowing to the rearward end of the piston chamber B may act for holding the valve in its rearmost position.

The rearward end of the valve *b* is in the form of a ring portion *u* which is adapted to overrun the inlet opening of the inlet passage *j* to control the flow of pressure fluid from the valve chamber *f* into the said inlet passage. At the rearward end of the ring portion *u* is a pressure surface *v* of smaller area than the front pressure surface *t*, and said pressure surface *v* is constantly exposed to pressure fluid present in the rearward end of the valve chamber *f*. The pressure fluid acting against the rear pressure surface *v* assists in throwing the valve *b* forwardly and also to hold it in the forward position.

Additional means are provided however, for actuating the valve *b* in this direction. To this end the valve *b* is provided with a flange *w* on the rearward end of which is an actuating surface *x* which is adapted to be intermittently exposed to pressure fluid for throwing the valve forwardly in timed relation with the piston C. The pressure fluid utilized for this purpose is conveyed into the valve chamber by a kicker passage *y* to act against the actuating surface *x*, the said kicker passage *y* opening into the piston chamber B at a point slightly rearwardly of the exhaust port D.

In order to afford an immediate escape for the pressure fluid acting against the actuating surface *x* after the valve *b* has been thrown forwardly the valve chamber is provided with a vent *z* which, as the valve moves forwardly, will be uncovered by the flange *w* to permit the escape of such pressure fluid to the atmosphere.

The ring portion Y and the cylinder A are provided with a vent 2 which leads from the forward portion of the valve chamber wherein the flange *w* lies to prevent the formation of a cushion forwardly of the flange.

The operation of the device is as follows: With the valve *b* in the rearmost position the inlet opening of the inlet passage *j* will be covered by the ring portion *u* and pressure fluid will then flow through the opening *r* in the front end of the valve and through the annular chamber *p* and the rear inlet passages *k* into the piston chamber B to drive the piston C forwardly on its working stroke.

Immediately prior to the uncovering of the exhaust port D by the piston said piston will uncover the kicker passage *y*. Pressure fluid will then flow through the said kicker passage *y* rearwardly of the flange *w* to act against the actuating surface *x*. This pressure fluid, together with that acting against the pressure surface *v*, will throw the valve *b* forwardly.

In the new position of the valve the shoulder *q* will extend into the opening *r*, thus cutting off the flow of pressure fluid into the rearward end of the piston chamber, and the ring portion *u* will uncover the inlet passage *j* to permit the flow of pressure fluid into the front end of the piston chamber B to drive the piston C rearwardly.

Immediately after the valve has been thrown forwardly the pressure fluid previously admitted into the valve chamber through the kicker passage *y* to act against the actuating surface *x* will be exhausted to the atmosphere through the passage *z*.

As the piston proceeds rearwardly the air rearwardly of the exhaust port D will be compressed by the piston. Such compression will act against the pressure surface *t* to again return the valve to its initial position for admitting pressure fluid to the rearward end of the piston chamber.

I claim:

In a fluid actuated rock drill, the combination of a cylinder and a piston therein, an exhaust port in the cylinder, a valve chest having a valve chamber, rear and front inlet passages leading from the valve chamber to the cylinder, a main supply passage leading from a source of pressure fluid supply to the valve chamber, a distributing valve movable in the valve chamber and having a fluid reservoir therein in constant communication with the supply passage, an opening at the front end of the valve through which all the pressure fluid from the supply passage flows through said fluid reservoir to the rear inlet passage in one position of the valve, a ring portion on the rear end of the valve over which pressure fluid flows from the valve chamber to the front end of the cylinder, a front pressure surface on the valve exposed to compression for throwing the valve rearwardly and exposed to pressure fluid flowing through the opening for holding the valve, an actuating surface intermediate the ends of the valve, a kicker passage leading from the cylinder and controlled by the piston for intermittently conveying pressure fluid to the actuating surface to throw the valve forwardly, and a rear pressure surface on the valve constantly exposed to pressure fluid to assist in throwing the valve forwardly and to hold said valve in the forward position.

In testimony whereof I have signed this specification.

WILLIAM A. SMITH, JR.