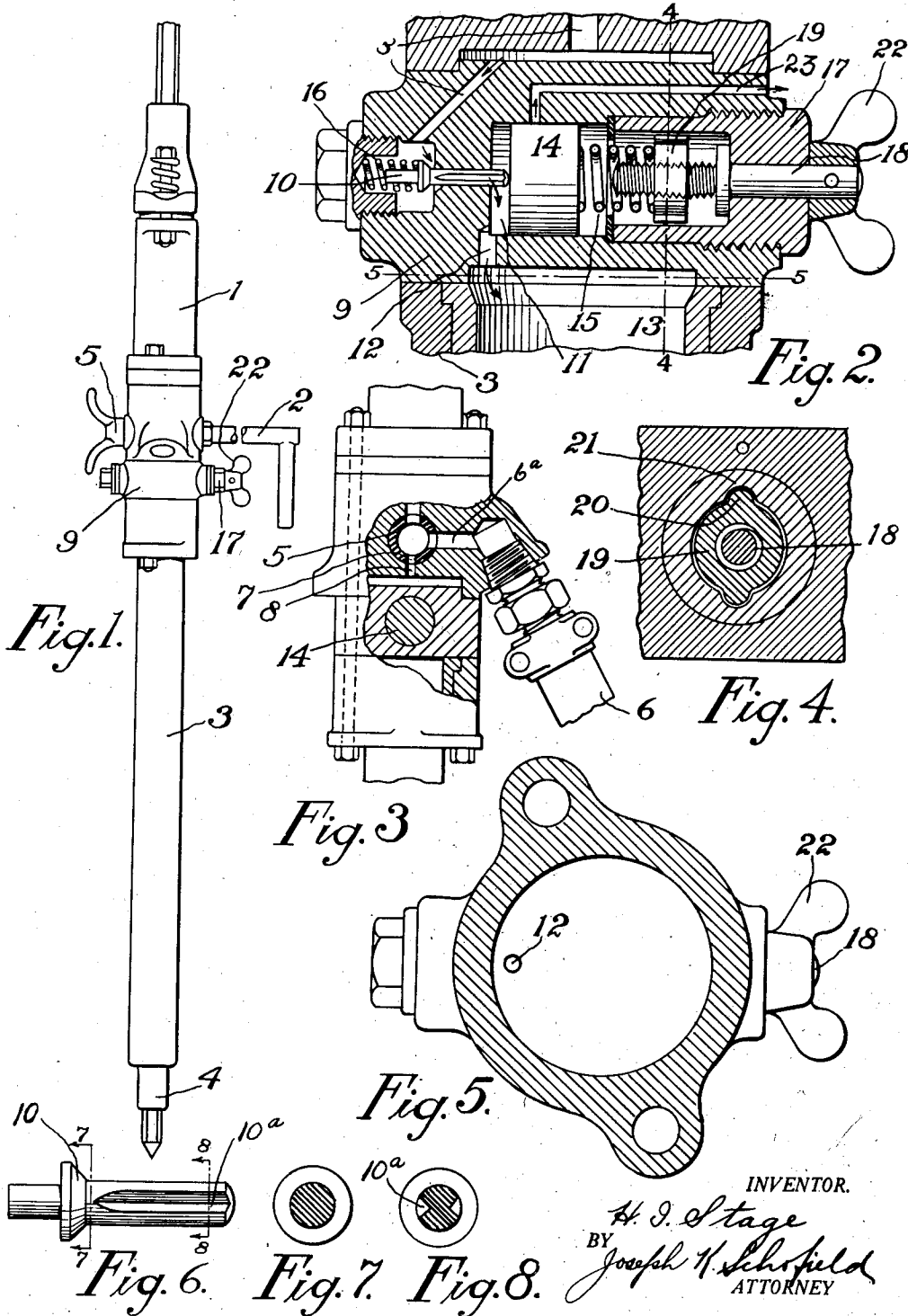


H. I. STAGE.
 REGULATING VALVE FOR DRILL FEEDING MEANS.
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REGULATING-VALVE FOR DRILL-FEEDING MEANS.

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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 Regulating-Valves for Drill-Feeding Means, of which the following is a specification.

This invention relates to a class of rock drills known as stopers and in particular to a valve construction for maintaining a constantly regulated pressure in the feed cylinder for holding the drill up against the rock when it is in operation.

The objects of the present invention are to provide a valve between the fluid pressure supply and the feed cylinder which will enable the operator to control the pressure exerted within the feed cylinder to force the drill upwardly to the work. A further object of the invention is to make this valve in a form which will be compact, readily operated by the workman and one which will enable the pressure within the feeding cylinder to be maintained at a constant pressure, when the valve has been set by the operator, within very close limits regardless of the character of rock being drilled.

With the above and other objects in view my invention consists in the features of construction and operation set forth in the following specification.

In the drawings annexed hereto and forming a part hereof:

Figure 1 shows an outside view in elevation of a complete stoper or air feed drill provided with the present invention;

Fig. 2, an elevation in cross section of the complete valve structure forming the subject matter of the present invention;

Fig. 3, a portion of the stoper with parts broken away to show the fluid pressure supply, the throttle valve, and the position of the regulating valve relative thereto;

Fig. 4, a view taken on lines 4-4 of Fig. 2.

Fig. 5, a section taken along lines 5-5 of Fig. 2;

Fig. 6, a view of the regulating valve forming a part of my invention,

Figs. 7 and 8, cross sectional views of the regulating valve taken on lines 7-7 and 8-8 respectively.

Referring more particularly to the figures of the drawing, 1 refers to the hammer cyl-

inder of a stoper which may be of any well known type, that shown being of the hammer drill type with hand rotating means shown at 2. At 3 is shown the feed cylinder which is of the usual type containing a piston or plunger forcing the point 4 away from the cylinder 3 when pressure is admitted at the upper end of the cylinder. The throttle valve shown at 5 receives its supply of fluid pressure through conduits 6 and 6^a in the usual manner.

In drilling different types of rock the pressure with which the drill is held against the work must necessarily be varied within rather wide limits to obtain the most effective drilling, especially is this so when seamy rock is being operated on, and when the type or hardness of the rock varies while a single hole is being drilled. In order to efficiently use the drill in this seamy or other type of ground the novel form of regulating valve has been provided which will maintain the pressure within the feed cylinder 3 at any pressure desired under control of the operator without regard to the rapidity of drilling or type of rock being drilled. This is accomplished in the following manner. The throttle valve 5 is shown provided with a radial passage 7 which, when in its open position as shown in Fig. 3 permits fluid to pass directly from the supply conduit 6 into passages 8 as shown in Fig. 2. Passing through the passages or conduit 8 the fluid passes through block 9 past a valve 10 shown in Fig. 2 in open position which is its normal position, as will hereinafter appear. The fluid then enters cavity 11 and thence into conduit 12 and into the cylinder pressure cavity 13 within the feed cylinder 3.

Within the cavity 11 a plunger 14 is provided pressed toward the left by means of a spring 15, its forward face pressing against one end of the valve 10 and tending to hold it in open position against a spring 16 which surrounds the valve 10 and exerts relatively light pressure tending to force it into closed position. Inserted within the cavity 11 is a screw plug 17, carrying a threaded bolt 18, rotation of which moves forwardly or back the nut 19 which is mounted upon the threaded portion of bolt 18. The nut 19 is restrained from rotating by means of flutes and recesses shown respectively at 20 and 21 in Fig. 4. Rotation of the bolt is accom-

plished by means of winged nut 22 which forces the nut 19 forwardly and back varying the pressure exerted by spring 15 against the plunger 14.

5 It will be seen from this mechanism that the fluid pressure exerted within the cavity 11 is exerted against the face of the plunger 14 tending to force it to the right against pressure of the spring 15 and with move-
10 ment of this plunger 14 the valve 10 is allowed to close. With the spring 15 adjusted to a given pressure by the adjustment of nut 19 it will be obvious that a given pressure will just balance the pressure to hold the
15 valve 10 in a closed position and that when the pressure within cavity 11 is lower than that critical pressure the plunger 14 will move to the left thus opening the valve 10 and permitting a little fluid to pass through
20 the flutes 10^a provided in valve 10 and thus enter the pressure chamber 13, and as soon as the critical pressure is reached in cavity 11, plunger 14 will be moved to the right and thus the valve 10 will be closed until
25 the pressure again drops within the pressure chamber 13 and cavity 11. Should the pressure within cavity 11 increase above the critical pressure the plunger 14 will be moved to the right far enough to open the
30 exhaust conduit 23 thus allowing some of the fluid within cavity 11 to escape.

In the operation of starting the drill the throttle valve is partially opened and as the valve 10 is initially and normally open the
35 drill 1 is permitted to rise to the work and the hammer started in operation. As soon as the drilling is started and the throttle opened to its fully opened position, the pressure of spring 15 may be readily adjusted
40 by rotation of the wing nut 22 until the desired pressure for feeding the drill forwardly and holding the drill against the rock is obtained within the feed cylinder 3 and as the drilling progresses this pressure
45 may be varied as desired, by simply rotating the wing nut 22 slightly to either increase or decrease the pressure of spring 15.

Valve 10 which is clearly shown in Figs. 6-7-8—may be made of any well known
50 or common type, the one shown being of the puppet type, its front extension or stem being fluted as shown at 10^a to permit air to pass into cavity 11 when in its open position. The valve is not necessarily fastened
55 to the forward face of the plunger 14 as the pressure of light spring 16 and of the fluid pressure against the head of the valve will continuously tend to force it to its closed position to the right and hold it against the
60 plunger 14. A force sufficient to maintain the valve open is exerted when the force of spring 15 exceeds the resisting force of the light spring 16 and the pressure in cavity 11, but this is the normal condition, and
65 the valve is adapted to close when the fluid

within the feed cylinder reaches a critical pressure greater than the force exerted in holding the valve open.

The above description discloses a construction which will regulate the supply of air 70 into the feed cylinder 3 of a stope drill and maintain it at any desired constant pressure less than the full line pressure at the throttle valve.

Having thus described my invention; 75 what I claim is:

1. In a pressure regulating device for rock drill feeding means, a normally open valve mounted on said drill independent of the throttle valve between said throttle and the 80 feed cylinder of said drill, resilient means exerting relatively light pressure tending to force said regulating valve to closed position, and a piston resiliently pressed against said valve to hold it open, said valve 85 being adapted to close when the fluid within the feed cylinder reaches a critical pressure greater than the force exerted in holding the valve open.

2. In a pressure regulating device for rock 90 drill feeding means, a normally open valve mounted on said drill, independent of the throttle valve between said throttle and the feed cylinder of said drill, resilient means exerting relatively light pressure tending to 95 force said regulating valve to closed position, and a piston resiliently pressed against said valve to hold it open, said valve being adapted to close when the fluid within the feed cylinder reaches a critical pressure greater than 100 the force exerted in holding the valve open, and adapted to open an exhaust conduit when the critical pressure is exceeded.

3. In a pressure regulating device for rock drill feeding means, a normally open 105 regulating valve mounted between the fluid supply and the feed cylinder of said drill, resilient means exerting relatively light pressure tending to force said regulating valve to closed position, a piston resiliently 110 pressed toward said valve to hold it open, said valve being adapted to close when the fluid within the feed cylinder reaches a critical pressure greater than the force exerted in holding the valve open. 115

4. In a pressure regulating device for rock drill feeding means, a normally open regulating valve mounted between the fluid supply and the feed cylinder of said drill, resilient means exerting relatively light pressure 120 tending to force said regulating valve to closed position, a piston resiliently pressed toward said valve to hold it open, said valve being adapted to close when the fluid within the feed cylinder reaches a critical pressure 125 greater than the force exerted in holding the valve open, and adapted to open an exhaust conduit when the critical pressure is exceeded.

5. In a feed pressure regulating device for 130

rock drills, a normally open valve inserted in the conduit extending from the throttle valve to the feed cylinder, said valve being urged toward its closed position by means of a spring exerting relatively light pressure and held in its open position by a piston operating within a cavity, said piston being forced in a direction to open said valve by means of adjustable spring pressure and forced in a direction to close said valve when the pressure within said cavity reaches a critical amount greater than the spring pressure exerted in holding the valve open.

6. In a feed pressure regulating device for rock drills, a normally open valve inserted in the conduit extending from the throttle valve to the feed cylinder, said valve being urged toward its closed position by relatively light resilient pressure and held in its open position by a piston operating within a cavity, said piston being forced in a direction to open said valve by means of adjustable spring pressure and forced in a direction to close said valve against said spring pressure when the pressure within said cavity and also within said feed cylinder reaches a critical amount.

7. In a feed pressure maintaining means for rock drills, a normally open valve adapted to admit fluid to a feed cylinder on said drill when pressure in said cylinder is below a critical pressure, and means comprising a piston movement of which opens and closes an exhaust conduit to vary the pressure at which said valve maintains pressure within said feed cylinder.

8. A pressure regulating device for rock drill feeding means mounted between the fluid supply and the feed cylinder of the drill, comprising a casing having a bore in

communication at its inner end with the feed cylinder, a piston sliding in said bore, a spring forcing the piston inward against pressure from the feed cylinder, a valve controlling communication from the source of supply to the feed cylinder and opened by the piston when it moves inward due to the spring pressure exceeding the feed cylinder pressure and a port extending from the bore of the regulating device and adapted to open communication from the feed cylinder through the said bore to the atmosphere, said port being uncovered by the piston due to the fluid pressure from the feed cylinder exceeding the spring pressure against the piston.

9. A pressure regulating device for rock drill feeding means mounted between the fluid supply and the feed cylinder of the drill, comprising a casing having a bore in communication at its inner end with the feed cylinder, a piston sliding in said bore, a spring forcing the piston inward against pressure from the feed cylinder, ports and passages normally open to establish communication from the source of supply to the feed cylinder, means for closing said communication when the pressure from the feed cylinder on the piston exceeds the spring pressure, ports and passages normally closed but opened to connect the feed cylinder with the atmosphere when the force of the pressure from the feed cylinder on the piston compresses the said spring farther than is required to close communication from the source of supply to the feed cylinder.

In testimony whereof, I have hereunto set my hand.

HAROLD I. STAGE.