Aug. 20, 1940. W. A. SMITH, JR 2,212,329

ROCK DRILL

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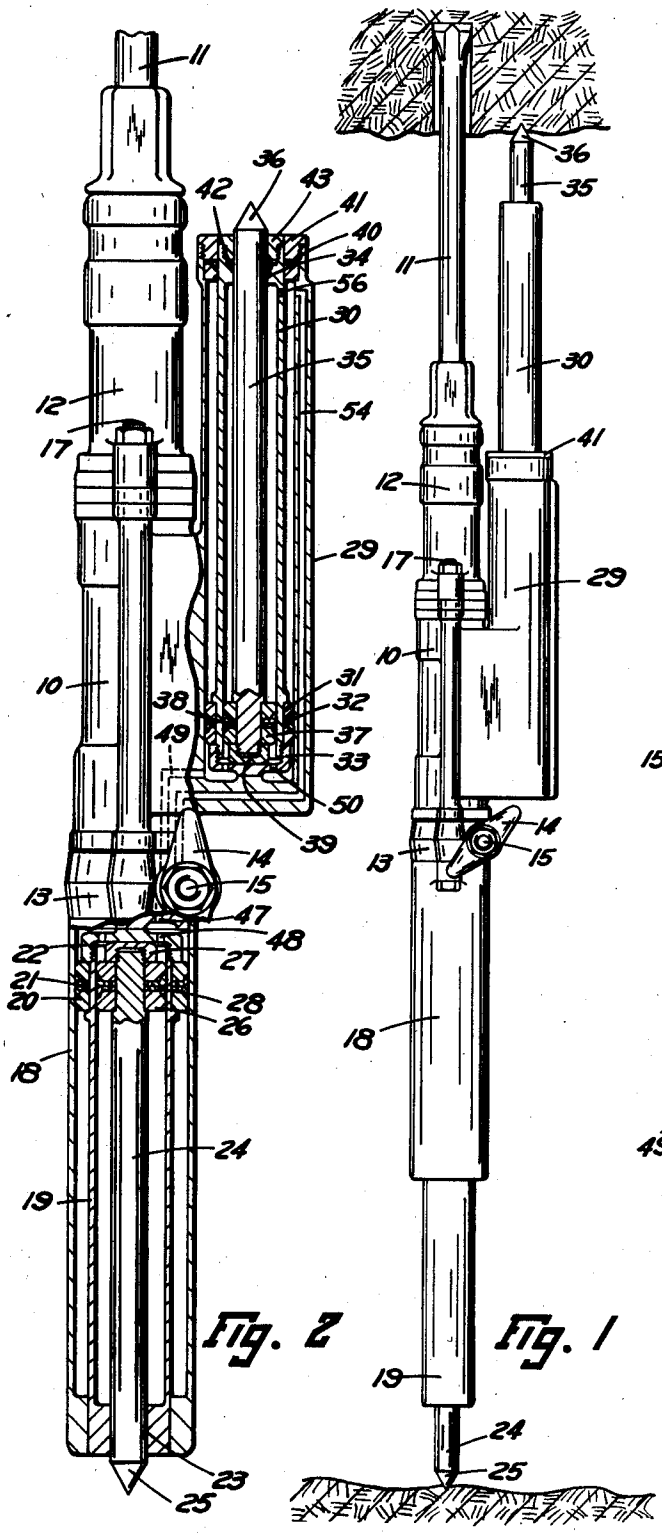


Fig. 2

Fig. 1

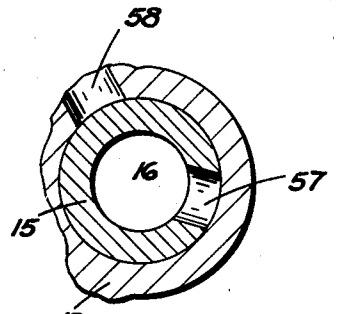


Fig. 4

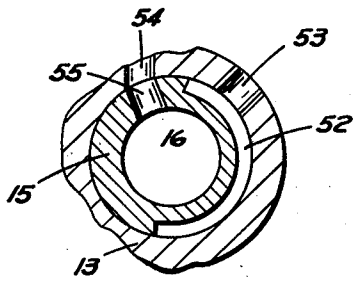


Fig. 5

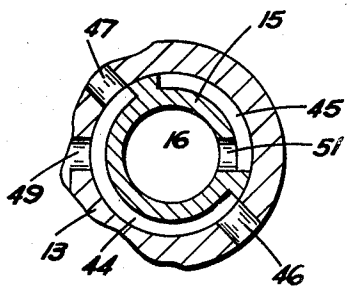


Fig. 3

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ROCK DRILL

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Application November 1, 1938, Serial No. 238,205

3 Claims. (Cl. 255—45)

This invention relates broadly to fluid actuated rock drills, but more particularly to a support and feeding mechanism for rock drills of the stoper type.

One object of this invention is to produce a stoper type drill with an improved combined feeding and supporting mechanism.

Another object of this invention is to provide a stoper type drill with a self supporting mechanism engageable with the work irrespective of the position of the drill thereon.

Another object of this invention is to produce an improved stoper type rock drill forming a compact assembly, which is strong, durable and efficient.

Other objects and advantages more or less ancillary to the foregoing reside 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 drawing which illustrates the invention:

Fig. 1 is a side elevational view of a rock drill embodying the invention and shown in operation.

Fig. 2 is an enlarged side elevational view shown partly in section of the rock drill shown in Fig. 1.

Figs. 3, 4 and 5 are enlarged cross sectional views of the throttle valve, each in the same position, but taken in different planes.

Referring to the drawing, 10 represents a fluid actuated rock drill or drilling motor having a piston (not shown) reciprocable therein for delivering impacts to a drill steel 11 slidable within a front housing 12. To the rear of the drilling motor 10, a valve housing 13 has rotatable therein by a handle 14, a throttle valve 15 provided with a central bore 16 into which motive fluid is admitted from any suitable source of supply.

Depending from the throttle valve housing 13 coaxially with the drilling motor 10, there is a cylinder 18 secured in position by a pair of bolts 17, one of which is shown in Fig. 2. The lower end of the cylinder 18 is reinforced by the provision of a bore 18' of a diameter materially smaller than the normal inner diameter of the cylinder, through which bore is free to slide an inner cylinder 19 extending into the outer cylinder 18 and having its upper end portion carrying a piston 20 having one or more packing rings 21 in fluid tight engagement with the inner wall of the outer cylinder 18. A dome nut 22 closes the upper end of the inner cylinder, while the lower end thereof is provided with a relatively small bore 23 through which is free to slide a feed rod 24 formed with a lower pointed end 25. The upper end of the rod 24 carries a piston 26 secured in position by a nut 27 and equipped with one or more packing rings 28 in fluid tight engagement with the inner cylinder.

Located on one side of the drilling motor 10, there is a combination of cylinders and pistons similar to the one above described which includes cylinder 29 preferably formed integral with the drilling motor 10, and extending upwardly along side of the front housing 12. Slidably within the cylinder 29 is an inner cylinder 30 carrying at its lower end a piston 31 and one or more packing rings 32, which pistons and rings are held in position by a dome nut 33 which closes the lower end of the cylinder 30, while the upper end thereof is formed with a relatively small bore 34 through which is free to slide an anchor rod 35 formed with a pointed end 36. The lower end of the rod also carries a piston 37 which includes packing ring 38 held in position by a nut 39. Closing the upper end of the other cylinder 29 around the inner cylinder 30, there is a packing ring 40 held in place by a gland nut 41, and in the inner cylinder 34 there is a similar packing ring 42 held in operative engagement with the anchor rod 35 by a nut 43.

Within one vertical plane of the throttle valve 15 shown in Fig. 3, the throttle valve is provided with two semicircular grooves 44 and 45, the former being in constant communication with the atmosphere through a port 46. The cylinder 18 is capable of communication with either the groove 44 or 45 through a port 47 formed within the valve housing 13, and opening into the upper end of the cylinder 18, from where motive fluid may be admitted into the upper end of the inner cylinder 19 through one or more ports 48 provided through the dome nut 22. Similarly the lower end of the cylinder 29 is capable of communication with the groove 44 or 45 through a port 49, from which end motive fluid may be admitted into the lower end of the inner cylinder 30 through one or more ports 50 provided through the dome nut 33. The throttle valve groove 45 is in constant communication with the throttle valve inlet port 16 through a radial port 51.

Within another vertical plane of the throttle valve 15 shown in Fig. 5, the throttle valve is provided with a semicircular groove 52 in constant communication with the atmosphere through a port 53, and capable of communication with a passageway 54 leading into the upper

end of the other cylinder 29. The passageway 54 may also be brought into communication with the throttle valve inlet port 16 through radial port 55, while the inner cylinder 30 may communicate with the other cylinder 29 through a port 56 formed across the wall of the former near the upper end thereof.

Within still another vertical plane of the throttle valve 15 shown in Fig. 4, the throttle valve is formed with a relatively large radial port 57 capable of communicating with port 58 for admitting motive fluid into the drilling motor 10.

In the operation of the device, let it be assumed that the throttle valve 15 has motive fluid admitted into its inlet port 16, and that the throttle valve is positioned as shown in Figs. 3 to 5. In this instance the feeding mechanism including the cylinders 18 and 19 will remain in the position shown in Fig. 2 because the port 47 controlled by the throttle valve 15 is in communication with the atmosphere through the port 46 as shown in Fig. 3. Similarly the anchoring mechanism including the cylinders 29 and 30, will remain in the position shown in Fig. 2 because the port 49 is also in communication with the atmosphere via the groove 44 and the port 46, while motive fluid is admitted into the upper end of the cylinder 29 through the throttle valve port 55 and the passageway 54, and therefrom into the cylinder 30 through the port 56, thereby causing the motive fluid to act on the pistons 31 and 37 for holding anchoring mechanism as shown in Fig. 2. In this position of the throttle valve, it will be noticed that the port 58 leading into the drilling motor 10, is out of communication with the throttle valve port 57, thereby preventing operation of the drilling motor.

When the throttle valve is moved in the counterclockwise direction in Fig. 3, the port 47 will register with the throttle valve groove 45 which is in constant communication with the inlet port 16 through the radial port 51, thereby supplying motive fluid to the piston 20 for effecting feeding motion of the drilling motor 10 and bring the drill steel 11 into contact with the work. Thereafter the throttle valve 15 is rotated further in a counterclockwise direction in Fig. 3, to bring the port 49 into communication with the throttle valve groove 45. In this instance the interior of the cylinders 30 and 29 are vented to the atmosphere through the port 56, the passageway 54, the valve groove 52 and the exhaust port 53, thereby enabling the action of the motive fluid on the piston 31 to cause upward motion of the cylinder 30 and rod 35 until the rod's pointed end 36 contacts the work. Subsequently, the throttle valve 15 may again be turned in a clockwise direction to bring the throttle valve port 57 with the port 58 for admitting motive fluid into the drilling motor 10 and cause the piston reciprocable therein to deliver impacts on the drill steel 11.

As the drilling operation proceeds the drilling motor 10 is gradually fed upwardly to maintain the drill steel to the work. Due to the telescopic arrangement of the cylinder 19 and feed rod 24, it will be understood that when the cylinder 19 has reached the end of its possible stroke, motive fluid admitted from the cylinder 18 into the cylinder 19 through the ports 48, will act on the piston 26 for continuing the feeding operation until the piston 26 reaches the end of the possible stroke.

Due to the engagement of the anchor rod 35 with the work, it will be understood that the drilling apparatus above described can operate automatically without the assistance of an operator holding the machine in position or against rotation. The anchor rod 36 being offset relative to the drill steel 11 will not only support a machine, but also prevent it from rotating on its own axis. Due to the telescopic arrangement of the cylinder 30 and anchor rod 35 relative to the cylinder 29, the possible movement of the rod 36 is such that it will operate successfully under normal conditions of operation. In practice the diameters of the cylinders 29 and 30 are made materially smaller than that of the cylinders 18 and 19 respectively, thereby enabling the action of the motive fluid within the feeding mechanism to feed the drill to the work irrespective of the action of the motive fluid within the anchoring mechanism.

When it is desired to cease operation of the drilling mechanism, the throttle valve 15 may again be rotated into the position shown in Figs. 3 to 5. In this instance the throttle valve port 57 is first moved out of communication with the port 58, thereby preventing impacts to be delivered to the drill steel 11, even though the mechanism is still held in the position shown in Fig. 1. Thereafter the port 49 will be brought into communication with the atmosphere via the throttle valve groove 44 and the exhaust port 46, subsequently the throttle valve may be rotated into the position shown on the drawing, causing the passageway 54 to be brought into communication with the throttle valve port 55 for admitting motive fluid into the cylinder 29 and therefrom into the cylinder 30 through the port 56 for causing the retraction or collapse of the anchoring mechanism as shown in Fig. 2. Simultaneously the port 47 will communicate with the atmosphere via the throttle valve groove 44 of the port 46, thereby causing the collapse of the feeding mechanism due to the weight of the drilling motor thereon.

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 modifications of structural detail may be resorted to without departing from the scope or spirit of the invention as herein claimed.

I claim:

1. A rock drilling apparatus including a drilling motor having a drill steel carried thereby, a duality of cylinders rigidly secured to the motor one being larger than the other, a fluid actuated feeding mechanism within the larger of said cylinders operable for feeding the motor into drill steel engagement with the work, and a fluid actuated extensible mechanism within the smaller of said cylinders capable of operative anchoring engagement with the work, the size of said cylinders calculated to enable adequate feeding of the motor to the work irrespective of the operative anchoring engagement of said extensible mechanism with the work.

2. In a drilling apparatus, a fluid actuated drilling motor, a duality of cylinders rigidly secured to said motor one located coaxially therewith and the other extending alongside of the motor, and a set of fluid actuated telescoping elements within each cylinder, each set being extensible in opposite direction with its innermost

element engageable with the work for supporting said motor in a drilling position.

3. In a drilling apparatus, a fluid actuated drilling motor, lower and upper cylinders rigidly secured to said motor the former coaxially with the motor and the latter along its side and of an inner diameter smaller than that of the former, and a fluid actuated piston rod within each cylinder, each piston rod being slidable in opposite direction through one end of its cylinder into motor supporting engagement with the work.

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