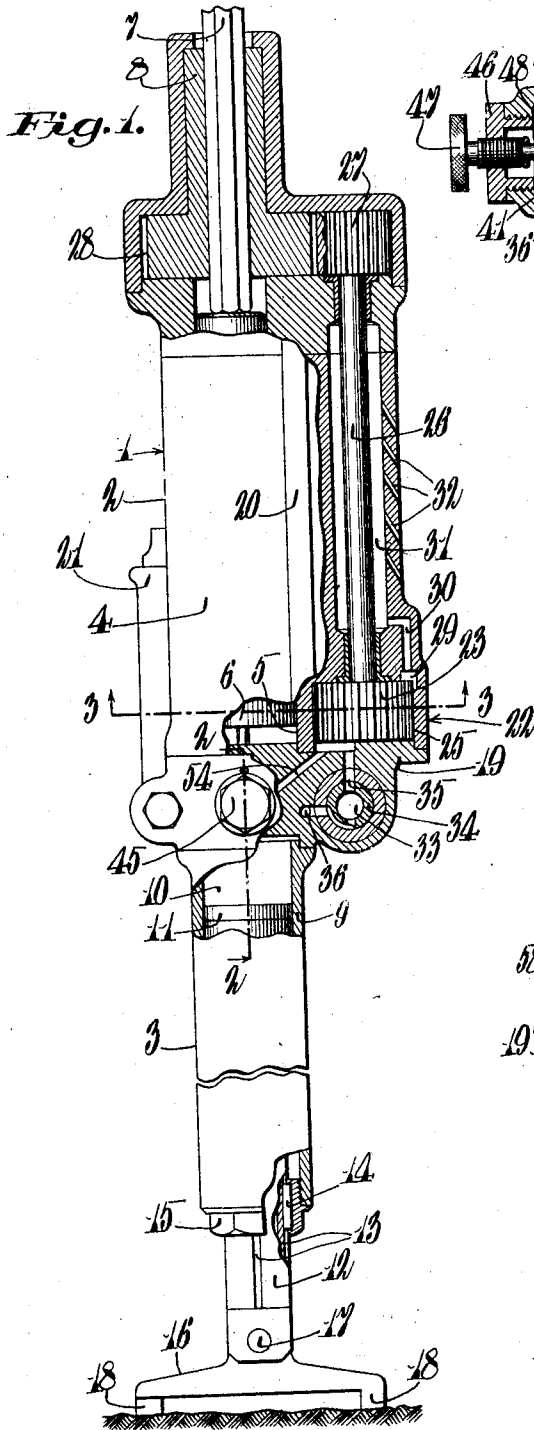
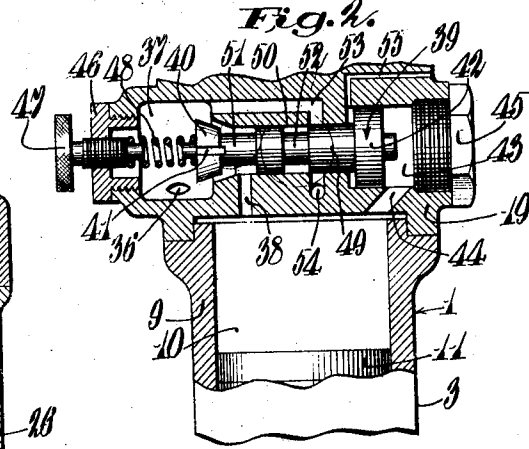
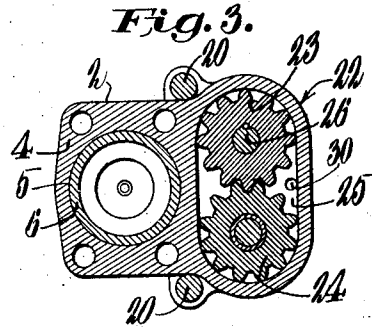
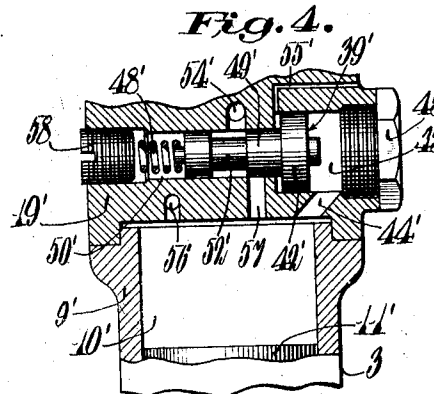


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C. F. OSGOOD
DRILLING MECHANISM
Filed Dec. 19, 1923



Inventor:
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by
[Signature]
att'y.

UNITED STATES PATENT OFFICE.

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DRILLING MECHANISM.

Application filed December 19, 1923. Serial No. 681,598.

My invention relates to drilling mechanism.

An object of my invention is to provide an improved drilling mechanism. Another object of my invention is to provide an improved rock drilling mechanism having improved controlling mechanism therefor. A further object of my invention is to provide an improved rock drilling mechanism of the pressure fluid percussive type whereby the pressure fluid feeding means and the drill steel rotation means have improved controlling mechanism therefor. A still further object of my invention is to provide an improved rock drilling mechanism of the pressure fluid percussive type whereby the feeding means automatically controls the feed and rotation motor. Still another object of my invention is to provide an improved controlling mechanism for a rock drill of the pressure fluid percussive pneumatically fed type which is responsive to the variations of pressure within the feeding mechanism for automatically controlling the rate of feed and the speed of the rotation motor.

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 elevational view of a rock drilling mechanism in which an illustrative form of my invention is incorporated, the view being partially in section to facilitate illustration.

Fig. 2 is a central longitudinal vertical sectional view taken substantially on line 2—2 of Fig. 1.

Fig. 3 is a transverse sectional view through the drilling and rotation motors taken substantially on line 3—3 of Fig. 1.

Fig. 4 is a central longitudinal vertical sectional view similar to Fig. 2 of a modified form of construction.

In the illustrative form of my invention shown in Figs. 1 to 3, I have shown a "stopper" drill of standard form generally designated 1 including a drilling motor 2 and a feeding mechanism 3. The drilling

motor 2, herein of the pressure fluid percussive type, comprises a cylinder 4 having a longitudinally extending bore 5 in which a hammer piston 6 is reciprocable and adapted to percussively actuate a drill steel 7 carried in a chuck 8 arranged within the front end of the drilling motor. The feeding mechanism comprises a feed cylinder 9 arranged in alinement with the drilling motor and having a bore 10 in which a feed piston 11 is disposed having a piston rod 12 suitably rigidly secured thereto. Herein, the piston rod 12 is provided with longitudinally extending spline ways 13 which cooperate with splines 14 suitably carried within the rear head 15 of the feed cylinder 3, thereby preventing relative rotation between the cylinder and piston. The rear end of the piston rod 12 terminates in a foot piece 16 which is pivotally connected at 17 thereto and which is provided with a plurality of points 18 adapted to engage a stationary extraneous abutment or support, herein the mine bottom, during the drilling operation. Interposed between the drilling motor 2 and the feeding mechanism 3 is a head block 19 in which my improved controlling mechanism is incorporated. The feeding mechanism, the head block, and the drilling motor parts are rigidly held in the desired assembled relation by means of side rod connections 20, in the usual manner. Suitably secured to and projecting laterally from the head block 19 is a handle 21 which is employed to support the drilling mechanism at certain times during drilling operation.

An independent pressure fluid actuated motor, generally designated 22, is provided to rotate the drill steel 7 and comprises a pair of intermeshing toothed rotors 23 and 24 disposed in a bore 25 formed in the cylinder 4. The rotor 23 is operatively connected through a shaft 26, disposed parallel with the cylinder bore 5, mounted in suitable bearings and provided with a pinion 27 meshing with a gear 28 formed integral with the chuck 8. Herein, the motor 22 is provided with an exhaust chamber 29 which communicates by way of a passage 30 with an enlarged chamber 31 surrounding the

shaft 26 and which communicates with the atmosphere by means of a series of small ports 32 which muffle or silence the screech produced by pressure fluid passing through motors of this type. Pressure fluid is supplied to the drilling mechanism from any suitable source of supply to a chamber 33 formed in a throttle valve 34 which is arranged in a boss formed on the head block 19 and passes through a main supply port 35 to the inlet chamber of the rotation motor 22, a port (not shown) leading to the distribution ports of the drilling motor, and a port 36 to a constant supply chamber 37 (see Fig. 2) and through a port 38 to the feed cylinder under the control of an automatic control valve generally designated 39. Herein, it will be observed that the automatic control valve 39 comprises a conical or tapered head 40 having a cut away or slotted portion 41 in its tapered side and a piston head 42 at its opposite end movable in a fluid tight chamber 43 which communicates with the bore of the feed cylinder by means of a port 44 and which is closed by a plug 45. The chamber 37 is closed by a plug 46 through which extends a threaded adjustable follower 47 adapted to adjust the pressure on a spring 48 acting on the valve 39 tending to move it to its normal operative position. The body portion 49 of the valve is disposed in a bore 50 and is grooved at 51 and 52, the groove 51 permitting the passage of pressure fluid from the chamber 37 to the feed cylinder while the groove 52 controls the passage of fluid pressure from the chamber 37 through a port 53 to a supplemental supply port 54 leading to the inlet chamber of the rotation motor 22. The end of the chamber 43 on the opposite side of the piston head 42 from the port 44 is vented to the atmosphere by means of a small passage 55. The type of automatic control valve shown herein is for illustrative purposes only, the type of valve used being immaterial.

In the operation of this form of my improved mechanism it will be noted that the points 18 of the foot piece 16 are placed against a stationary abutment a suitable distance from the working face, the operator holding the drilling mechanism in position at this time by means of the handle 21. The throttle valve is then manipulated admitting pressure fluid to the constant supply chamber 37 causing it to act on the head 40 of the valve 39, forcing it to its seat, the pressure in the feed cylinder and the chamber 43 being low at this time. A relatively small amount of pressure fluid then leaks through the slot 41 gradually building up the pressure in the feed cylinder 9, the port 44, and the chamber 43, moving the piston head 42 slightly to the left (see Fig. 2) unseating the head 40, admitting more pressure fluid to the

feed cylinder by way of port 38 and feeding the drilling motor 2 forward until the bit of the drill steel 7 assumes a position adjacent the work. Pressure fluid is then admitted to the rotation motor 22 and the drilling motor 2, causing the drill steel to be rotated and percussively actuated, thereby "spotting" and drilling the hole, the feed cylinder 9 moving forward relative to the piston 11 as the hole deepens, the operator's grasp on the handle 21 being relieved at this time. If a soft spot or cavity is encountered during drilling the resistance on the drill steel is relieved and the feed cylinder, and consequently the drilling motor, moves rapidly forward tending to jam or stick the drill steel and simultaneously materially reducing the pressure within the feed cylinder and in the chamber 43. The pressure in the constant supply chamber 37 then overcomes the pressure in the chamber 43 seating the head 40 of the valve, decreasing the fluid flow through port 38 and simultaneously opening communication by means of the groove 52 between the port 53 communicating with the fluid supply chamber 37 and the port 54 leading to the inlet chamber of the rotation motor 22, consequently retarding the feed and augmenting the supply of pressure through the port 35, increasing the speed and power of the rotation motor while the speed of the hammer piston remains constant, thereby preventing the sticking of the drill steel in the hole. When normal drilling is again resumed, that is, when the feed is again resisted by the work, the pressure builds up in the feed cylinder and the chamber 43, overcoming the spring 48 and the pressure acting on the head 40, moving the valve to its wide opened position cutting off the supplemental supply of pressure fluid flowing through ports 53 and 54 to the rotation motor, decreasing its speed.

In the form of my invention shown in Fig. 4, it will be observed that the port 36 from the throttle valve 34 communicates by means of the port 56 directly with the bore 11' of the feed cylinder 9' while, port 54' leading to the inlet chamber of the rotation motor communicates directly with the bore of the feed cylinder by way of a port 57 which is slightly larger than the port 56. A threaded plug 58 adjusts the pressure on the spring 48'.

The operation of this form of my invention is as follows. When the pressure is reduced in the feed cylinder 9', as when a cavity or a soft spot is encountered, the pressure drops in the chamber 43' and the spring 48' forces the valve 39' to the right, opening communication between the port 57 leading to the feed cylinder and the supplemental supply port 54' leading to the inlet chamber of the rotation motor, passing the

pressure fluid from the feed cylinder which is materially higher than the pressure in the inlet chamber of the rotation motor due to the restricted size of the main supply port 35 and to the comparatively rapid air consumption of the motor 22, and thereby materially reducing the pressure in the feed cylinder, retarding the feed, and simultaneously supplementing the pressure fluid supply to the rotation motor, increasing the speed and power thereof, and consequently preventing the jamming or sticking of the drill steel in the hole.

While I have in this application specifically described two forms which my invention may assume in practice, it will be understood that these forms 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, work performing means comprising a plurality of motors, feeding means for said work performing means comprising a plurality of relatively movable feeding elements, and means effective when an abnormal rate of relative longitudinal movement between said feeding elements occurs during feeding for automatically varying the power of said feeding means and one of said motors.

2. In a drilling apparatus, work performing means comprising a plurality of motors one of which is rotary, feeding means for said work performing means comprising relatively movable feeding elements, and means effective when an abnormal rate of relative longitudinal movement between said feeding elements occurs during feeding for automatically varying the power of said feeding means and one of said motors.

3. In a drilling apparatus, work performing means comprising a plurality of tool actuating motors, feeding means for said work performing means, and means controlled by changes of load on said feeding means for automatically varying the operation of the latter and one of said motors.

4. In a drilling apparatus, work performing means comprising a plurality of tool actuating motors one of which is rotary, feeding means for said work performing means, and means controlled by changes of load on said feeding means for automatically varying the operation of the latter and one of said motors.

5. In a drilling apparatus, work performing means comprising a fluid actuated reciprocatory motor and a fluid actuated rotary motor, pressure fluid actuated feeding means therefor, and means controlled by pressure changes in said feeding means for automatically varying the supply of pres-

sure fluid to the latter and one of said motors.

6. In a drilling mechanism, work performing means comprising a fluid actuated reciprocatory motor and a fluid actuated rotation motor, pressure fluid actuated feeding means therefor, and means controlled by pressure changes in said feeding means for automatically varying the supply of pressure fluid to the latter and to said rotation motor.

7. In a drilling apparatus, work performing means comprising a plurality of fluid actuated tool actuating motors, pressure fluid actuated feeding means therefor, and means controlled by pressure changes in said feeding means for automatically varying the supply of pressure fluid to the latter and one of said motors.

8. In a drilling apparatus, work performing means comprising a drilling motor of the hammer type, and a fluid actuated rotation motor, a pressure fluid actuated feeding element for said work performing means including feeding elements held against relative rotation, and means operable independently of pressure conditions in said rotation motor and without operator intervention for varying the supply of pressure fluid to said feeding element and said rotation motor.

9. In a drilling apparatus, a drilling motor of the hammer type adapted to actuate a drill steel, a rotation motor for the drill steel, feeding means for the drill steel, and means controlled by the changes of load on said feeding means for simultaneously varying the operation of the latter and said rotation motor.

10. In a drilling apparatus, a drilling motor of the hammer type, a fluid actuated rotation motor, a fluid supply for said rotation motor, a pressure fluid feeding means, a constant fluid supply chamber, and automatic pressure fluid transmitting means for simultaneously opening communication for pressure fluid from said chamber to said rotation motor to augment said supply and to control said feeding means.

11. In a drilling apparatus, a drilling motor adapted to actuate a drill steel, pressure fluid feeding means therefor, a pressure fluid actuated rotation motor for the drill steel, and means controlled by pressure changes in said feeding means for automatically varying the supply of pressure fluid to said feeding means and said rotation motor.

12. In a drilling apparatus, a drilling motor, pressure fluid feeding means therefor including feeding elements held against relative rotation, a pressure fluid actuated rotation means, and automatic pressure actuated fluid transmitting means for decreasing the supply of pressure fluid flowing into said feeding means and for increasing the

supply of pressure fluid to said rotation motor.

13. In a drilling apparatus, a drilling motor, pressure fluid actuated feeding means therefor, a rotation motor, and automatic means controlled by the variations of pressure in said feeding means for simultaneously varying the operation of said feeding means and said rotation motor.

14. In a drilling apparatus, a drilling motor of the hammer type, fluid actuated feeding means therefor comprising a cylinder and a cooperating relatively movable piston, a rotation motor, and automatic means controlled by an abnormal rate of relative longitudinal movement between said cylinder and piston during feeding for simultaneously varying the power of said feeding means and said rotation motor.

15. In a drilling apparatus, a drilling motor of the hammer type, pressure fluid operated feeding means therefor, a fluid actuated rotation motor, and fluid transmitting means controlled by pressure changes in said feeding means for automatically reducing the pressure fluid supply to said feeding means and to increase the supply of pressure fluid to said rotation motor to increase the power thereof.

16. In a drilling apparatus, a drilling motor of the hammer type, a fluid actuated rotation motor, separate main and supplemental pressure fluid supply connections therefor, a pressure fluid operated feeding means, and automatic means controlled by pressure changes in said feeding means for opening the supplemental pressure fluid supply connection to said rotation motor for increasing the power of the same.

17. In a drilling apparatus, a drilling motor of the hammer type, feeding means therefor comprising stationary and movable elements, a rotation means, and means controlled by changes of load on said feeding elements for automatically varying the operation of said feeding means and said rotation means.

18. In a drilling apparatus, a drilling motor of the hammer type, a fluid actuated feeding means comprising a feed cylinder and a cooperating relatively movable feed piston, a rotation motor, and means controlled by pressure changes in said feeding means caused by an excessive rate of movement between said feed cylinder and said feed piston during feeding to automatically control the pressure within said feed cylinder and to increase the power of said rotation motor.

19. In a drilling apparatus, a drilling motor, feeding means therefor including a plurality of relatively movable telescopic elements, a rotation motor, and means controlled by an abnormal rate of relative longitudinal movement between said telescopic

elements during feeding for automatically simultaneously varying the operation of said feeding means and said rotation motor.

20. In a drilling apparatus, a drilling motor, feeding means therefor, a rotation motor, and power transmitting means controlled by an abnormal rate of feed during feeding for automatically simultaneously varying the operation of said feeding means and said rotation motor.

21. In a drilling apparatus, a drilling motor of the hammer type, pressure fluid feeding means therefor, a fluid actuated rotation motor, and automatic fluid transmitting means for varying the operation of said feeding means and said rotation motor including a valve and a plurality of pressure chambers having variations of pressure in one controlling the fluid flow from another, one of said chambers having a fluid connection with said feeding means through which fluid flows to effect feeding of the drill.

22. In a drilling apparatus, a drilling motor of the hammer type, pressure fluid feeding means therefor, a pressure fluid actuated rotation motor, a fluid supply therefor, and an automatic pressure fluid controlled valve for varying the operation of said feeding means and for opening a supplemental supply of pressure fluid to said rotation motor.

23. In a drilling apparatus, a drilling motor of the hammer type, pressure fluid feeding means therefor, a fluid actuated rotation motor, and fluid transmitting means including an automatic pressure fluid controlled valve for venting the pressure in said feeding means to said rotation motor thereby increasing the power of the latter.

24. In a drilling apparatus, a drilling motor of the impact type, pressure fluid feeding means therefor, a fluid actuated rotation motor, and means controlled by changes of load on said feeding means for automatically simultaneously varying the operation of said feeding means and said rotation motor.

25. In an apparatus, work performing means comprising a plurality of tool actuating motors, pressure fluid actuated feeding means therefor, and means including a valve responsive to the variations of pressure within said feeding means for automatically varying the operation of one of said motors and said feeding means.

26. In an apparatus, work performing means comprising a plurality of tool actuating motors one of which is rotary, pressure fluid actuated feeding means therefor, and means comprising a valve responsive to the variations of pressure within said feeding means for automatically varying the operation of the latter and said rotary motor.

27. In an apparatus, work performing means including a plurality of tool actuat-

ing motors, pressure fluid actuated feeding means therefor, and means automatically responsive to pressure changes in said feeding means for varying the operation of said feeding means and one of said motors.

28. In an apparatus, work performing means including a reciprocatory tool actuating motor and a rotary tool actuating motor,

pressure fluid actuated feeding means therefor, and means comprising a valve responsive to variations of pressure within said feeding means for automatically varying the operation of the latter and one of said motors. 10

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