

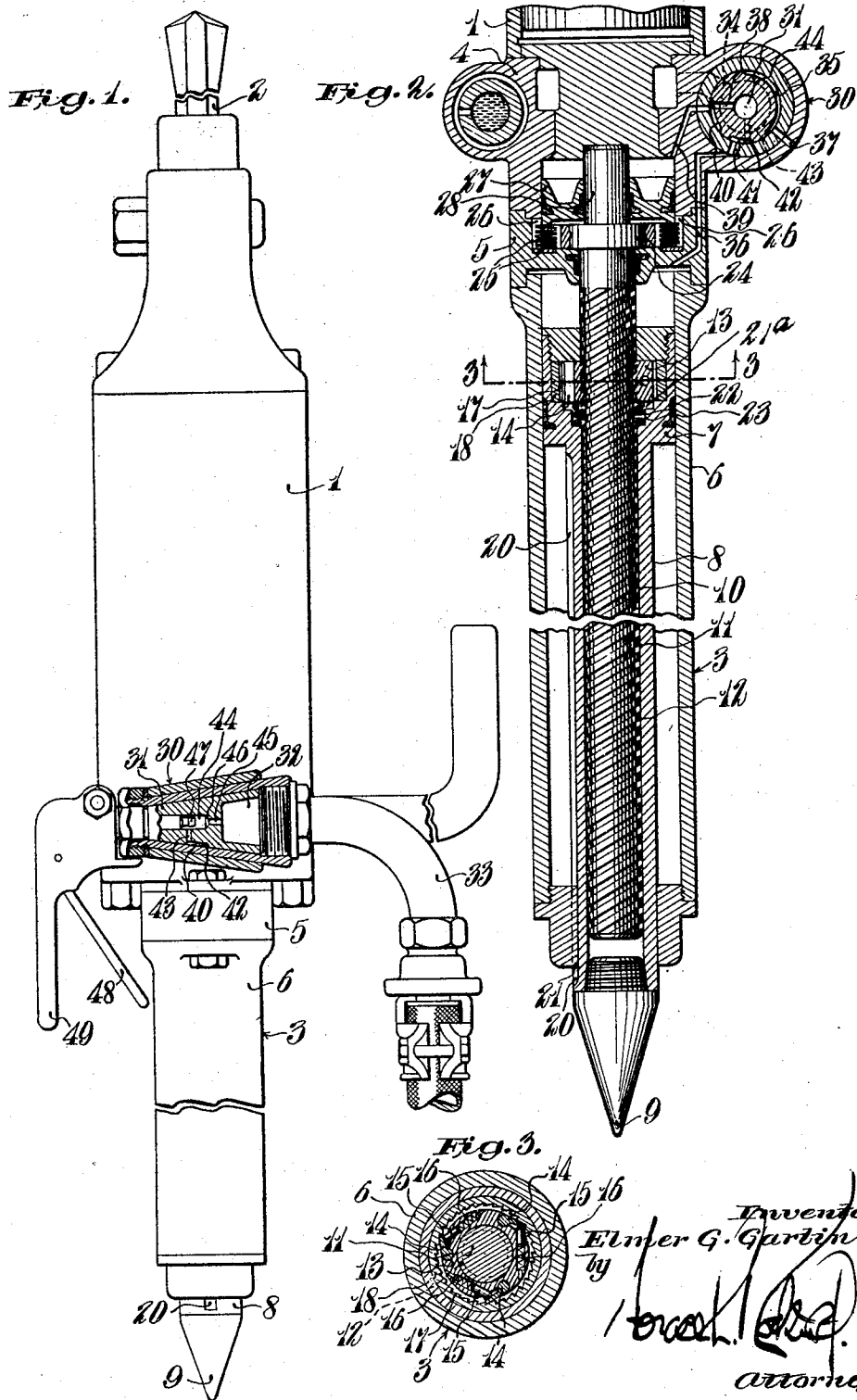
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E. G. GARTIN

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ROCK DRILLING MECHANISM

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Inventor:
Elmer G. Gartin.
by *[Signature]*
Attorney.

UNITED STATES PATENT OFFICE

ELMER G. GARTIN, OF CLAREMONT, NEW HAMPSHIRE, ASSIGNOR TO SULLIVAN MACHINERY COMPANY, A CORPORATION OF MASSACHUSETTS

ROCK DRILLING MECHANISM

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My invention relates to rock drilling mechanisms, and more particularly to feeding mechanisms for rock drills of the stoper type.

An object of my invention is to provide an improved feeding mechanism. Another object of my invention is to provide an improved feeding mechanism for rock drills which will permit ready control of the forward feed and will prevent any danger of dropping back of the drill due to momentary reduction of air pressure in the feed cylinder. A further object of my invention is to provide an improved type of feeding mechanism operative automatically to maintain the drill in proper position relative to the work. 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 side elevation, somewhat shortened, of a drilling mechanism of the type in which my improved feeding mechanism is adapted to be employed.

Fig. 2 is a central longitudinal section through the illustrative embodiment of my improved feeding mechanism.

Fig. 3 is a transverse section on the line 3—3 of Fig. 2.

In the form of my invention which I have elected to show for purposes of illustration, the same is embodied in a drilling mechanism of the stoper type which comprises a percussive motor 1 which cooperates with a drill steel 2 and which is adapted to be fed toward the work by a feeding mechanism generally designated 3. This feeding mechanism, as will be observed from an inspection of Fig. 2, is arranged at the opposite side of an intermediate head 4 from the motor 1 and comprises a chamber forming member 5, which will later be more fully described, a feed cylinder 6, a feed piston 7 disposed within the cylinder 6, a piston rod 8, an abutment engaging point 9, and mechanism for holding the drilling mechanism adjacent the work during the "spotting" or starting of a hole and for preventing back slip of the feed accidentally. It will be observed that the cylinder

6 moves relatively to the piston 7 which remains stationary during feed with the point 9 in engagement with any suitable abutment.

The piston rod 8 is bored out as at 10 to form a chamber within which a screwthreaded brake rod or rifle bar 11 is disposed, this member 11 having a series of helical threads 12 upon its periphery, which threads are engaged by a nut 13 mounted in the piston 7 and provided with suitable pawls 14 normally held outward by followers 15 and springs 16 mounted in the nut, which pawls cooperate with teeth 17 formed in a ring 18 carried within and in non-rotative relation with respect to the piston 7. The pawls 14 and ratchet teeth 17 are so arranged that relative movement between the cylinder 6 and the piston 8 tending to cause the approach of the lower end of the cylinder to the piston may be accomplished without rotation of the rifle bar, while reverse movement, i. e. collapse of the feed, is only possible when the rifle bar rotates. At this point it should be noted that the piston rod 8 is traversed by a longitudinal straight spline-way 20 with which a key 21 carried on the lower cylinder head cooperates. It will also be observed that the nut 13 is provided with a slight longitudinal play at 21^a within the piston head, this play being somewhat greater than the maximum normal penetration of the steel during drilling. It will be further noted that a relatively heavy spring 22 is arranged in a recess 23 below the nut for the purpose of forcing the nut as far forwardly as possible.

Within the housing member 5 is arranged a flange 24 upon the rifle bar 11, which flange is keyed, or otherwise suitably held, in non-rotatable engagement with alternate ones of a series of friction discs 25, while the other discs are held against rotation with respect to the housing 5 by keyways in the discs engaged by splines 26 formed or secured in the interior of the housing 5. A piston 27 is slidable upon a reduced extremity 28 of the rifle bar 11 and on admission of air to its upper surface will force the friction discs 25 into binding engagement with each other and so lock the rifle bar against rotation. A suitable valve mechanism, generally designated 30, is pro-

vided for the control of the movements of the piston 27 and the supply of air to the cylinder. This valve mechanism is in many respects similar to that described in my copending case, Serial No. 481,974, filed July 4, 1921, and comprises a conical valve member 31 having a recess 32 in the large end thereof to which fluid may be admitted from a supply line 33. The valve is provided with a radial port 34 through which fluid may be admitted to the drilling motor 1 and in a transverse plane nearer the small end of this valve there are arranged certain ports and grooves for the control of the piston 27 and feed mechanism. In this plane is a circumferential groove 35 which is adapted to connect a passage 36 leading to the feed cylinder with the atmosphere by way of a port 37 at certain times. In this same plane, but spaced circumferentially from the groove 35, is a second passage 38 adapted to supply pressure to a passage 39 which leads to the space above the piston 27, the passage 38 terminating in a groove 40 of sufficient length to allow material turning of the valve without interrupting connection between the passages 38 and 39. In this same plane there is also located a groove 41 to which fluid may be supplied by a passage 42 extending along the side of the valve and communicating by a radially extending passage 43 with a central chamber 44 in the valve member, which chamber communicates through a port 45 surrounded by a valve seat 46 and controlled by a tapered valve 47 with the recess 32. It will be noted that the valve 47 is manually controllable by a grasping lever 48, the same being normally open, but adapted to be closed when ready to operate, while the valve member 31 is controlled by a rotatable handle 49. It will be observed that upon initial turning of the valve 31 from "off" position, the existing communication between the passage 36 and the atmospheric port 37 will be interrupted and pressure will be supplied to act upon the piston 27 by way of port 38, groove 40, and passage 39. This is the position of the valve shown in Fig. 2 and on further rotation of the valve, the groove 41 will be brought in communication with the groove 36, and depending upon the release of the handle 48 and the opening of the valve 47, as a result thereof, air will be supplied to the feed cylinder to effect forward feed.

From the foregoing description the mode of operation of my invention will be readily apparent. Let it be assumed that the drill is shut down. No air is then supplied to the passages 36 and 39 and the first of these passages is connected by the groove 35 with the atmospheric port 37. The drill runner takes hold of the handles 48 and 49 with one hand and moves the handle 48 to close the valve 47. He then turns the handle 49, the handle 48 moving with it, and first supplies pressure to

act upon the friction disc controlling piston 27. This locks the rifle bar against rotation relative to the feed cylinder and as further turning of the valve 31 starts the motor and opens communication under control of the valve 47 between the recess 32 and the passage 36 leading to the feed cylinder, it will be noted that the drill may be run and forward feed at any desired rate accomplished, the rate or force of feed depending upon the total period of open position of the valve 47. As the valve 47 is opened the feed cylinder and the drilling motor will be moved upward until the drill steel 2 is disposed adjacent or engages the work. The operator then manipulates the handle 48 which controls the valve 47, reducing the flow or cutting off the supply of pressure fluid to the feed cylinder, the ratchet mechanism preventing rotation of the rifle bar and consequently holding the drill steel in a substantially stationary position during the "spotting" or starting of the hole and preventing the collapse of the feed. As the hole deepens the valve 47 will be manipulated to maintain the necessary pressure in the feed cylinder. As forward feed takes place, the rifle bar, which cannot turn on account of its being held by the friction discs, will cause the rotation of the nut 13, the pawls slipping over the ratchet during this operation. This will result in the drill being held at all times substantially up against the work, but by reason of the clearance below the nut, there will be sufficient play to permit rotation of the steel without binding. There will be no chance, however, of excessive bouncing of the motor back from the end of the steel and so no danger of the steel ever getting far enough from the bottom of the hole to permit its being driven completely out of the chuck. When it is desired to back out of the hole, this can be very readily done. The motor will be shut down, the feed cylinder will be connected to the atmosphere by way of the groove 35, and the chamber above the piston 27 will also be connected with the atmosphere whereby the friction discs will be released and the nut, as the parts telescope, may cause rotation of the rifle bar freely. It is obvious that the reverse movement of the feed cylinder 6 relative to the feed piston 7 may be either checked or prevented at will by suitable manipulation of the valve 31 controlling fluid flow through the passage 39 communicating with the bore at the upper side of the plunger 27.

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 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 rock drilling mechanism, a drilling motor and feeding means therefor comprising a member movable with said motor, a cooperating member stationary during feeding, means for supplying air to effect relative movement of said members to advance said motor, and means including a cooperating ratchet and screw mechanism for preventing reverse movement thereof, the cooperating parts of said mechanism being carried respectively by said members.

2. In a drilling mechanism, a drilling motor and feeding means therefor comprising relatively movable cylinder and piston elements, one of which is fastened to said drilling motor, means for supplying motive fluid to said elements to effect relative movement thereof, means movable bodily with the movable one of said elements, means carried by the stationary one of said elements and cooperating with said last mentioned means and operative to cause rotation thereof on collapse of said feeding mechanism, and means for preventing such rotation during feeding.

3. In a drilling mechanism, a drilling motor and feeding means therefor comprising relatively movable cylinder and piston elements, one of which is fastened to said drilling motor, means for supplying motive fluid to said elements to effect relative movement thereof, means movable bodily with the movable one of said elements, means carried by the stationary one of said elements and cooperating with said last mentioned means and operative to cause rotation thereof on collapse of said feeding mechanism, and means for preventing such rotation while air is admitted to said elements.

4. In a rock drilling mechanism having an impact motor, the combination of fluid actuated feeding means therefor comprising a pair of relatively movable elements one of which is connected to said motor, a rotatable screw threaded control rod movable with one of said elements and engageable with the other, a fluid operated brake for controlling rotation of said control rod, a rotatable threaded nut cooperating with said control rod, and ratchet and pawl mechanism interposed between said nut and one of said elements.

5. In a rock drilling mechanism having a drilling motor, the combination of feeding means therefor comprising fluid actuated members having relative movement during feeding, and means automatically operative upon initiation of reverse movement during normal drilling for checking said latter movement while allowing free forward feeding movement, said means comprising a rotatable element, friction means for controlling rotation of said element, and means associated with said element for preventing said reverse

movement except when said friction means is released to allow rotation of said element.

6. In a rock drilling mechanism, the combination of feeding means therefor comprising fluid actuated members having relative movement during feeding, and means for preventing a reverse movement of said members and excessive bouncing of the drilling motor during drilling, while allowing free forward feeding movement said means comprising a rotatable threaded nut carried by one of said members and a screw threaded rod cooperating with said nut carried by the other of said members, means for controlling rotation of said rod, and means associated with said nut and its cooperating member for preventing said reverse movement except when said controlling means is released to allow rotation of said element.

7. In a feeding mechanism, a plurality of elements having relative movement during feeding, and means for preventing substantial reverse movement while allowing free forward feeding movement comprising a rotatable rod extending coaxially within one of said members, fluid actuated means for controlling rotation of said rod, and means associated with said rod for preventing said reverse movement except when said fluid actuated means is released to allow rotation of said rod.

8. In a rock drilling mechanism having a drilling motor, the combination of fluid actuated feeding means therefor comprising relatively movable elements, and means for checking said relative movement in one direction while permitting free movement in the opposite direction to prevent excessive bouncing of said drilling motor during drilling, said means comprising a rotatable screw threaded rod, fluid actuated friction means for controlling rotation of said rod, and means including a rotatable threaded nut associated with said rod for preventing relative movement of said elements except when said fluid actuated friction means is released to permit rotation of said rod.

9. In a rock drilling mechanism, the combination of fluid actuated feeding means therefor including relatively movable elements, means for controlling relative movement between said feeding elements comprising a rotatable member, a ratchet and pawl mechanism interposed between said member and one of said elements, said mechanism and member serving to prevent relative movement between said elements in one direction except with a corresponding rotation of said member, and means for controlling rotation of said member.

10. In a rock drilling mechanism, the combination of feeding means comprising fluid actuated members having relative movement during feeding, and fluid actuated controlling

mechanism associated with said feeding means automatically operative while permitting free forward feeding movement to prevent substantial reverse movement and bouncing.

11. In a rock drilling mechanism, the combination set forth in claim 10 wherein said controlling mechanism includes a rotatable control rod and a fluid actuated brake for controlling rotation of said rod.

12. In a rock drilling mechanism, the combination of feeding means comprising fluid actuated members having relative movement during feeding, and fluid actuated controlling mechanism associated with said feeding means automatically operative when pressure is applied thereto to prevent substantial reverse movement while permitting free forward feeding movement, and a common control means for said feeding mechanism and said control mechanism operative to supply pressure fluid simultaneously to both mechanisms.

13. In a rock drilling mechanism, the combination of feeding means comprising fluid actuated members having relative movement during feeding and fluid operated controlling means associated with said feeding members including a ratchet mechanism and a rotatable nut for connecting said members, said nut having a lost motion connection with one of said members whereby a limited amount of free movement in either direction is permitted.

In testimony whereof I affix my signature.
ELMER G. GARTIN.