

H. I. STAGE.
FEEDING MEANS FOR DRILLS.

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1,425,613.

Patented Aug. 15, 1922.

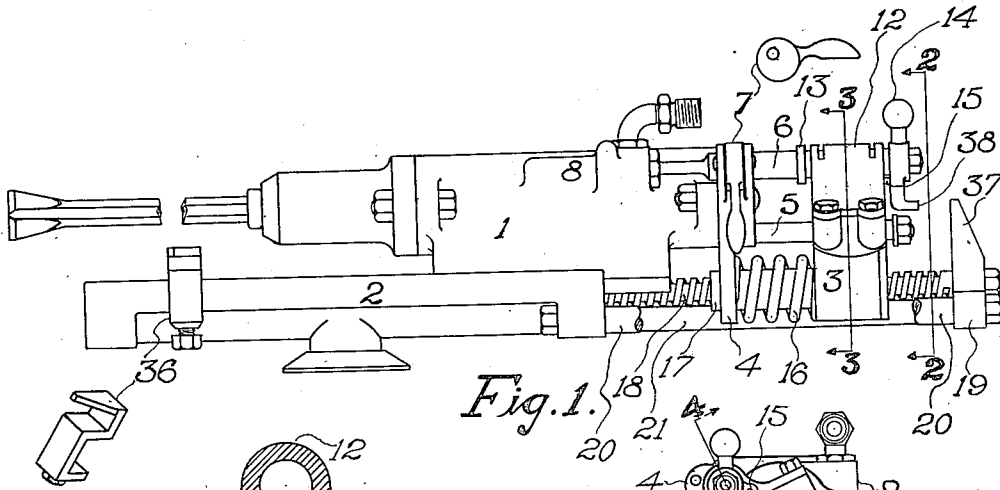


Fig. 1.

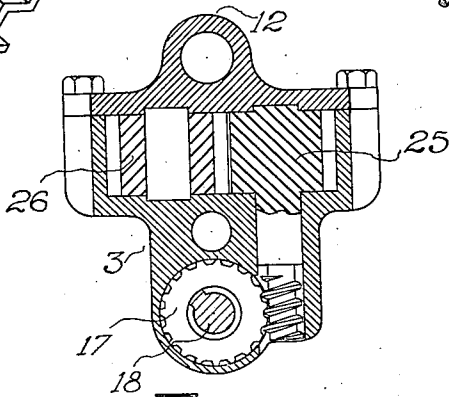


Fig. 3.

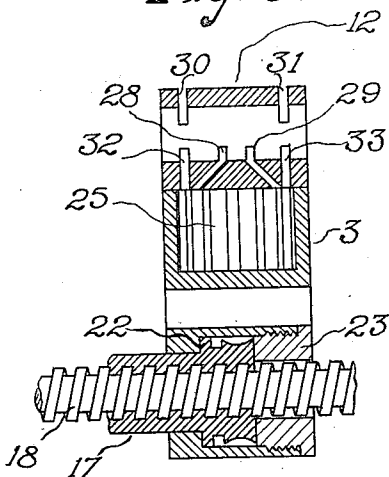


Fig. 4.

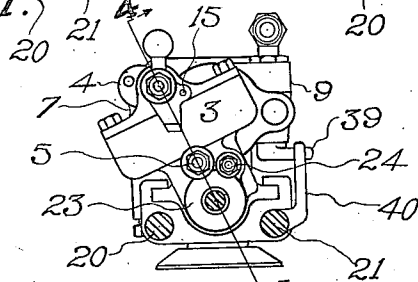


Fig. 2.

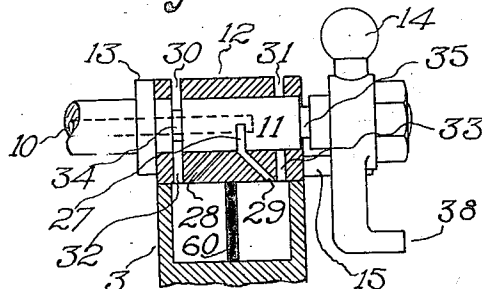


Fig. 5.

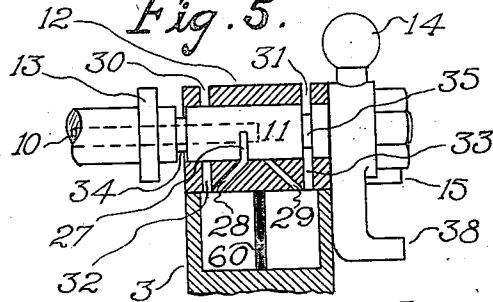


Fig. 6.

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FEEDING MEANS FOR DRILLS.

1,425,613.

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To all whom it may concern:

Be it known that I, HAROLD I. STAGE, a citizen of the United States, residing at Easton, in the county of Northampton and State of Pennsylvania, have invented new and useful Improvements in Feeding Means for Drills, of which the following is a specification.

This invention relates to mounted percussive tools, and in particular to the feeding means thereof.

The objects of this invention are to provide a mechanism adapted to be manually controlled; to move the impact motor in a forward or a rearward direction, along its carriage; to be adjusted and fixed to automatically feed the impact motor to its work when drilling; to automatically reverse the feed, returning the impact motor to its starting position, and to shut off the power to the impact motor.

These objects are accomplished by adapting a fluid operated feeding motor to rotate the feed screw nut on a fixed or non-rotatable feed screw, together with the construction and combination of other parts hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a side elevation of a pneumatic drill in its carriage with one of the feed screw crosshead standards partly broken away.

Figure 2 is a cross section through the drill mounting on the line 2—2 of Figure 1, looking in the direction of the arrows showing the position of the feeding motor.

Figure 3 is a cross section of the feeding motor on line 3—3 of Figure 1, looking in the direction of the arrows.

Figure 4 is a longitudinal section of a part of the feeding motor on line 4—4, Figure 2, looking in the direction of the arrows.

Figure 5 is a diagrammatic view of the feeding motor valve set to operate the motor in a rearward direction, of the same section as Figure 4, and

Figure 6 is a diagrammatic view of the feeding motor valve set to operate the motor in a forward direction, of the same section as Figure 4.

In the construction as shown in the drawings, 1 represents the body of an automatic rotation impact motor, slidably mounted in its carriage 2. The body of the feeding

motor 3 is slidably attached to the back head 4 of the impact motor, by the stud 5 and by the motive fluid supply tube 6 which passes through and is clamped in the back head 4 by the locking cam 7, a reduced section of the tube 6 being extended on through a stuffing gland and into a chamber and supplied with motive fluid through a passage leading from ahead of the throttle valve 9.

A motive fluid passage 10 leading from chamber 8 through and to the circular sliding valve 11, formed on the rear end of tube 6, supplies motive fluid to the motor. The valve 11 working in a valve bore formed in the feeding motor cap 12 is limited in movement by the collar 13 on the front side and the valve handle on the other side. A pin 15 passing through the lower projection of handle 14 prevents the valve from turning out of alignment. The handle 14 is fastened to valve 11 by a nut and takes up against a shoulder. The governor spring 16, encircling the feed screw nut 17, is put in place under a few pounds compression. The nut and washer which takes up against a shoulder at the rear end of stud 5 limits the expansion of the spring 16.

The feed screw 18 is bolted firmly to the cross head 19 which is supported by the standards 20 and 21. The feed screw nut passes loosely through the impact motor back head 4 at the forward end; a gear is formed on the other end, also a collar, to take the thrust on body 3. The feed screw nut cover 23, screwed into body 3 and locked by clamping stud and nut 24, takes the thrust on the rear end of nut 17.

Gearing connecting nut 17 with the motor gears 25 and 26 transmits the power of the feeding motor to the nut 17, to revolve it in either direction relative to the position of valve 11. The heavy line 60 in diagrams Fig. 5 and Fig. 6 represents the mesh of gears 25 and 26.

In operation the valve 11 is manually forced forward against the pressure in chamber 8, exerted on the end of tube 6, the handle 14 limiting the movement of valve 11. This brings the exhaust ports 31, 33 and 35, also the inlet ports 27 and 28 into communication as shown in Figure 6, setting the feeding motor in operation to move the drill in a forward direction along the carriage.

Removing the manual pressure from handle 14 allows the fluid pressure on tube 6 to move the valve back in its seat, the movement being limited by the collar 13. This brings exhaust ports 30, 32 and 34, also inlet ports 27 and 29 into communication as shown in Figure 5. Motive fluid flowing from chamber 8 through passage 10 in tube 6, and through inlet ports 27 and 29 sets the motor in operation, moving the drill in a rearward direction along the carriage. Applying pressure in a forward direction to handle 14, sufficient to move the valve 11 to its neutral position, that is, with the port 27 half way between ports 28 and 29, stops the feeding motor.

The ease with which the machine is manually controlled gives the operator the same advantage to be had with the ordinary type of hand-operated screw-feed machine, in starting, or collaring holes, the usual practice in this case being to "long stroke" the piston. "Short stroking" or crowding the drill tends to catch and hold the points of the drill bit on the irregular surface of the rock, interfering with the rotation and piston stroke of the impact motor.

When the hole is collared the operator feeds the drill ahead until the proper working stroke of its piston is obtained, and locks the tube 6 in back head 4 by means of the locking-cam 7, the feed now becoming automatic.

Assume for example, that a hole is being drilled vertically up. It is evident that the governor spring 16 is supporting and being compressed by the weight of the drill steel and drill motor. When the drill motor is set in operation, the recoil still further compresses the spring 16; and since the recoil of a hammer drill decreases as the length of the hammer stroke increases, it follows that as the drill steel advances into the rock the recoil pressure diminishes allowing the governor spring 16 to force the drill motor forward. Valve 11 on tube 6 clamped on the drill motor is carried forward also. This brings the ports 27 and 28 into communication, feeding the feeding motor forward until the recoil pressure forces the valve 11 back to its neutral position. This cycle of operations continues as the hole is drilled.

A releasing piece 36 designed to be clamped at predetermined distances along the carriage 2, projects upward and presents a beveled edge to the handle of locking clamp 7 forcing it to release tube 6, reversing the feeding motor and feed, returning the drill to the back end of the carriage.

The machine is stopped at the back end of the carriage by the piece 37 extending upward from cross head 19 which meets the projection 38 on the handle 14 and forces the valve 11 into its neutral position as the feeding motor approaches.

The piece 40 extending upward from cross head standard 21 is designed to force handle 39 of the throttle valve forward closing the valve as the machine moves to the rear.

I wish it understood that various changes in form, proportion, and details of construction may be resorted to within the scope of the appended claims, and that I do not wish to limit myself to the specific design and construction here shown.

I claim:

1. The combination of a carriage, an impact motor slidably mounted on said carriage, a non-rotatable feed screw, a feed nut, a fluid operated reversible feeding motor adapted to rotate the feed-screw nut on the said non-rotatable feed screw, motive fluid conveying and admitting means to operate said feeding motor, and spring pressed governing means to control said motive fluid admitting means to the feeding motor, actuated by the varying recoil pressure of the impact motor when drilling.

2. In combination, a carriage, an impact motor slidably mounted on said carriage, a non-rotatable feed-screw and a rotatable feed-screw nut thereon, a fluid operated reversible feeding motor adapted to rotate said feed-screw nut, motive fluid conveying and admitting means to operate said feeding motor, and a spring to control said motive fluid admitting means to the feeding motor, actuated by the varying recoil pressure of the impact motor when drilling.

3. In combination, a carriage, an impact motor slidably mounted on said carriage, a non-rotatable feed screw with a rotatable feed-screw nut thereon, and motive fluid actuated feeding means to rotate said feed-screw nut, to move the impact motor in a rearward, or a forward direction along the carriage, and combined manual and automatic motive fluid supply controlling means to operate said feeding means.

4. In combination, a carriage, an impact motor slidably mounted on said carriage, a non-rotatable feed screw and a rotatable feed-screw nut thereon, a motive fluid operated reversible feeding motor adapted to rotate said feed-screw nut, and to be moved along the carriage by said feed-screw nut, motive fluid conveying and admitting means to operate said feeding motor, a slidably connected to a motive fluid supply chamber on the impact motor, spring pressed governing means to control said motive fluid admitting means to operate said feeding motor, said spring pressed governing means being actuated by the varying recoil pressure of the impact motor when drilling, and clamping means for the motive fluid conveying and admitting means, on the impact motor, to permit adjustment of the motive fluid admitting means, for said feeding motor, relative to the compression of the

spring of the governing means for different positions of the impact motor when drilling.

5. In combination, a carriage, an impact motor slidable thereon, a feeding motor 5 mounted on said impact motor, a non-rotatable feed-screw and a rotatable feed-screw nut carried by said feeding motor, means for transmitting power from said feeding motor to said feed-screw nut for 10 rotating it to move the slidably mounted parts along the carriage, and means to automatically control said feeding motor by the recoil of the impact motor.

6. In combination, a carriage, an impact 15 motor slidable thereon, a feeding motor mounted on said impact motor, a non-rotatable feed-screw and a rotatable feed-screw nut carried by said feeding motor, means for transmitting power from said feeding 20 motor to said feed-screw nut for rotating it to move the slidably mounted parts along the carriage, a spring interposed between the impact motor and the feeding motor to control the feeding motor by the recoil 25 of the impact motor and means to limit the expansion of said spring.

7. In a percussive tool, an impact motor, a feeding motor slidably mounted at the rear thereof, a spring interposed between 30 the two motors and under compression, means for adjusting the compression of the spring for different positions of the tool, the stored energy in the spring after adjustment opposing the recoil pressure of the 35 impact motor as the drill steel enters the

ground, and automatically feeding the impact motor forward when the recoil of the impact motor is less than the stored energy of the spring.

8. In a percussive tool, an impact motor, 40 a feeding motor slidably mounted at the rear thereof, a spring interposed between the two motors, and under compression, means for adjusting the compression of the spring for different positions of the tool, the 45 stored energy in the spring after adjustment opposing the recoil pressure of the impact motor as the drill steel enters the ground, and a valve for the feeding motor 50 movable with the impact motor and controlled by said spring, for controlling the operation of the feeding motor, when the recoil of the impact motor is less than the stored energy of the spring.

9. In a percussive tool, an impact motor, 55 a feeding motor slidably mounted at the rear thereof, a spring interposed between the two motors, and under compression for moving one of said motors with respect to 60 the other, a valve for the feeding motor, a fluid supply tube connected to the valve and leading to the impact motor, and means for adjustably clamping the said tube to 65 the impact motor, whereby movement of the impact motor relative to the feeding motor controls said valve.

In testimony whereof I have hereunto set my hand.

HAROLD I. STAGE.