

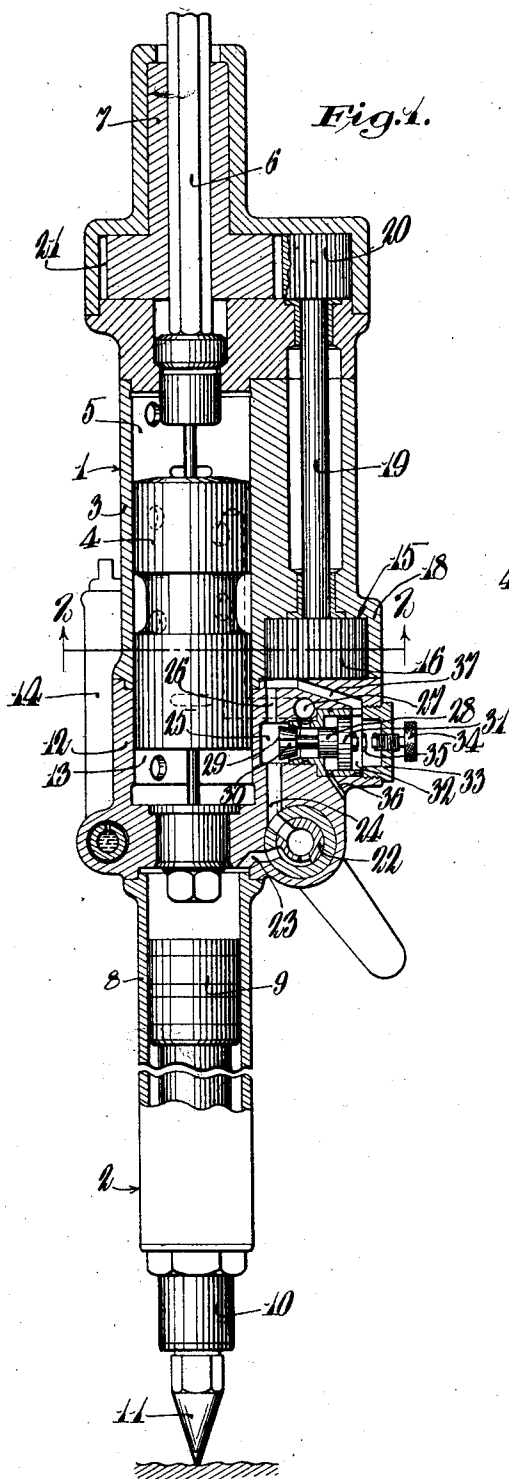
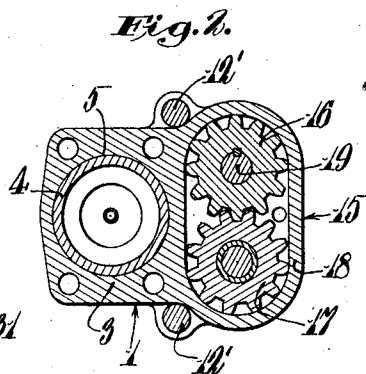
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DRILLING MECHANISM

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DRILLING MECHANISM.

Application filed May 24, 1923. Serial No. 641,095.

My invention relates to drilling mechanisms, and more particularly to controlling devices for fluid pressure rock drills of the percussive type.

- 5 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 fluid pressure rock drills. A further object of my invention is to provide an improved controlling device for fluid pressure rock drills of the percussive type whereby the rotation 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 the resistance to rotation for automatically varying the flow of pressure fluid to the drilling motor. Other objects and advantages of my invention will hereinafter more fully appear.

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

- 25 In these drawings,—

Fig. 1 is a central longitudinal section, partially in elevation, of a stoper drill incorporating my improved device.

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

- In the illustrative form of my invention I have shown a stoper drill of standard form including a drilling motor 1 and a feeding mechanism 2. The drilling motor 1, herein of the valveless percussive type, comprises a cylinder 3 having a piston 4 reciprocable in a bore 5 therein, adapted percussively to actuate, herein through a tappet, a drill steel 6 carried in a chuck 7 in the front end of the drilling motor. The feeding mechanism 2 comprises a feed cylinder 8 having a piston 9 disposed therein and having suitably secured thereto a piston rod 10 terminating in a point 11. Interposed between the motor 1 and the feeding mechanism 2 is a head block 12 having a bore 13 therein forming a continuation of the bore 5 in the cylinder 3, the feed cylinder, head block, and drilling motor parts being suitably held together by side rods 12', in a well known manner. Suitably secured in the head block 12 is also a handle 14 employed to support the machine and to prevent the machine from bodily rotating about its axis during the drilling operation.

An independent fluid pressure actuated rotation motor, generally indicated 15, is provided to rotate the drill steel 6 and comprises a pair of intermeshing rotors 16 and 17 disposed in a casing 18 formed integral with the cylinder 3. The rotor 16 is operatively connected through a shaft 19, disposed parallel with the cylinder 3, mounted in suitable bearings and provided with a pinion 20 meshing with a gear 21 formed on the chuck 7. Fluid pressure is supplied to the machine through a throttle valve 22 arranged in a boss formed on the head block 12, from any suitable source of supply, and passes through a port 23 to the feed cylinder 8, a passage 24 to a constant pressure chamber 25, a port 26 to the rotation motor 15, and a port 27, under the control of an automatic control valve 28, to the drilling motor 1. The automatic control valve 28 comprises a conical, or tapered, head 29, having a cut-away portion or slot 30 in its tapered side so that when the valve is seated a sufficient amount of fluid may pass to bring the piston 4 up to drilling speed during normal conditions. At the opposite end of the valve 28 is a piston head 31 movable in a pressure tight chamber 32, which is closed by a plug 33 through which extends a follower 34 adapted to adjust the pressure on a spring 35 acting on the valve 28 and tending to move it to open 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 the other side of the piston head 31 the chamber 30 is vented to the atmosphere by way of port 36. A passage 37 also extends from the rotation motor to the pressure chamber 32. During normal drilling the line pressure in the chamber 25 overcomes the force exerted by the fluid pressure and the spring pressure in the chamber 32, and the pressure in the motor casing is materially less than the main line pressure in chamber 25 because of the speed of the rotation motor and the relative size of the port 24, so that the fluid pressure acting on the head 31 is comparatively light. The type of automatic control valve shown is used for illustrative purposes only, the particular type of valve used being immaterial.

The mode of operation of my invention will be clearly apparent in view of the description given. The point 11 is placed against an abutment a suitable distance from

the working face, the operator holding the drill in position at this time by means of the handle 14. The throttle valve 22 is then manipulated admitting fluid pressure to the feeding mechanism and to the pressure chamber 25, thereby closing the valve 28 and allowing a comparatively small amount of pressure fluid to pass to the drilling motor 1. This amount of pressure is sufficient to bring the speed of the hammer piston 4 up to the point desired when the machine is operating normally. If a soft spot is encountered, tending to stick the drill steel, an additional load is placed on the rotation motor 15, cutting down its speed, and the pressure on the admission side of the motor is thereby increased, thus increasing the pressure at the right of the piston head 31 and opening wide the valve 28 and admitting more pressure fluid to the drilling motor by way of port 27 in such manner as to speed up the same and increase its power. Variations in the load on the motor 15 and its effect on the speed produce variations in pressure in the admission side of the motor 15 and the position of the valve 28 is accordingly automatically varied, increasing or decreasing the amount of pressure fluid admitted to the drilling motor as needed. When the drill steel again rotates freely, the valve 28 automatically returns to its initial position, the pressure dropping in chamber 32 as the rotation motor again speeds up. As the drill steel 6 deepens the hole, it is of course fed forward.

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, work performing means including a tool actuating motor of the reciprocating hammer piston type, a tool actuated thereby, and means responsive to the changes of load on said tool for automatically controlling said reciprocating motor, said automatic means being operative to increase the power of said tool actuating motor as the load on said tool increases.

2. In combination, a pressure fluid actuated motor of the reciprocating hammer piston type, a tool actuated thereby, means for supplying actuating fluid to said motor, and means for automatically controlling the fluid flow to said motor in accordance with the nature of the work encountered by said tool, said automatic means being operative to increase the flow of fluid to said reciprocating motor as the working load on said tool increases.

3. In combination, work performing means including a pressure fluid actuated percussive motor, a tool actuated thereby, and means for automatically controlling the pressure in said motor in accordance with the nature of the work encountered by said tool, said automatic means being operative to increase the flow of pressure fluid to said percussive motor as the working load on said tool increases.

4. In combination, work performing means including a plurality of tool actuating motors, one of which is of the hammer piston type while the other is of the rotary type, a tool actuated thereby, and means automatically controlled by one of said motors for controlling the speed of said other motor, said automatic means being operative to increase the speed of said hammer motor when the speed of said other motor is decreased.

5. In combination, a cutting tool, work performing means including a reciprocating motor of the hammer piston type for imparting movement to said tool, and means responsive to the resistance to movement of said tool for automatically controlling said motor, said automatic means being operative to increase the power of said reciprocating motor as the resistance to movement of said tool is increased.

6. In combination, a cutting tool, work performing means including a reciprocating motor of the hammer piston type for imparting motion to said tool, and means responsive to an increased resistance to movement of said tool for automatically increasing the power of said reciprocating motor.

7. In combination, a tool actuating motor of the hammer type, a tool actuated thereby, and means for automatically controlling the speed of said tool actuating motor in accordance with the nature of the work encountered by said tool, said automatic means being operative to increase the speed of said hammer motor as the working load on said tool increases.

8. In combination, a tool actuating motor, a tool actuated thereby, a motor for rotating said tool, and means automatically controlled by said rotation motor for controlling said tool actuating motor, said automatic means being operative to increase the power of said tool actuating motor as the resistance to rotation of said tool rotating motor increases.

9. In combination, a drilling motor, a drill steel actuated thereby, means for rotating said drill steel, and means for automatically controlling the speed of said drilling motor in accordance with the resistance to drill steel rotation, said automatic means being operative to increase the speed of said drilling motor as the resistance to drill steel rotation increases.

10. In combination, a tool actuating motor, a tool actuated thereby, means for rotating said tool, and means automatically responsive to the resistance to rotation for controlling said tool actuating motor, said automatic means being operative to increase the power of said tool actuating motor as the resistance to drill steel rotation increases.

11. In combination, a drilling motor, a drill steel actuated thereby, means for rotating said steel, means for supplying pressure fluid to said motor, and means responsive to the resistance to rotation of said drill steel for automatically controlling the pressure fluid supply to said drilling motor, said automatic means being operative to increase the supply of pressure fluid to said drilling motor as the resistance to drill steel rotation increases.

12. In combination, a drilling motor, a drill steel actuated thereby, means for rotating said drill steel, and means to automatically increase the speed of said drilling motor when the speed of said rotation is decreased.

13. In combination, a drilling motor comprising a cylinder and a piston reciprocable therein, a drill steel actuated by said piston, means for rotating said drill steel, and means automatically effective upon variations in speed of said rotation means for varying the speed of said piston, said automatic means being operative to increase the speed of said piston when the speed of said rotation means is decreased.

14. In combination, a drilling motor comprising a cylinder and a piston reciprocable therein, a drill steel actuated thereby, means for rotating said drill steel, and means automatically controlled by said rotating means for controlling the speed of said drilling motor, said automatic means being operative to increase the speed of said drilling motor when the speed of said rotating means is decreased.

15. In combination, work performing means including a percussive motor and a rotary motor, and means automatically responsive to the load changes on one of said motors for controlling the operation of the other, said automatic means being operative to increase the speed of said percussive motor when the speed of said rotary motor is decreased.

16. In combination, a drilling motor of the hammer type, a tool actuated thereby, a motor for rotating said tool, and means automatically responsive to the load changes on one of said motors for controlling the operation of the other, said automatic means being operative to increase the power of said

drilling motor as the load on said tool rotating motor increases.

17. In combination, work performing means including a tool actuating motor having a reciprocable hammer piston, a tool actuated thereby, and means for automatically controlling the speed of said hammer piston in accordance with the nature of the work encountered by said tool, said automatic means being operative to increase the speed of said tool actuating motor as the working load on said tool increases.

18. In combination, a drilling motor of the hammer type, a tool actuated thereby, an independent motor for rotating said tool, and means to automatically control said drilling motor controlled by said tool rotating motor, said automatic means being operative to increase the power of said drilling motor as the load on said rotating motor increases.

19. In combination, work performing means including a plurality of tool actuating motors, one of which is of the hammer type, a tool actuated thereby, and means automatically responsive to the operation of one of said motors for controlling said other motor, said automatic means being operative to increase the speed of said hammer motor when the speed of said other motor is decreased.

20. In combination, a tool actuating motor, a tool actuated thereby, a pressure fluid actuated rotation motor for said tool, said latter motor having a fluid supply communicating therewith, and means for automatically controlling said tool actuating motor including a valve having opposed pressure surfaces, and means for subjecting said surfaces to the pressure fluid in said rotation motor and said fluid supply respectively.

21. In combination, a drilling motor of the hammer type, a drill steel actuated thereby, a drill steel rotation motor of the intermeshing rotor type, and means automatically responsive to the torque of said rotation motor for controlling said drilling motor, said automatic means being operative to increase the speed of said drilling motor when the speed of said rotation motor is decreased.

22. In combination, a motor of the reciprocating type, a tool actuated thereby, means for rotating said tool, and means responsive to the load changes on said rotation means for controlling said reciprocating motor, said automatic means being operative to increase the power of said reciprocating motor as the load on said tool rotating motor increases.

In testimony whereof I affix my signature.
CHARLES F. OSGOOD.