Dec. 24, 1929. C. F. OSGOOD 1,740,703

DRILLING MECHANISM

Filed May 24, 1923

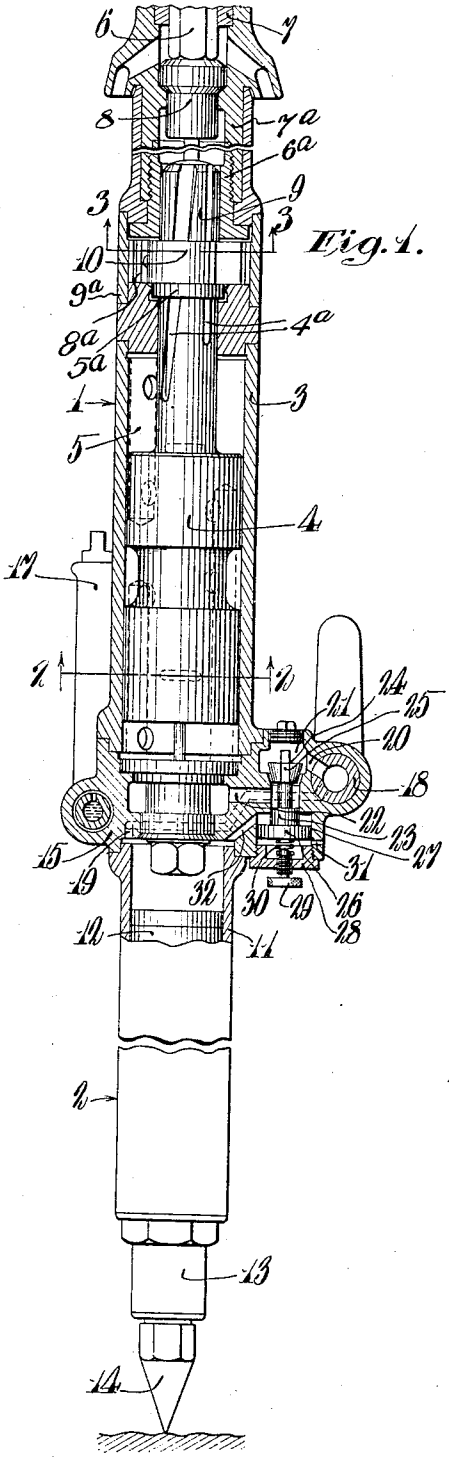
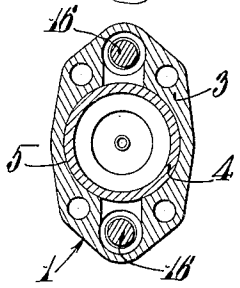


Fig. 1.

Fig. 2.



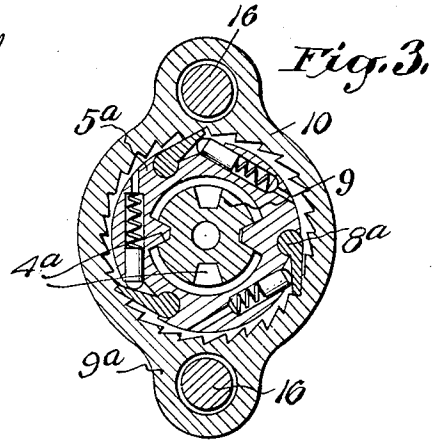


Fig. 3.

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UNITED STATES PATENT OFFICE

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DRILLING MECHANISM

Application filed May 24, 1923. Serial No. 641,096.

My invention relates to drilling mechanisms, and more particularly to drilling mechanisms of the pneumatically fed type.

An object of my invention is to provide an improved drilling mechanism. Another object of my invention is to provide an improved controlling device for drilling mechanisms of the pressure fluid percussive type. A further object of my invention is to provide an improved controlling device for pressure fluid percussive rock drills of the pneumatically fed type whereby the feeding mechanism automatically controls the speed of the hammer piston. A still further object of my invention is to provide an improved controlling device responsive to variations of pressure within the feeding mechanism for automatically varying the pressure in the drilling motor. These and other objects and advantages of my invention will hereinafter more fully appear.

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

In these drawings,—

Fig. 1 is a central longitudinal section, partially in elevation, of a drilling mechanism embodying my improved device.

Fig. 2 is a transverse section taken on line 2—2 of Fig. 1.

Fig. 3 is a transverse sectional view taken substantially on line 3—3 of Fig. 1.

In this illustrative form of my invention it will be noted that I have shown a stopper drill of standard form including a drilling motor 1 and a feed mechanism 2. The drilling motor 1, herein of the valveless percussive type, comprises a cylinder 3 having a hammer piston 4 reciprocable in a bore 5 therein adapted to percussively actuate a drill steel 6, carried in a chuck 7 in the front end of the drilling motor, through a striking block 8. The piston 4 is provided with a striking bar 9 which has straight and spiral grooves 4^a formed therein which cooperate with a ratchet mechanism, generally designated 10, which is adapted to impart a step by step rotation to the drill steel 6, in a well known manner. As shown the spiral and straight grooves 4^a cooperate respectively with a pawl carrier 5^a and a usual chuck nut 6^a, the latter being threadedly secured within a usual rotatable chuck member 7^a which receives the chuck 7 in the usual manner. Herein the pawl carrier 5^a has a plurality of spring pressed pawls 8^a mounted thereon which are adapted to react on a relatively stationary internal ratchet ring 9^a. The feeding mechanism 2 comprises a feed cylinder 11 having a piston 12 disposed therein and having suitably secured thereto a piston rod 13 terminating in a point 14 adapted to engage a suitable abutment, or support, during the drilling operation. Interposed between the drilling motor 1 and the feeding mechanism 2 is a head block 15 which incorporates the improved controlling device; the feed cylinder, head block, ratchet ring and drilling motor parts being held together by side rods 16 in a well known manner. Suitably secured to the head block 15 is also a handle 17 employed to support the machine during the drilling operation.

Pressure fluid is supplied to the machine through a throttle valve 18 arranged in a boss formed on the head block 15, from any suitable source of supply, and passes through a port 19 to the feed cylinder 11, and a passage 20 to a constant pressure chamber 21, and a port 22, under the control of an automatic control valve 23, to the drilling motor 1. The automatic control valve 23 comprises a conical or tapered head 24 having a cut-away portion or slot 25 at its tapered side so that when the valve is seated a sufficient amount of pressure fluid may pass to bring the hammer piston 4 up to drilling speed during normal conditions. At the opposite end of the valve 23 is a piston head 26 movable in a pressure tight chamber 27 which is closed by a plug 28 through which extends a follower 29 adapted to adjust the pressure on a spring 30 acting on the valve 23, tending to move it in opened position. By changing the pressure on this spring any desired speed of the motor is obtained, but this will be constant with different air pressures. On this side of the piston head 26 the chamber 27 is vented to the atmosphere by way of a port 31. A passage 32 extends from the feed cylinder 11

to the other side of the piston head 26 in the pressure chamber 27. The live pressure in the chamber 21 and the pressure acting on the head 26 overcome the force exerted by the tension of the spring 30, holding the valve 23 seated. The type of automatic control valve shown is used for illustrative purposes only, the particular type of valve used to accomplish the desired result being immaterial.

The mode of operation of my invention will be clearly apparent in view of the description given. The point 14 is placed against an abutment, herein the mine bottom, a suitable distance from the working face, the operator holding the drill in position at this time by means of the handle 17. The throttle valve 18 is then manipulated admitting fluid pressure to the feeding mechanism 2 and to the pressure chamber 21, forcing the valve 23 closed and allowing a comparatively small amount of pressure fluid to the drilling motor through the slot 25. This amount of pressure fluid is sufficient to bring the speed of the piston 4 up to the point desired during normal operation, the feed cylinder 11 moving upward relative to the piston 12 as the hole is deepened. Heretofore if a soft spot or cavity was encountered the machine jumped rapidly forward, and in many instances caused the sticking of the drill steel in the hole. In the improved automatic control device when a cavity or soft spot is encountered by the drill steel the machine jumps suddenly forward causing a material reduction in pressure within the feed cylinder and consequently in the chamber 27. The spring pressure then overcomes the pressure in the chamber 21 and opens wide the valve 23, admitting more pressure fluid to the drilling motor and thereby speeding up its blow and increasing the power of the rotation to prevent sticking of the drill steel. When normal drilling is again resumed, the valve returns to its initial position, the pressure bulding up in the chamber 27 to overcome the spring and seat the valve and slow down the speed of the drilling motor.

While I have in this application specifically described one form which my invention may assume in practice, it will be understood that this form of the same is 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 combination, a drilling motor, pressure fluid actuated feeding means therefor, and means having communication with said feeding means and automatically effective upon variation of pressure in said feeding means incident to an increased rate of feeding movement due to substantial decrease in the resistance to feeding movement to increase the power of said drilling motor.

2. In combination, a drilling motor, pressure fluid actuated feeding means therefor, and means having communication with said feeding means and automatically responsive to a reduction in pressure within said feeding means for increasing the power of said drilling motor.

3. In combination, a drilling motor having a movable member, a drill steel actuated thereby, means cooperating with said member and actuated thereby for rotating said drill steel, feeding means for said steel, and means operatively connected to said feeding means and automatically controlled by changes in the rate of operation of said feeding means incident to a variation in the resistance to feeding movement for controlling said drilling motor.

4. In combination, a drilling motor having a movable member, a drill steel actuated thereby, means cooperating with said member and actuated thereby for rotating said drill steel, means for feeding said steel, and means operatively connected to said feeding means and automatically controlled by changes in the rate of operation of said feeding means incident to a variation in the resistance to feeding movement for simultaneously controlling said drilling motor and said rotation means.

5. In combination, a drilling motor having a movable member, a drill steel actuated thereby, means cooperating with said member and actuated thereby for rotating said drill steel, pressure fluid actuated feeding means for said steel, and means having communication with said feeding means and automatically responsive to pressure changes in said feeding means for controlling said drilling motor and said rotation means.

6. In combination, a pressure fluid actuated drilling motor having a movable member, a drill steel actuated thereby, means cooperating with said member and actuated thereby for rotating said drill steel, pressure fluid actuated feeding means for said steel, and means having communication with said feeding means and automatically responsive to pressure changes in said feeding means for controlling said drilling motor and said rotation means.

7. In combination, a drilling motor, a drill steel actuated thereby, feeding means for said steel comprising relatively movable cylinder and piston members, and pressure fluid actuated means having communication with said feeding means and automatically effective when an abnormal rate of feeding movement between said elements occurs due to a substantial decrease in the resistance to feeding movement to automatically increase the speed of said drilling motor.

8. In combination, a tool actuating motor,

a tool actuated thereby, means for rotating said tool, pressure fluid actuated feeding means for said tool, and means having communication with said feeding means and automatically effective when the pressure in said feeding means is reduced incident to an excessive rate of feeding movement due to a substantial decrease in the resistance to feeding movement to speed up said tool actuating motor and said rotation means.

9. In combination, a tool actuating motor, a tool actuated thereby, pressure fluid actuated feeding means for said tool, means for rotating said tool, and means having communication with said feeding means and automatically effective when the pressure in said feeding means is reduced incident to an excessive rate of feeding movement due to a substantial decrease in the resistance to feeding movement to speed up said tool actuating motor and said tool rotation means.

10. In combination, a drilling motor, a drill steel actuated thereby, feeding means for said steel, and means operatively connected to said feeding means and automatically effective when the power of said feeding means is decreased to automatically increase the power of said drilling motor.

11. In combination, a drilling motor, a drill steel actuated thereby, mechanism for rotating said drill steel, pressure fluid actuated feeding means for said steel, and automatic pressure controlled means having communication with said feeding means and responsive to pressure changes in said feeding means for controlling said drilling motor and said rotation mechanism.

12. In combination, a drilling motor having a hammer piston, a drill steel percussively actuated thereby, means cooperating with said piston for rotating said drill steel, a fluid actuated motor for feeding said steel, and means having communication with one of said motors and automatically responsive to pressure changes in said latter motor for controlling said other motor.

13. In combination, a pressure fluid actuated drilling motor having a hammer piston, a drill steel percussively actuated thereby, means cooperating with said piston for rotating said drill steel, a fluid actuated motor for feeding said steel including relatively movable cylinder and piston elements, and means having communication with one of said motors and automatically responsive to pressure changes in said latter motor for automatically controlling said other motor.

14. In combination, a fluid actuated drilling motor having a hammer piston, a drill steel percussively actuated thereby, ratchet and pawl mechanism operated by said piston for rotating said drill steel, a fluid actuated motor for feeding said steel, and means having communication with one of said motors and responsive to pressure changes in said latter motor for automatically controlling said other motor.

15. In combination, a drilling motor having a reciprocating piston, a drill steel actuated thereby, means cooperating with said piston for intermittently rotating said drill steel, pressure fluid actuated feeding means for said steel, and automatic means having communication with said feeding means and controlled by pressure changes in said feeding means for controlling said drilling motor and said rotation means.

16. In combination, a drilling motor having a piston, a drill steel actuated thereby, means cooperating with said piston for intermittently rotating said drill steel, pressure fluid actuated feeding means for said steel, and means having communication with said feeding means and automatically controlled by pressure changes in said feeding means for controlling said drilling motor and said rotation means.

17. In combination, a drilling motor having a reciprocable piston, a drill steel actuated thereby, means cooperating with said piston for rotating said drill steel, pressure fluid actuated feeding means for said drill steel, and means having communication with said feeding means and automatically responsive to the changes in feeding pressure caused by changes in the rate of feed for controlling said drilling motor and said rotation means.

18. In combination, a drilling motor, a drill steel actuated thereby, rotation means for said steel, pressure fluid actuated feeding means for said steel, and means having communication with said feeding means and responsive to changes in feeding pressure caused by changes in the rate of feed for controlling said drilling motor and said rotation means.

In testimony whereof I affix my signature.

CHARLES F. OSGOOD.