March 30, 1937. J. C. CURTIS 2,075,706

ROCK DRILL

Filed Jan. 17, 1934 3 Sheets-Sheet 1

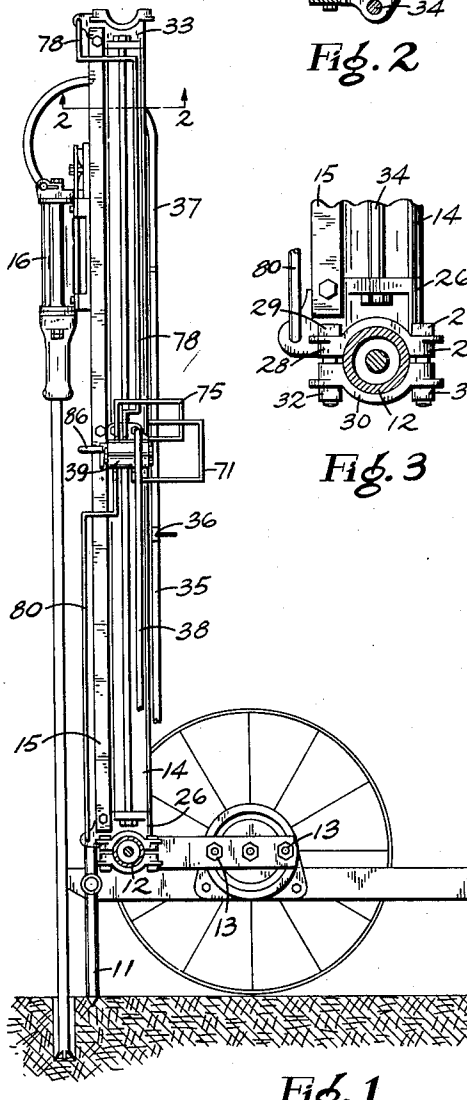

Fig. 1

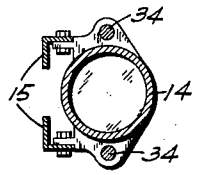

Fig. 2

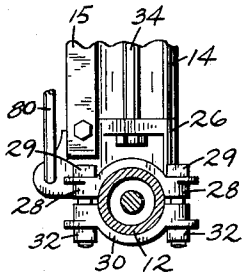

Fig. 3

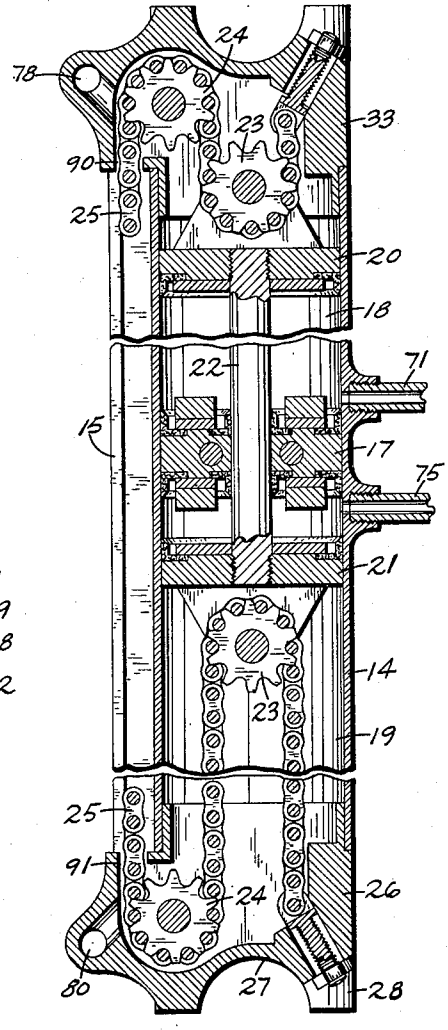

Fig. 4

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ROCK DRILL

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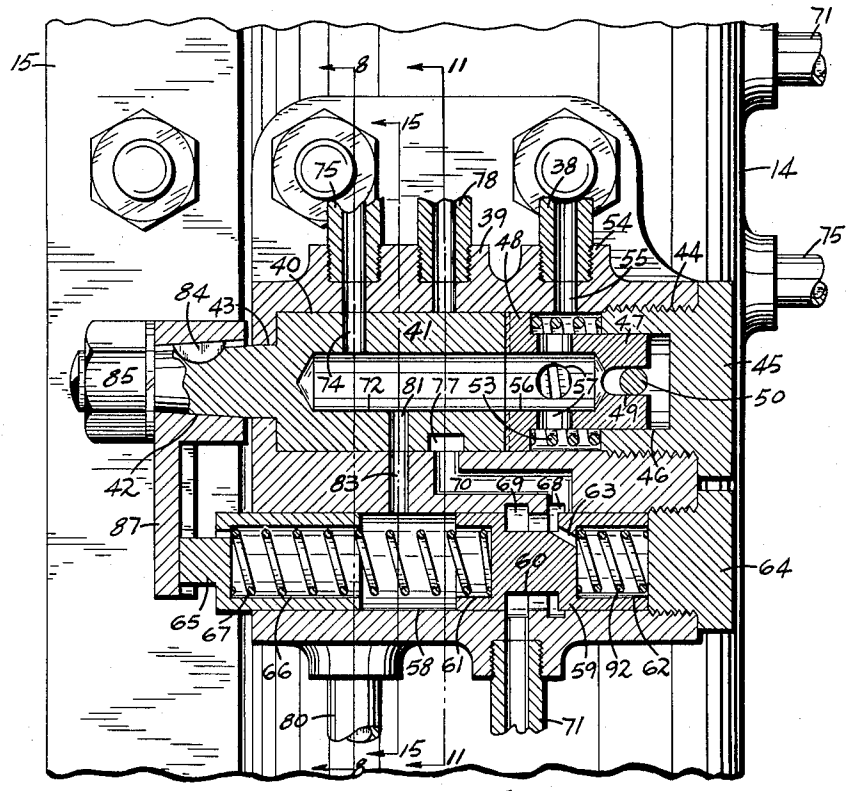

Fig. 5

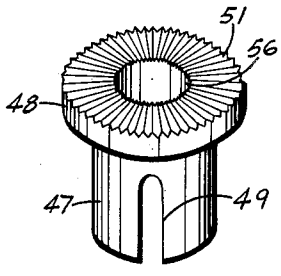

Fig. 6

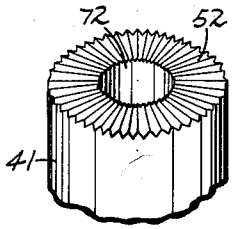

Fig. 7

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ROCK DRILL

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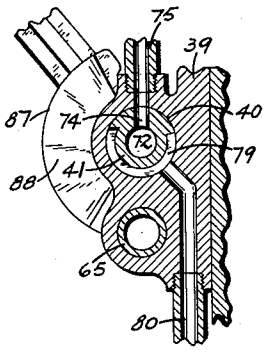

Fig. 8

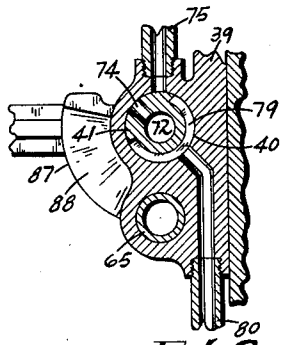

Fig. 9

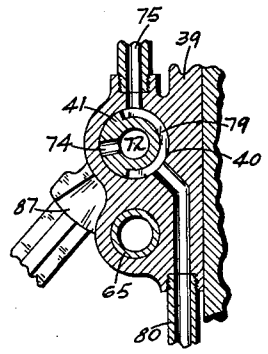

Fig. 10

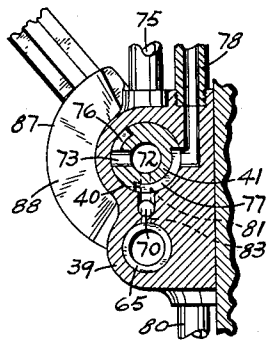

Fig. 11

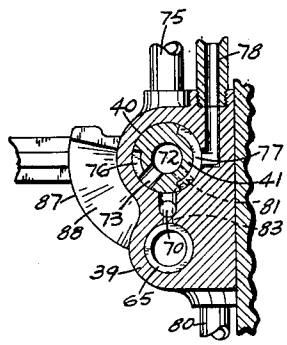

Fig. 12

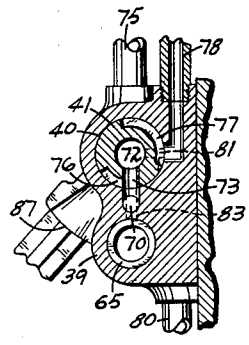

Fig. 13

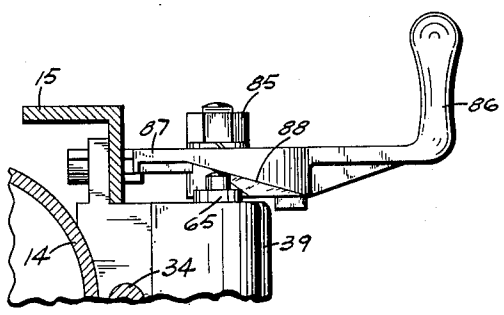

Fig. 14

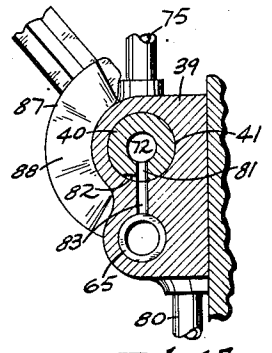

Fig. 15

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Patented Mar. 30, 1937 2,075,706

UNITED STATES PATENT OFFICE

2,075,706

ROCK DRILL

John C. Curtis, Garfield Heights, Ohio, assignor to The Cleveland Rock Drill Company, Cleveland, Ohio, a corporation of Ohio

Application January 17, 1934, Serial No. 706,997

21 Claims. (Cl. 121—9)

This invention relates broadly to rock drills, but more particularly to a valvular mechanism for controlling the action of the feeding mechanism thereof.

One object of this invention is to provide an improved valvular mechanism for regulating the speed of a feeding mechanism for rock drills.

Another object of this invention is to produce an improved feeding mechanism for rock drills, wherein the rate of feeding speed in one direction may be regulated at the will of the operator.

Other objects and advantages more or less ancillary to the foregoing resides in the specific construction and aggroupment of the elements peculiar to this structure, as will become apparent from a more complete examination of this specification.

In the drawings which illustrate one form which the invention may assume in practice:

Fig. 1 is a view illustrating the complete drilling apparatus together with a portion of the frame on which the former is movably mounted.

Fig. 2 is an enlarged cross sectional view taken in a plane indicated by line 2—2 in Fig. 1.

Fig. 3 is an enlarged view illustrating the clamping device by which the drilling apparatus is secured to its supporting frame.

Fig. 4 is an enlarged sectional view illustrating the interior of the feeding mechanism shown in Fig. 1.

Fig. 5 is an enlarged sectional view of the valvular mechanism embodying the invention.

Figs. 6 and 7 are perspective views illustrating the locking device used for securing the throttle valve into any desired position.

Figs. 8, 9, and 10 are cross sectional views taken in a plane indicated by line 8—8 in Fig. 5, illustrating the throttle valve in different positions.

Figs. 11, 12, and 13 are cross sectional views taken in a plane indicated by line 11—11 in Fig. 5, illustrating the throttle valve in the positions shown in Figs. 8, 9, and 10.

Fig. 14 is an enlarged view, partly in section, illustrating the relation of the throttle valve handle with a portion of the valvular mechanism shown in Fig. 5.

Fig. 15 is a cross sectional view taken in a plane indicated by line 15—15 in Fig. 5.

Referring to the drawings in which like characters designate corresponding parts through the several views, 10 represents a truck frame which may be anchored by means of pins 11 which are detachably secured to the side members of the frame. Detachably secured to the frame 10 by bolts 13, there is a U-shaped cross member 12, having mounted therein a feed tube 14. Affixed to the exterior of the latter, there are two parallel guides 15, upon which a rock drill 16 is free to slide. Secured within the feed tube 14 at a place substantially equi-distant from the ends thereof, there is a partition 17 dividing the feed tube 14 into an upper and lower portion 18 and 19. Reciprocably mounted within the portion 18, there is a feeding element or piston 20, and similarly mounted within the portion 19, there is a piston 21, the latter being united to the former by a piston rod 22, which is reciprocably mounted through the partition 17. The pistons 20 and 21 are constructed to rotatably receive a sprocket 23. Adjacent each end of the feed tube 14, there is rotatably mounted a sprocket 24. These sprockets are capable of engagement with a chain 25 having the ends thereof secured to a point adjacent the ends of the tube 14. At a point substantially equi-distant from its ends, the chain 25 is also attached to the rock drill 16. The construction of the feeding mechanism comprising the pistons 20 and 21, together with the disposition of the sprockets 23 and 24, and the chain 25, being identical to the construction described in my pending application filed February 2, 1933, Serial No. 654,802, now matured into Patent No. 2,029,223, patented January 28, 1936, no further description of the same is thought necessary.

Secured to the lower end of the feed tube 14, there is a front head 26 which is formed, on the end face thereof, with a semi-circular groove 27 of a diameter equal to that of the cross member 12, and capable of engagement with the latter. The four corners of the front head are provided with apertured lugs 28 adapted to receive the bolts 29. Corresponding to the shape of the front end portion of the front head 26, there is a cap 30 which is also provided with apertured lugs similar to the lugs 28 of the front head 26, through which the bolts 29 are free to pass to receive the nuts 32 for securing the feed tube assembly to the cross member 12. Secured to the upper end of the feed tube 14, there is a back head 33 which is a replica of the front head 26. These two heads are secured to the feed tube 14 by a pair of rods 34.

Affixed to one side of the feed tube 14, there is a motive fluid conveying conduit or pipe 35, equipped with a throttle valve 36 for controlling the admission of the pressure fluid into the rock

drill 16, which is admitted therein through a hose 37.

Adjacent the pipe 35, there is another pressure fluid conveying conduit 38 admitting pressure fluid into a throttle valve housing 39. This housing is formed with a cylindrical valve chamber 40, having rotatably mounted therein a throttle valve 41, formed with a shank 42 extending from the valve housing 39 through a restricted bore 43. The right end of the chamber 40 is threaded as at 44 to receive, in screw tight engagement therewith, a plug 45 formed with a counterbore 46 adapted to slidably receive a locking member 47. This last member is formed with an enlarged head 48 slidably guided within the chamber 40. To prevent the rotation of the member 47, the latter is provided with a slot 49 adapted to receive a pin 50 secured within the plug 45. The end surface of the head 48 is provided with radially disposed ratchet teeth 51 which are capable of engagement with corresponding teeth 52 formed on the adjacent end surface of the throttle valve 41. The member 47 is constantly urged against the throttle valve 41 by the action of a compression spring 53 interposed between the plug 45 and the head 48 of the member 47, thus maintaining the teeth of the latter in constant engagement with the teeth of the throttle valve 41. The pressure fluid conduit 38 is connected to the throttle valve housing 39 as at 54, thus admitting pressure fluid into the valve chamber 40 directly under the head 48 of the member 47 through a passage 55, from where pressure may be admitted into a centrally disposed bore 56, formed within the member 47, through a plurality of radially disposed passages 57. The bore 56 opens into the slot 49 for admitting pressure fluid on the extreme end of the member 47 for the reasons explained hereinafter.

Adjacent to the valve chamber 40, the housing 39 is provided with another bore or chamber 58 having, reciprocable therein, a valve 59. This valve is formed with an external annular recess 60. Each end of the valve is properly machined to form the counterbores 61 and 62, the latter being in constant communication with the recess 60 through a restricted orifice 63. Secured in screw tight engagement within one end of the bore 58, there is a plug 64, having seated thereon one end of a compression spring 92, while the other end thereof is seated on the bottom of the counterbore 62. Reciprocably mounted within the other end portion of the bore 58, there is a cap 65 formed with a counterbore 66 adapted to receive one end of a compression spring 67. The other end of this spring is seated on the bottom wall of the valve counterbore 61.

Intermediate its ends, the bore 58 is formed with two annular recesses 68 and 69 capable of intercommunication through the valve recess 60. The recess 68 may also communicate with the throttle valve chamber 40 through a passage 70, while the recess 69 is capable of constant communication with the upper portion 18 of the feed tube 14, through a conduit 71, which terminates therein at a point adjacent the partition 17.

The throttle valve 41 is provided with a centrally disposed bore 72 capable of constant communication with the bore 56 of the member 47. Leading from the bore 72 to the circumferential wall of the throttle valve, there are two radially disposed passages 73 and 74, the former being capable of communication with the passage 70, while the latter is capable of communication with the lower portion 19 of the feed tube 14, through a conduit 75, which terminates therein at a point adjacent the partition 17. In a cross sectional plane passing through the passage 73, the throttle valve 41 is formed with a groove 76 opening into the passage 73, and with a partly circumferentially disposed groove 77 capable of establishing communication between the passage 70 and another passage 78 which leads into the upper end of the feed tube 14. Similarly disposed in relation to the passage 74 the throttle valve 41 is formed with another partly circumferentially disposed groove 79 capable of establishing communication between the conduit 75 and another passage 80, which leads into the lower end of the feed tube 14. Intermediate the grooves 77 and 79, the throttle valve 41 is provided with a port 81 and a groove 82 opening therein and capable of admitting pressure fluid from the throttle valve bore 72 into the bore 58 through a port 83.

Secured to the shank 42 of the throttle valve 41 by means of a key 84 and nut 85, there is a handle 86. This handle is formed with an enlarged semicircular flange 87 extending over the cap 65, and capable of engagement therewith. For about 90°, the face of the flange 87 engageable with the end of the cap 65 is machined into a helical cam 88, the purpose of which will be explained later.

The operation of the mechanism is as follows: Assuming the throttle valve 41 to be positioned as illustrated in Figs. 8 and 11, motive fluid admitted into the throttle valve chamber 40 through the conduit 38 and passage 55, will act on the head 48 of the member 47. From the chamber 40, motive fluid will flow into the bore 56 of the member 47, via the ports 57, to be admitted on the extreme end of the member 47 through the slot 49, thus cooperating with the pressure fluid acting on the head 48 together with the action of the compression spring 53 for maintaining the engagement of the teeth 51 with the teeth 52 of the throttle valve. Since the member 47 is held against rotation by the pin 50, it will be understood that the throttle valve 41 may be maintained into any desired position. When manual power is applied to the throttle valve handle 86 for rotating the throttle valve 41, the teeth 52 of the latter engaging the teeth 51 of the member 47, will effect a camming action causing the member 47 to move toward the right against the action of the pressure fluid thereon, permitting thereby a step by step rotation of the throttle valve. From the bore 56, motive fluid will flow into the throttle valve bore 72, to be admitted therefrom into the lower portion 19 of the feed tube 14, via the throttle valve passage 74 and conduit 75. Motive fluid admitted into the feed tube 14 through the conduit 75, will act on the piston 21 to drive the latter, together with the piston 20 by means of the piston rod 22, downwardly. The chain 25 passing over the sprocket 23 now driven downwardly, will cause the upward movement of the rock drill 16.

Motive fluid previously admitted into the upper portion 18 of the feed tube 14, will now exhaust therefrom through the conduit 71, valve groove 60, passage 70, throttle valve groove 77 and conduit 78 into the upper end of the feed tube 14. The chain 25 leading from the upper sprocket 24 to the rock drill is free to move into or out of the upper portion 18 of the feed tube 14 through an opening 90. The conduit 78 terminates into the feed tube adjacent the opening 90 as shown in Fig. 4, thus permitting the fluid

from the conduit 78 to exhaust to the atmosphere through the opening 90. In this manner, any foreign matter such as dust resulting from the drilling operation, which may have collected on the portion of the chain located in the exterior of the feed tube, will be blown off from the chain before the engagement of the latter with the upper sprocket 24.

The exhausting fluid flowing from the passage 71 into the passage 70 via the valve groove 60, will also be admitted into the valve counterbore 62 through the restricted port 63, thus cooperating with the tension of the spring 92 for driving the valve 59 upwardly against the tension of the compression spring 67, thereby tending to prevent the communication of the groove 60 with the groove 68. To overcome this possibility, when the throttle valve 41 is positioned to afford the communication of the passage 70 with the conduit 78 through the groove 77, pressure fluid from the throttle valve 41 is admitted into the bore 58 through the ports 81 and 83, thus cooperating with the compression spring 67 to exert pressure on the spool valve 59 to maintain the latter against the plug 64.

During the travel of the throttle valve from the off to the open position, the amount of motive fluid admitted into the lower portion 19 of the feed tube 14, may be varied by a more or less complete communication of the throttle valve passage 74 with the conduit 75. The movement of the throttle valve handle engaging the cap 65, will not vary the tension of the compression spring 67, since the cam 88 provided on the handle flange does not extend to that engaging portion of the throttle valve handle. Therefore, it will be understood that the admission of the motive fluid into the lower portion 19 of the feed tube 14, may be regulated by the throttle valve 41, without affecting the operation of the spool valve 59, other than maintaining the latter into one extreme position by the action of the pressure fluid admitted thereon through the ports 81 and 83.

From the off position shown in Figs. 9 and 12, the throttle valve 41 may be rotated into the open position as shown in Figs. 10 and 13, for admitting pressure fluid into the upper portion 18 of the feed tube 14 from the throttle bore 72, through the throttle valve passage 73, passage 70, groove 68, valve groove 60, groove 69 and finally passage 71. The motive fluid admitted on the piston 20 will cause the upward movement of the latter as well as the upward movement of the piston 21 through the piston rod connection 22. The upward movement of the piston 21 and the consequential movement of the sprocket 23, will cause the chain passing over the last sprocket to transmit downward feeding motion to the rock drill. Pressure fluid previously admitted into the lower portion 19 of the feed tube 14 may now exhaust therefrom through the conduit 75, throttle valve groove 79 and conduit 80, which terminates into the extreme lower end of the feed tube 14 adjacent the lower opening 91 through which the chain 25 is free to move into or out of the lower portion 19 of the feed tube 14. The motive fluid exhausting from the conduit 80, will clean the chain 25 as previously explained in connection with the exhaust of the motive fluid through the conduit 78. Motive fluid admitted into the spool valve groove 60, will also flow into the valve counterbore 62, thus cooperating with the tension of the compression spring 92 for shifting the valve 59 upwardly against the tension of the compression spring 67. When the throttle valve is positioned as illustrated in Figs. 10 and 13, the cam 88 formed on the valve handle flange 87, is beginning its engagement with the cap 65. However, since the rise of the cam at that point is negligible, the tension of the spring 67 will remain practically unchanged, thus permitting the valve 59 to be shifted toward the left by the action of the motive fluid admitted into the counterbore 62 thereof through the port 63. The shifting of the valve 59 will tend to prevent the communication of the valve groove 60 with the groove 68, thus restricting the flow of the motive fluid from the port 70 into the port 71, or into the feed tube 14, reducing thereby the rate of speed of the piston 20, together with the rate of speed of the rock drill feeding motion. In this instance, the restricted flow of the motive fluid into the feed tube 14 is calculated to provide a rather slow feeding motion of the rock drill, which has been found desirable when drilling in hard and abrasive rock. When it is desired to increase the rate of the feeding speed of the rock drill, the operator may rotate the throttle valve handle downwardly, thus causing through the cam 88, the movement of the cap 65 toward the valve 59, and consequently increasing the compression of the spring 67. In this instance, the throttle valve groove 76 is in communication with the passage 70, thereby admitting motive fluid into the upper portion 18 of the feed tube 14 as previously explained. The motive fluid admitted into the valve counterbore 62 through the port 63, together with the effort of the spring 92, will again tend to shift the valve 59 toward the left. However since the compression of the spring 67 is now increased, the valve 59 will assume a position permitting a more complete communication of the valve groove 60 with the groove 68, assuring thereby a freer flow of the motive fluid into the upper portion 18 of the feed tube 14, with a consequential increase of the feeding speed of the rock drill 16. It will now be understood that the pressure within the upper portion 18 of the feed tube 14 is adapted to remain constant for a predetermined position of the throttle valve handle 86, and irrespective of the feeding speed of the drilling motor in one direction. The pressure of the fluid admitted in that portion of the feed tube through the conduit 71, does not have the opportunity to vary when the throttle valve handle remains stationary, since any variation of the pressure will immediately cause the movement of the valve 59 for increasing or reducing the flow of the fluid through the groove 68. For instance, when the valve 59 is positioned as illustrated in Fig. 5, a relatively large amount of fluid is admitted into the upper portion of the feed tube 19, thus causing a relatively fast movement of the rock drill due to a certain pressure acting on the piston 20. When the speed of the rock drill is retarded due to a difference of hardness of the rock being drilled, the pressure acting on the piston 20 immediately tends to increase, thus also increasing the pressure into the chamber 62 through the port 63. The valve 59 subjected to an increased pressure will shift toward the cap 65 for immediately reducing the amount of pressure fluid admitted into the upper portion 18 of the feed tube 14, thereby maintaining the pressure acting on the piston 20 substantially constant irrespective of the feeding speed of the rock drill. It will also be understood that the feeding speed of the rock drill 16 may be varied by simply rotating the throttle

valve handle 86, without affecting the amount of motive fluid controlled by the throttle valve 41, since the latter is provided with a groove 76 affording the complete communication of the throttle valve passage 73, with the passage 70.

Although the foregoing description is necessarily of a detailed character, in order to completely set forth the invention, it is to be understood that the specific terminology is not intended to be restrictive or confining and it is to be further understood that various rearrangements of parts and modification of structural detail may be resorted to without departing from the scope or spirit of the invention is herein claimed.

I claim:

1. In a drilling apparatus the combination with a drilling motor, of a feeding mechanism therefor including a feed tube having a fluid actuated feeding element reciprocable therein for imparting feeding motion to said drilling motor, a throttle valve for controlling the admission of a predetermined amount of pressure fluid into passages leading into said feed tube, a handle secured to said throttle for operating the same, means movable into one direction by the action of the pressure fluid admitted thereon for restricting the flow of the pressure fluid through one of said passages, and means including said throttle valve handle for variably limiting the movement of said first mentioned means into said one direction, permitting thereby a more or less restricted flow of the pressure fluid through said one passage.

2. In a drilling apparatus the combination with a drilling motor, of a feeding mechanism therefor including a feed tube having a fluid actuated feeding element reciprocable therein for imparting feeding motion to said drilling motor, a throttle valve for controlling the admission of a predetermined amount of pressure fluid into passages leading into said feed tube, a handle secured to said throttle for operating the same, means movable into one direction by the action of the pressure fluid admitted thereon for restricting the flow of the pressure fluid through one of said passages, and means including a cam on said throttle valve handle for variably limiting the movement of said first mentioned means into said one direction, permitting thereby a more or less restricted flow of the pressure fluid through said one passage.

3. In a drilling apparatus the combination with a drilling motor, of a feeding mechanism therefor including a feed tube having a fluid actuated feeding element reciprocable therein for imparting feeding motion to said drilling motor, a throttle valve for controlling the admission of a predetermined amount of pressure fluid into passages leading into said feed tube, means within said throttle valve permitting a limited oscillation of the latter without affecting said admission, a handle secured to said throttle valve for oscillating the latter, means movable into one direction by the action of the pressure fluid admitted thereon for restricting the flow of the pressure fluid through one of said passages, and means responsive to the movement of said handle during the oscillation of said throttle valve for variably limiting the movement of said first mentioned means into said one direction, permitting thereby a more or less restricted flow of the pressure fluid through said one passage.

4. In a drilling apparatus, the combination with a drilling motor, of a fluid actuated feeding mechanism connected to said drilling motor for imparting feeding motion thereto, a throttle valve for controlling the admission of the pressure fluid into passages leading into said feeding mechanism for actuating the same, a handle secured to said throttle valve for operating the latter, a valve movable into one direction by the action of the pressure fluid thereon for restricting one of said passages, resilient means for normally limiting the movement of said valve into said one direction, and means including a cam on said handle for variably increasing the compression of said resilient means, affecting thereby the length of travel of said valve into said one direction and the consequential restriction of said one passage.

5. In a drilling apparatus, the combination with a drilling motor, of a fluid actuated mechanism connected to said drilling motor for feeding the latter, a rotatable throttle valve for controlling the admission of the pressure fluid into passages leading into said feeding mechanism for actuating the same, a handle secured to said throttle valve for rotation therewith, means responsive to the action of the pressure fluid thereon for reducing the feeding speed of said drilling motor in one direction irrespective of the feeding speed of said drilling motor in the other direction, and means responsive to the rotation of said handle for increasing the first mentioned feeding speed of said drilling motor.

6. In a drilling apparatus, the combination with a drilling motor, of a feeding mechanism therefor including a feed tube having a fluid actuated piston reciprocable therein, a flexible member connecting said piston to said drilling motor for transmitting the reciprocation of the former to the latter, an opening through which said flexible member is free to be pulled into said feed tube by said piston, means for admitting and exhausting pressure fluid into and from said feed tube for actuating said piston, and means for directing the fluid exhausting from said tube on said flexible member during its passage through said opening on its way into said feed tube.

7. In a drilling apparatus, the combination with a drilling motor, of a feeding mechanism therefor including a feed tube having a fluid actuated piston reciprocable therein, a flexible member connecting said piston to said drilling motor for transmitting the movement of the former to the latter, a wheel upon which the portion of the flexible member extending between said piston and said drilling motor is free to ride, passages for admitting and exhausting pressure fluid into and from said feed tube, and means for directing pressure fluid on the portion of said flexible member extending between said wheel and said drilling motor prior to its engagement with said wheel.

8. In a drilling apparatus, the combination with a drilling motor, of a feeding mechanism therefor including a feed tube having a fluid actuated piston reciprocable therein, a member connecting said piston to said drilling motor for transmitting the reciprocation of the former to the latter, an orifice through which said member is free to move into or out of said feed tube, means for admitting pressure fluid into said feed tube for actuating said piston, and means including said orifice for exhausting pressure fluid therefrom.

9. In a drilling apparatus, the combination with a drilling motor, of a fluid actuated feeding mechanism connected to said drilling motor for feeding the latter, a throttle valve for controlling the

admission of the pressure fluid into passages leading into said feeding mechanism for actuating the same, means for normally reducing the feeding speed of said drilling motor in one direction irrespective of its feeding speed in the other direction, and unitary means for operating said throttle valve and for increasing the first mentioned feeding speed of said drilling motor.

10. In a drilling apparatus, the combination with a drilling motor, of a fluid actuated feeding mechanism connected to said motor for imparting feeding motion thereto, at least one fluid conveying port for admitting and exhausting motive fluid to and from said feeding mechanism, a valve automatically movable for varying the motive fluid conveying capacity of said port during the inlet travel of the motive fluid through said port, and means independent of said port for pneumatically shifting and maintaining said valve in one predetermined position during the outlet travel of the motive fluid through said port.

11. In a drilling apparatus, the combination with a drilling motor, of a fluid actuated feeding mechanism connected to said motor for imparting feeding motion thereto, a fluid conveying port for admitting and exhausting motive fluid to and from said feeding mechanism, a valve automatically movable for varying the motive fluid conveying capacity of said port during the inlet travel of the motive fluid through said port, a throttle valve for initially controlling the admission and exhaust of the motive fluid through said port, and a passage controlled by said throttle valve for admitting motive fluid on said valve for shifting and maintaining the same in a predetermined position during the outlet travel of the motive fluid through said port.

12. In a drilling apparatus, the combination with a drilling motor, of a fluid actuating feeding mechanism connected to said drilling motor for feeding the latter, a motive fluid inlet controlling valve for normally controlling the admission of the motive fluid into a passage leading into said feeding mechanism for actuating the same, a pressure controlling valve movable for varying the pressure of the motive fluid actuating said feeding mechanism, and a single element manually operable for causing the rotation of one of said valves and the slidable movement of the other, effecting thereby a variation of the pressure of the motive fluid actuating said feeding mechanism without affecting the admission of the motive fluid into said passage.

13. In a drilling apparatus, the combination with a drilling motor, of a fluid actuating feeding mechanism connected to said drilling motor for feeding the latter, a motive fluid inlet controlling valve for normally controlling the admission of the motive fluid into a passage leading into said feeding mechanism for operating the same, a pressure controlling valve movable for varying the pressure of the motive fluid actuating said feeding mechanism, unitary means manually operable for simultaneously causing the movement of said valves, effecting thereby a variation of the pressure of the motive fluid actuating said feeding mechanism due to the movement of one of said valves, and means for maintaining constant the admission of the motive fluid into said passage irrespective of the corresponding movement of the other of said valves.

14. In a drilling apparatus, the combination with a drilling motor, of a fluid actuated feeding mechanism connected to said drilling motor for imparting feeding motion thereto, a motive fluid conveying conduit for admitting motive fluid into said feeding mechanism for actuating the same, a valve movable for varying the motive fluid conveying capacity of said conduit, a resilient element acting on one side of said valve tending to move the latter in a closing position with respect to said conduit, a spring having one end acting on the other side of said valve tending to move the latter in open position with respect to said conduit, a cap seated on the other end of said spring, and means for varying the compression of said spring for causing the movement of said valve in a more or less complete open position with respect to said conduit, said means including a cam mounted eccentrically of said valve and associated with said cap.

15. In a drilling apparatus, the combination with a drilling motor, of a fluid actuated feeding mechanism connected to said drilling motor for imparting feeding motion thereto, a motive fluid conveying conduit for admitting motive fluid into said mechanism for actuating the same, a valve movable for varying the motive fluid conveying capacity of said conduit, means acting on one side of said valve tending to move the valve in a closing position with respect to said conduit, a spring acting on the other side of said valve tending to move the valve in open position with respect to said conduit, and means for varying the compression of said spring for causing the movement of said valve in a more or less complete open position with respect to said conduits, said means including a rotatable element locked against longitudinal movement having a surface machined in a manner capable of causing a variation in the compression of said spring during the rotation of said element.

16. In a drilling apparatus, the combination with a drilling motor, of a fluid actuated feeding mechanism connected to said motor for imparting feeding motion thereto, at least one fluid conveying conduit for admitting and exhausting motive fluid to and from said feeding mechanism, a pressure subjected valve movable in more or less complete open position relative to said conduit for controlling the inlet travel of the motive fluid therethrough, and means operable for subjecting said valve to additional pressure for shifting and maintaining the same in complete open position relative to said conduit during the outlet travel of the motive fluid through the latter conduit.

17. In a drilling apparatus, the combination with a frame having a drilling motor slidable thereon, of a feeding mechanism for said motor including a feed tube formed with two piston chambers having a partition therebetween, a piston within each of said chambers reciprocable therein and associated with said motor for imparting feeding motion thereto in two directions, a rod through said partition uniting said pistons, means including passages for alternatively admitting motive fluid into said chambers adjacent said partition for actuating said pistons, a valve subjected to the action of the motive fluid for normally closing one of said passages and thereby preventing the movement of said pistons and motor in one direction, and pressure adjustable means engageable with said valve for partly overcoming the action of the motive fluid thereon for causing a partial opening of said last mentioned passage by said valve, permitting thereby a restricted amount of motive fluid to be admitted into said mechanism for actuating said piston in

a manner whereby the rate of speed of the feeding motion of said motor in one direction is less than that of its feeding motion in the other direction.

18. In a drilling apparatus, the combination with a drilling motor, of a fluid actuated feeding mechanism for said motor, and inlet controlling valve operable for controlling the admission of the motive fluid into said mechanism, a pressure controlling valve operable for varying the pressure of the motive fluid actuating said mechanism, and a single element manually movable for operating both of said valves.

19. In a pressure regulating device for a rock drill fluid actuated feeding means, a normally closed valve mounted between said feeding means and the fluid supply therefor, a spring exerting a relatively light pressure on said valve to maintain the same in closed position, resilient means acting on said valve tending to overcome the pressure exerted by said spring to cause a partial opening of said valve, a throttle valve for controlling the fluid supply to said fluid actuated means, and a single element manually movable for operating said throttle valve and for increasing the pressure of said resilient means to cause the opening of said valve.

20. In a pressure regulating device for a rock drill fluid actuating feeding means, a conduit for admitting and exhausting motive fluid to and from said feeding means, a valve controlling said conduit normally closed with respect thereto, a spring exerting a relatively light pressure on said valve to maintain the same in closed position, resilient means acting on said valve tending to overcome the pressure exerted by said spring to cause a partial opening of said valve, means manually operable for increasing the pressure of said resilient means to cause a more complete opening of said valve during the inlet travel of the motive fluid through said conduit, and means for admitting motive fluid to said valve to cause the complete opening thereof during the outlet travel of the motive fluid through said conduit.

21. In a pressure regulating device for a rock drill fluid actuated feeding mechanism, a conduit for admitting and exhausting motive fluid to and from said mechanism, a valve controlling said conduit, means for admitting motive fluid on one side of said valve for normally closing said conduit, pressure adjustable means acting on the other side of said valve to cause a more or less complete opening of said conduit for admitting motive fluid to said feeding mechanism, and means for admitting motive fluid to said other side of said valve to cause the opening of said conduit during the outlet travel of the motive fluid from said mechanism.

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