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C. F. OSGOOD

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FEEDING MECHANISM

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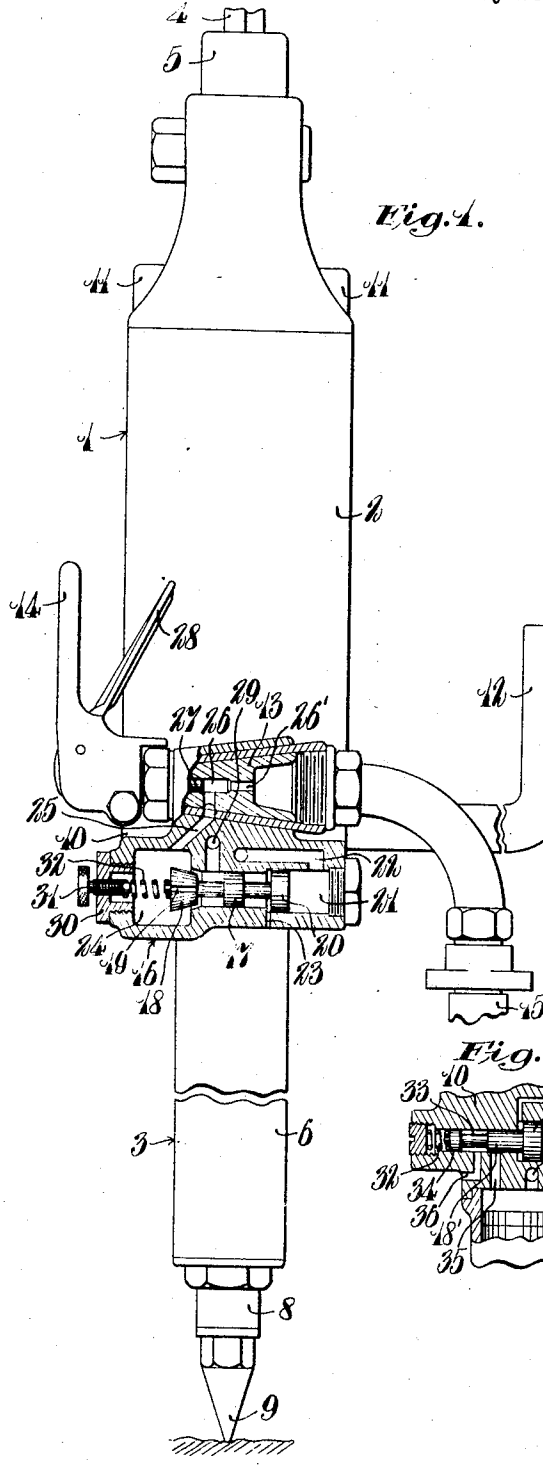


Fig. 1.

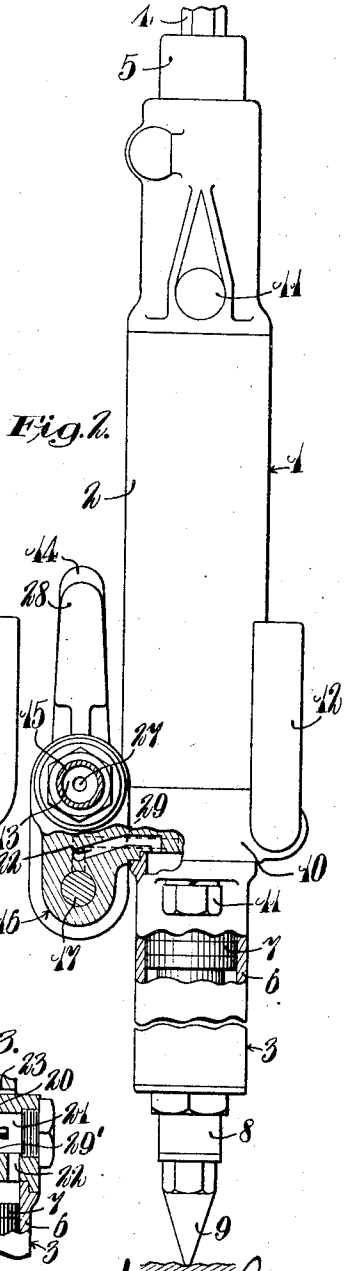


Fig. 2.

Fig. 3.

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UNITED STATES PATENT OFFICE.

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FEEDING MECHANISM.

Application filed May 24, 1923. Serial No. 641,094.

My invention relates to feeding mechanism, and more particularly to feeding mechanism for rock drilling devices.

An object of my invention is to provide an improved feeding mechanism. Another object of my invention is to provide an improved pressure fluid operated feeding mechanism having improved controlling means. A further object of my invention is to provide an improved feeding mechanism for pressure fluid rock drills having improved means for controlling the operation thereof. A still further object of my invention is to provide an automatic air feed control for the feeding mechanism of pressure fluid rock drills of the percussive type whereby the air feed is automatically controlled in accordance with the nature of the drilling encountered. Other objects and advantages of my invention will hereinafter more fully appear.

In the accompanying drawings I have shown for purposes of illustration two forms which my invention may assume in practice.

In these drawings,—

Fig. 1 is a side elevation, partially broken away to facilitate illustration, of a drilling mechanism incorporating my improved controlling mechanism.

Fig. 2 is a side elevation, partially in central longitudinal section, of Fig. 1.

Fig. 3 is a detail sectional view, similar to that of Fig. 1, showing a modified form of my invention.

In the illustrative form of my invention shown in Figs. 1 and 2 I have shown the same employed in a stopper drilling mechanism of standard form, generally designated 1, and which comprises a drilling motor 2 and a feeding mechanism 3. The drilling motor is herein of the valveless percussive type adapted to percussively actuate a drill steel 4 carried in a chuck 5 in the front end of the drilling motor. The feeding mechanism 3 comprises a feed cylinder 6 and a feed piston 7 disposed therein having a piston rod 8 suitably secured thereto and terminating in a point 9 adapted to engage a suitable abutment, or support, during drilling, herein the mine bottom.

Interposed between the drilling motor 2 and the feeding mechanism 3 is a head block 10 which incorporates my improved controlling mechanism. The feeding mechanism, the head block, and the drilling motor parts are rigidly held in position by side rod connections 11, in a well known manner. Suitably secured to the head block 10 is a handle 12 extending laterally from the drill and which is employed to rotate the drill steel, if automatic rotation is not desired, and to support the drill during the drilling operation whether the latter is automatically or manually rotated. Arranged within a boss formed integral with the head block is a throttle valve 13, provided with a controlling handle 14, through which pressure fluid is supplied to the drilling motor and to the feeding mechanism by means of a hose connection 15 from any suitable source of supply. In the drilling operation, if a soft spot, or cavity, is encountered, the power of the air feed should ordinarily be reduced to enable the machine to operate in its most efficient manner. To accomplish this I have provided adjacent the throttle valve 13 my improved automatic feed controlling mechanism, generally designated 16, and comprising a valve 17 having a conical or tapered head 18 which graduates the admission of pressure fluid as hereinafter described. The head 18 has a slot 19 cut in its tapered side so that when the valve is seated a small amount of pressure fluid may leak past to the feed cylinder 6. At the opposite end of the valve 17 is provided a piston head 20 disposed in a pressure tight chamber 21 which communicates with the interior of the feed cylinder 6 by means of a passage 22. To prevent the pressure building up on the other side of the piston head 20 a leak port 23 is provided exhausting this end of the chamber to the atmosphere. Within the head block 10 is a constant pressure chamber 24 from which pressure fluid is distributed to the feed cylinder. Pressure fluid is conducted to the chamber 24 by way of a port 25 which communicates with a bore 26 axially disposed in the throttle valve 13. The bore 26 communicates with the pressure supply by way of a port 26′. Slidable in the bore 26 is a valve 27 under control of a lever 28 arranged within the handle 14. When it is desired to manually control the air feed, the lever 28 is manipulated by the operator, seating, or partially seating, the

valve 27. Leading from the pressure chamber 24, under the control of the valve 17, is a passage 29 communicating with the feed cylinder. The chamber 24 is suitably closed by a plug 30 through which extends an adjustable follower 31 by which the pressure on a spring 32, acting on the valve 17, may be adjusted. The type of valve shown is for illustrative purposes only, the particular type of valve being immaterial.

The mode of operation of this form of my improved device is as follows. The point 9 of the feed piston 7 is placed against an abutment a suitable distance from the working face, the drill being supported by the handle 12. The operator opens the throttle valve 13 admitting fluid pressure to the drilling motor and the chamber 24. The pressure in the chamber 24 acts on the surface of the head 18 of valve 17 moving it to its seat, the pressure at this time being low in the feed cylinder. Pressure fluid then leaks through the slot 19 gradually building up the pressure in the feed cylinder 6, the port 22, and the chamber 21, moving the piston head 20 slightly to the left, admitting more pressure fluid to the feed cylinder by way of port 29, and as the drilling motor 2 deepens the hole in the usual manner the drill is fed forward, the cylinder 6 moving relative to the piston 7. If a soft spot, or cavity, is encountered, the drill moves rapidly forward materially reducing the pressure within the feed cylinder and consequently in the chamber 21. The pressure within the chamber 24 then overcomes the pressure in the chamber 21 seating the valve 18 and subsequently retarding the feed. When feeding movement is again resisted, the controlling valve returns to its initial position. From the foregoing description it is clearly apparent that the valve 17 will automatically control the strength of feed in accordance with the nature of the drilling. When it is desired to manually control the feed, the lever 28 is grasped by the operator moving the valve 27 to the right, cutting off the pressure supply to the chamber 24 and subsequently retarding the feed.

In the form of my invention shown in Fig. 3, I have shown a device similar to that in Figs. 1 and 2 except that a valve 18′ is employed provided with a groove 33 slidable in a bore 34. Communicating with the bore 34 is a pair of ports 35 and 36, respectively, the former leading to the feed cylinder 6 while the latter leads to the atmosphere. The passage 29′ communicates directly with the throttle valve 13.

The mode of operation of this form of my invention is as follows. When the pressure drops within the feed cylinder 6, as when soft drilling or a cavity is encountered, the pressure drops in the chamber 21 and the spring 32 then forces the valve 18′ to the right, opening communication between the ports 35, 36 and venting the feed cylinder to the atmosphere, thereby retarding the feed.

While I have in this application specifically described two forms which my invention may assume in practice, it will be understood that these forms of the same are shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In a drilling apparatus, the combination with a drilling motor, pressure fluid actuated feeding means therefor, and means for supplying pressure fluid to the latter, of pressure fluid controlled means controlled by pressure variations in said feeding means for automatically arresting an abnormal rate of feeding movement when the resistance on said feeding means is decreased.

2. In a drilling apparatus, the combination with a drilling motor, pressure fluid actuated feeding means therefor, and means for supplying pressure fluid thereto, of means automatically responsive to the pressure in said feeding means for arresting an abnormal rate of feeding movement when the resistance on said feeding means is decreased.

3. In a drilling apparatus, the combination with a drilling motor, pressure fluid actuated feeding means therefor, and means for supplying pressure fluid thereto, of feed control means operative to reduce the flow of pressure fluid to said feeding means automatically governed by the decrease in resistance to feeding movement.

4. In a drilling apparatus, the combination with a drilling motor, pressure fluid actuated feeding means therefor, and means for supplying pressure fluid thereto, of means automatically responsive to pressure conditions in said feeding means for reducing the supply of pressure fluid thereto in accordance with decrease of pressure therein.

5. In a drilling apparatus, the combination with a drilling motor, pressure fluid actuated feeding means therefor, and means for supplying pressure fluid to the latter, of means automatically responsive to a decreased resistance to feeding movement for decreasing the fluid flow to said feeding means.

6. In a drilling apparatus, the combination with a drilling motor, pressure fluid actuated feeding means therefor, and means for supplying pressure fluid to the latter, of pressure fluid controlled valve means for automatically substantially closing the fluid

now to said feeding means when the resistance to movement of the latter is suddenly decreased.

7. In a drilling apparatus, the combination with a drilling motor, pressure fluid actuated feeding means therefor, and a pressure fluid supply for the latter, of a valve for initially controlling the flow of fluid from said supply to said feeding means, and automatic means for subsequently controlling said fluid flow, said automatic means being responsive to a decrease in the feeding pressure for reducing the flow of fluid from said supply to said feeding means.

8. In a drilling apparatus, the combination with a drilling motor, fluid actuated feeding means therefor, and a fluid supply for the latter, of a plurality of manually operable valves for initially controlling the fluid flow to said feeding means, and a pressure fluid actuated valve for automatically subsequently controlling said fluid flow, said automatic means being responsive to a decrease in the feeding pressure for reducing the flow of fluid from said supply to said feeding means.

9. In a drilling apparatus, the combination with a drilling motor, fluid actuated feeding means therefor, and a fluid supply for the latter, of means for initially controlling the flow of fluid from said supply to said feeding means comprising a manually operable valve, and automatically fluid actuated valve means for subsequently controlling the fluid flow to said feeding means, said automatic means being responsive to a decrease in the feeding pressure for reducing the flow of fluid from said supply to said feeding means, said automatic means being operable independently of said manual means.

10. In a drilling apparatus, the combination with a drilling motor, fluid actuated feeding means therefor, and a fluid supply for the latter, of means for controlling said fluid supply including a valve having its opposite ends subjected to the pressure in said feeding means and to said fluid supply respectively, said valve being responsive to a decrease in the feeding pressure for interrupting said fluid supply.

11. In a drilling apparatus, the combination with a pressure fluid actuated drilling motor, pressure fluid actuated feeding means therefor, and a fluid supply for said motor and feeding means, of means for primarily controlling the fluid flow to said supply and said feeding means, supplemental means for controlling the fluid flow only to said feeding means, and means interposed between said latter means and said feeding means for automatically controlling the pressure within the latter, said automatic means being responsive to a decrease in the feeding pressure for reducing flow of fluid from said supply to said feeding means.

12. In a pneumatic feeding mechanism, a feed cylinder, a cooperating feed piston, means for supplying pressure fluid to said cylinder to effect relative movement between the latter and said piston, and automatic means controlled by the pressure within said feed cylinder to arrest an excessive rate of relative movement between said cylinder and piston when the resistance to feeding movement is suddenly decreased.

13. In a drilling apparatus, the combination with a drilling motor, pressure fluid actuated feeding means therefor, and means for supplying pressure fluid to the latter, of pressure fluid controlled means automatically operative when the resistance to feeding is decreased to diminish the ratio of feed effecting force to feed resistance.

14. In a drilling apparatus, the combination with a drilling motor, pressure fluid actuated feeding means therefor, and means for supplying pressure fluid to the latter, of means automatically operative when the resistance to feeding is decreased to diminish the unbalanced force tending to effect feeding movement.

In testimony whereof I affix my signature.

CHARLES F. OSGOOD.