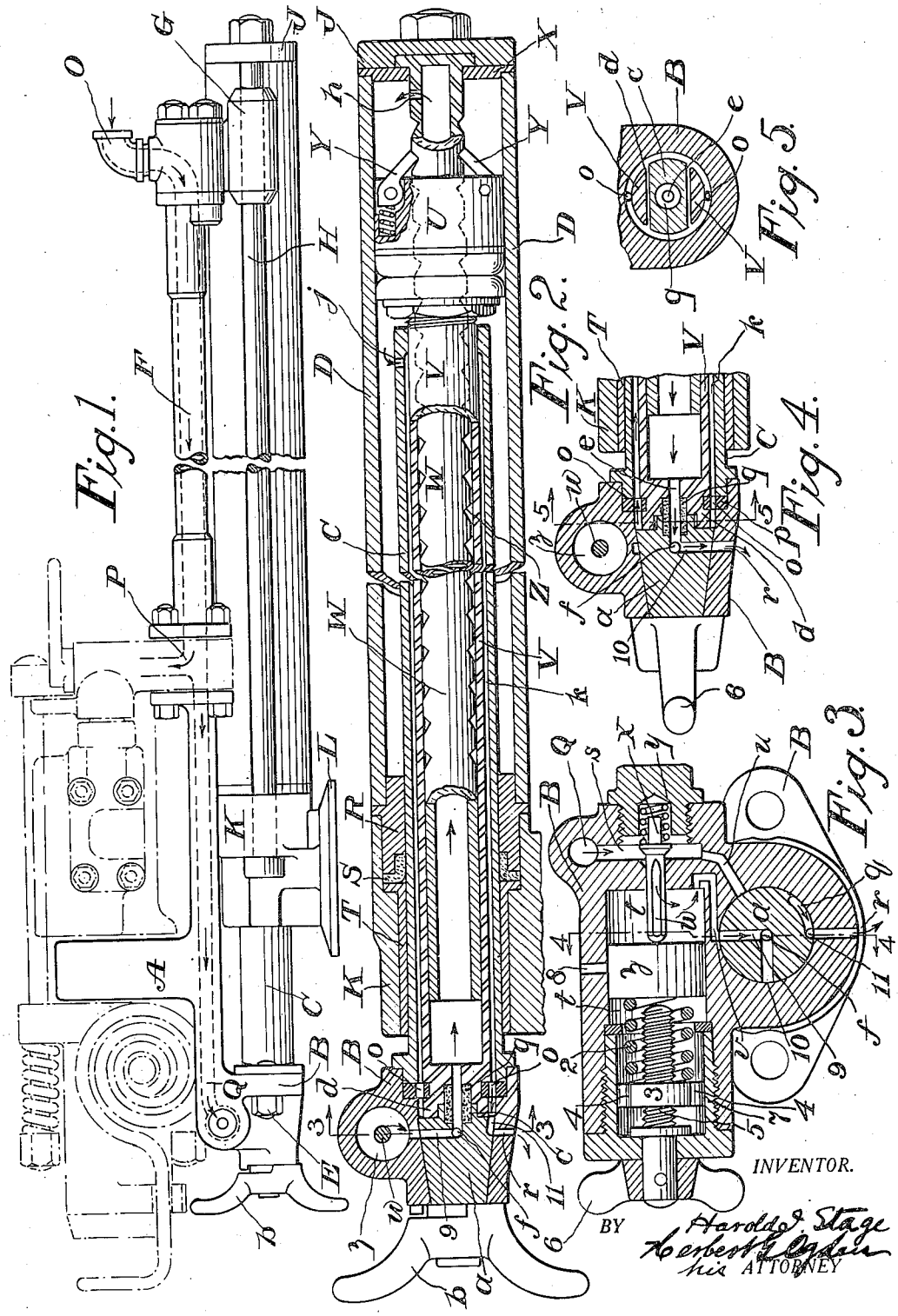
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UNITARY REGULATING AND CONTROLLING MEANS FOR DRILL FEED MECHANISM.

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1,378,491. Patented May 17, 1921.



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1,378,491. Specification of Letters Patent. Patented May 17, 1921.

Application filed March 4, 1920. Serial No. 363,164.

To all whom it may concern:

Be it known that I, HAROLD I. STAGE, a citizen of the United States, residing at Easton, in the county of Northampton and State of Pennsylvania, have invented a certain new and useful Improvement in Unitary Regulating and Controlling Means for Drill Feed Mechanism, of which the following is a specification.

This invention relates to fluid actuated percussive tools, but more particularly to fluid actuated feeding mechanism therefor, and the primary object of the invention is to procure a unitary regulating and controlling device which may be mounted in operative relation to the feed mechanism for automatically regulating the pressure and for controlling the forward and reverse movement of the feeding mechanism. By providing a unitary construction containing both a pressure regulating valve and a controlling throttle valve closely adjacent to each other in the same casing, both may be conveniently controlled and manipulated from the same location with one hand, leaving the other hand free for other purposes in connection with the drilling.

Another object of the invention is to afford simple and efficient means which may be readily and quickly controlled for obtaining a quick forward and back motion of the feeding mechanism without causing the motive fluid to pass through the pressure reducing regulating valve. Means are preferably provided for setting the regulating valve to control different pressures and the mechanism is so devised and constructed that the reducing valve may be set as desired, and yet a powerful forward feed may be obtained whenever wanted without altering the setting of the reducing valve.

To these and other ends which will hereinafter appear, the invention consists of the combinations of elements described and claimed in this specification and shown in the accompanying drawings in which—

Figure 1 is a side elevation of a percussive tool embodying the invention,

Fig. 2 is an enlarged longitudinal sectional view partly broken away, taken through the air feed cylinder,

Fig. 3 is a transverse sectional view on the line 3—3 of Fig. 2 looking in the direction of the arrows. In Figs. 1, 2 and 3 the parts are in position for forward feed,

Fig. 4 is a detail longitudinal sectional view partly broken away, taken through the valve casing and showing the parts in position for reverse, and

Fig. 5 is a transverse sectional view partly broken away, taken through the valve casing on the line 5—5 of Fig. 4 looking in the direction of the arrows.

Referring to the drawings, the cylinder and related parts of a percussive tool of suitable character for illustrating the application of the invention, are shown in dotted lines mounted on the carriage A having a casing B suitably secured to the longitudinally movable tubular piston rod casing C of the stationary air feed cylinder D as by means of the bolts E. The carriage A includes the piping F and the bracket G slidably mounted on the rods or bolts H connecting the back head J and front head K of the feed cylinder D. The front cylinder head K, as shown, is provided with a disk or pedestal L for mounting the tool on a suitable support. Motive fluid is supplied to the inlet O and passes to the percussive tool as indicated by the arrow P, and passes to the casing B through the inlet Q and from thence to the air feed cylinder in the manner to be described and under control of unitary controlling means forming the principal subject matter of this invention.

The air feed cylinder and its operative parts may be constructed in any suitable manner, but I prefer a construction substantially similar to that discussed in my U. S. Patent No. 1,336,930 dated April 13, 1920, for rock drill seating and controlling means, as a simple and efficient air feeding mechanism, certain modifications in that mechanism being provided for the purpose of the present invention. In the construction herein shown for illustrated purposes, a clamping ring R is clamped by the front head K and a packing ring S is secured between the ring R and a sleeve T forming a stuffing box for the piston rod casing C.

The hollow piston head U, adapted to be driven forward in the cylinder D to feed the drill and retracted for the reverse movement, is provided with a tubular piston rod V within the casing C. A tubular rack or toothed member W is disposed within the hollow piston rod V as shown and is supported and held at its rearward end by the plate X. A pair of spring pressed pawls

Y pivoted to the piston head U are adapted to engage the notches Z on the sides of the rack W as the piston is advanced, thus preventing retrograde movement during the feed. For the reverse movement the piston head U and piston rod V are turned through a quarter revolution by turning the throttle valve *a* in the manner to be described so that the pawls Y are disengaged from the rack and the piston may slide rearwardly over the rack. As shown, the casing B has a tapered port in which the tapered throttle valve *a* is seated. A handle *b* is provided for turning the valve and a reduced portion on the valve in the form of a tongue *c* is set into the slotted forward end *d* of the hollow piston rod V so that by turning the valve *a*, the piston rod and piston U are rotated to disengage the pawls Y from the rack for reversing purposes.

The forward end of the hollow piston rod V has a central aperture *e* communicating with the central passage *f* of the valve plug *a* through the bushing *g* forming a stuffing box for admission of fluid through the piston rod V and the hollow rack W, and through the port *h* at the rear end of the rack behind the piston head U to force the piston forward. On the forward feeding movement the fluid in front of the piston head U passes through port *j* in the piston rod casing C and through the space *k* between the casing C and the piston rod V, and out through the ports *o* in the ring *p* to the port *q* in the valve *a* and exhausts to atmosphere through the exhaust port *r* in the casing B. For the reverse movement to retract the piston U the valve is turned to the position shown in Fig. 4 as will be explained, and fluid is admitted from the valve through the ports *o* in the ring *p* to the space *k* between the casing C and piston rod V and through port *j* in front of the piston head U. The exhaust behind the piston head then passes through port *h* to the hollow rack W and piston rod V and out through the central port *e* to the valve *a* and exhaust port *r* in the casing B.

One of the important features of this invention consists of the valve casing B and its associated and contained parts which form a unitary controlling and regulating means for the drill feeding mechanism. The casing B contains in addition to the throttle valve *a* the regulating valve, the parts of which are arranged in the valve chambers *s* and *t* communicating with the valve chamber containing the valve *a* by means of the passages *u* and *v* respectively for the purposes.

The regulating or reducing valve between the fluid pressure supply inlet Q and the feed cylinder D is to maintain a constantly regulated pressure in the feed cylinder within close limits. The pressure in the feed cylinder is maintained substantially constant regardless of the work being done by the tool, and a regulating valve substantially like that disclosed in my U. S. Patent No. 1,361,636, dated Dec. 7, 1920, for drill feeding means, may be used although I do not limit myself to any particular type of valve and only show the one referred to for purposes of illustration with suitable modifications for adapting the valve to the present invention.

As shown, fluid pressure enters chamber *s* from inlet Q and may pass to chamber *t* around the fluted stem *w* of the valve *x* normally pressed toward its seat by the light spring *y*, or else pressure may pass directly through the passage *u* and thence to the feed cylinder depending upon the position of the valve *a*. A plunger *z* in the chamber *t* is normally pressed against the valve stem *w* by a spring 2 abutting against a nut 3 having flutes 4 which restrain its rotation as the threaded bolt 5 is adjusted by the wing nut 6 to adjust the tension of the spring 2. The spring adjusting means may be inclosed within the screw cap 7 for convenience with which the flutes 4 of the nut 3 engages. As shown, a leak port 8 is provided for the valve chamber *t*.

Movement of the plunger *z* under varying pressure in the chamber *t* varies the opening of the valve *x*, and with a given adjustment of the spring 2, a given critical pressure in the chamber *t* will balance the spring pressure and allow the valve to close. A lower pressure than that critical pressure will cause the plunger *z* to force the valve *x* to open a certain amount and permit pressure to pass around the flutes of the valve stem *w* to the chamber *t*. An increase of pressure beyond the critical pressure will move the plunger *z* in the opposite direction and permit fluid to exhaust through the port 8. By means of the reducing valve *x* and associated parts as described, the supply of motive fluid to the air feed cylinder is regulated and automatically maintained at any desired constant pressure less than the full line pressure.

In the position of the parts shown in Figs. 1, 2 and 3, the throttle valve *a* is set for forward feed, the fluid pressure being regulated by the reducing valve *x*. The construction is such, however, that a quick forward and back motion of the drill may be obtained without taking the air through the reducing valve. The reducing valve may be set as desired and yet a powerful forward feed may be obtained whenever wanted without altering this setting and this is one of the features of the invention made readily available in a simple and convenient manner by the unitary construction provided. With the parts in the position

shown in Figs. 1, 2 and 3, air passes to and through reducing valve *x* as indicated by the arrows, to chamber *t*, and through passage *v* to the radial passage 9 in valve *a*, and through the central passage *f* in the valve to the feed cylinder D to force the piston U forward as heretofore described. For the reverse movement as shown in Fig. 4, the valve *a* is turned to bring the lengthened peripheral passage *q* in communication with the direct supply passage *u* from the valve chamber *s*, and the radial passage 10 is brought opposite the exhaust port *r* in the valve casing B. Air then enters through passage *u* and follows around the peripheral passage *q* and back through the longitudinal slot 11 to the ports *o* in the ring *p* and passes into the feed cylinder as heretofore described.

For quick forward movement, the valve *a* is turned to bring the radial passage 9 opposite the direct supply passage *u*, and the lengthened peripheral passage *q* remains in communication with the exhaust port *r* in the valve casing B, permitting exhaust from the feed cylinder D.

I claim:

1. In fluid actuated feeding mechanism for drills having forward and reverse movement, a unitary regulating and controlling device mounted in operative relation to the feeding mechanism and comprising a valve casing having a plurality of regulating valve chambers, one of which is supplied with motive fluid under line pressure, an automatic pressure reducing valve operating in said chambers, an adjacent throttle valve chamber in said valve casing communicating with both chambers of said regulating valve, and a throttle valve in said throttle valve chamber for controlling the forward and reverse action of the feed mechanism whereby the feed mechanism may be supplied with motive fluid under line pressure directly from one regulating valve chamber or with reduced pressure from the other regulating valve chamber.

2. In fluid actuated feeding mechanism for drills having forward and reverse movement, a unitary regulating and controlling device mounted in operative relation to the feeding mechanism and comprising a valve casing having a plurality of regulating valve chambers one of which is supplied with motive fluid under line pressure, an automatic pressure reducing valve operating in said chambers, means for setting said valve to automatically control different pressures, an adjacent throttle valve chamber in said valve casing communicating with both chambers of said regulating valve, and a throttle valve in said throttle valve chamber for controlling the forward and reverse action of the feed mechanism whereby the feed mechanism may be supplied with motive fluid under line pressure directly from one regulating valve chamber or with reduced pressure from the other regulating valve chamber without altering the setting of the said regulating valve.

In testimony whereof, I have hereunto set my hand.

HAROLD I. STAGE.