E. M. MACKIE & P. F. DOYLE.

ROCK DRILL.

APPLICATION FILED JAN. 19, 1909.

965,474.

Patented July 26, 1910.

2 SHEETS—SHEET 1.

Fig. 1.

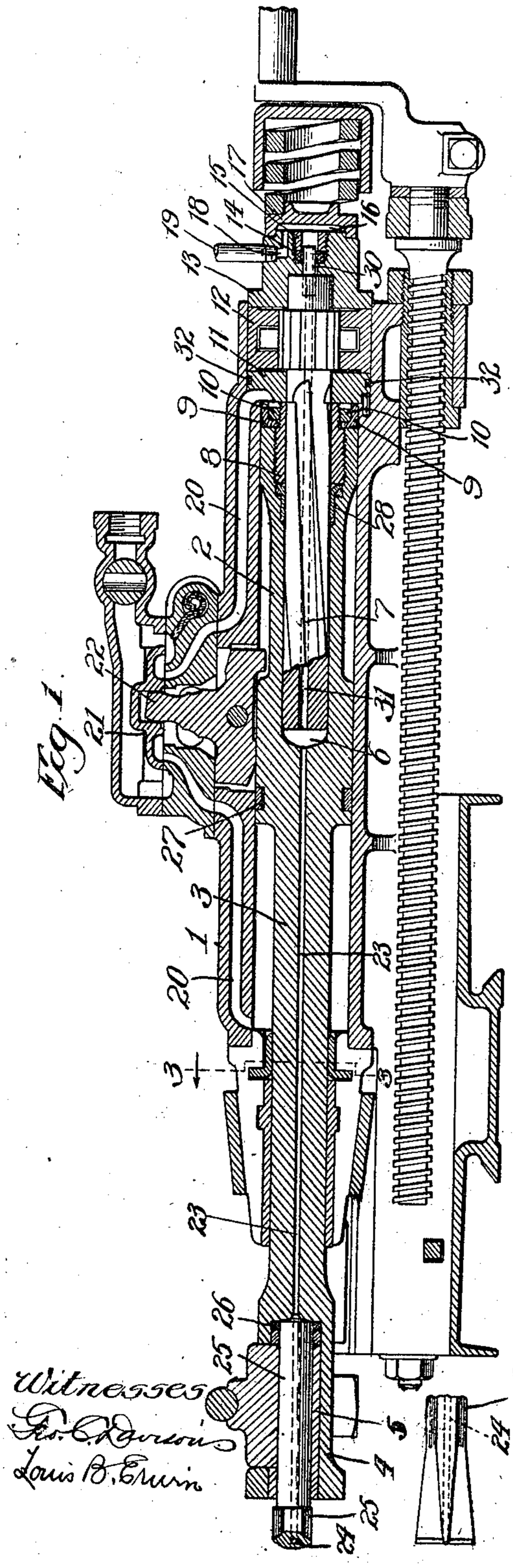


Fig. 3.

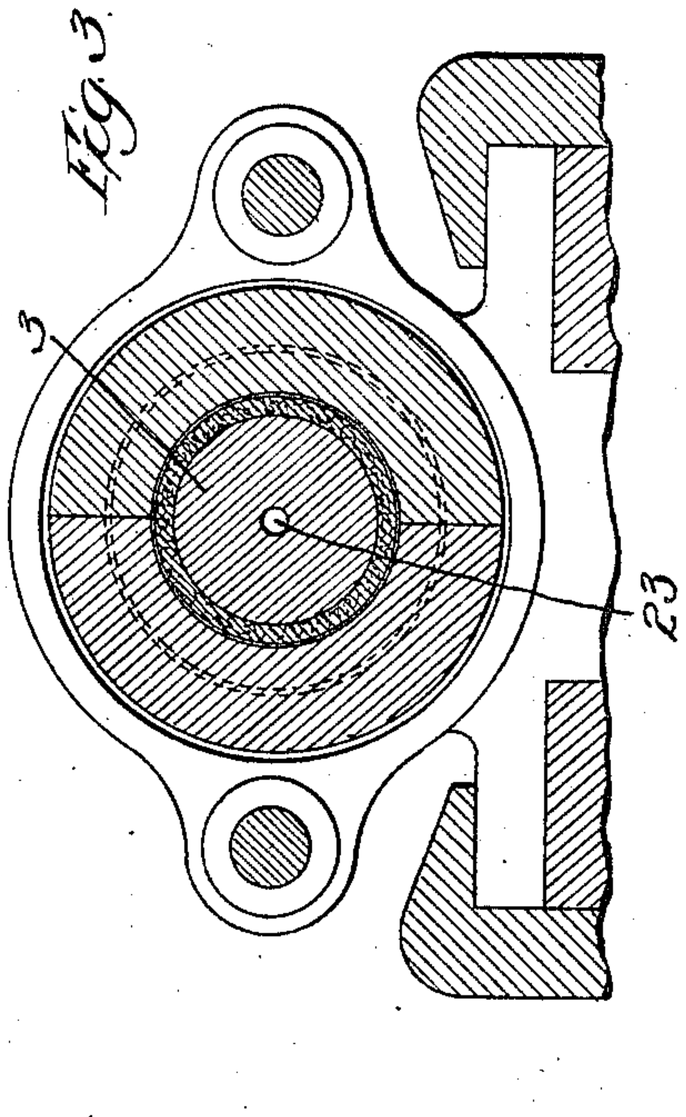
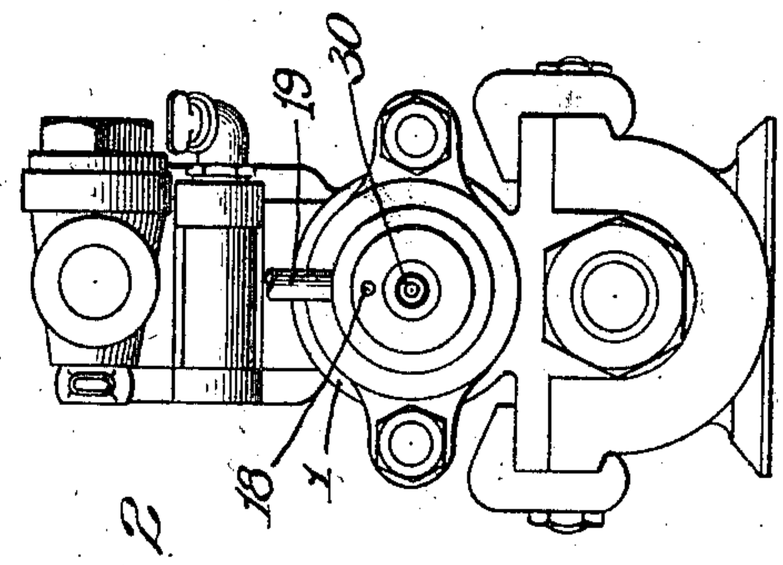


Fig. 2.



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2 SHEETS—SHEET 2.

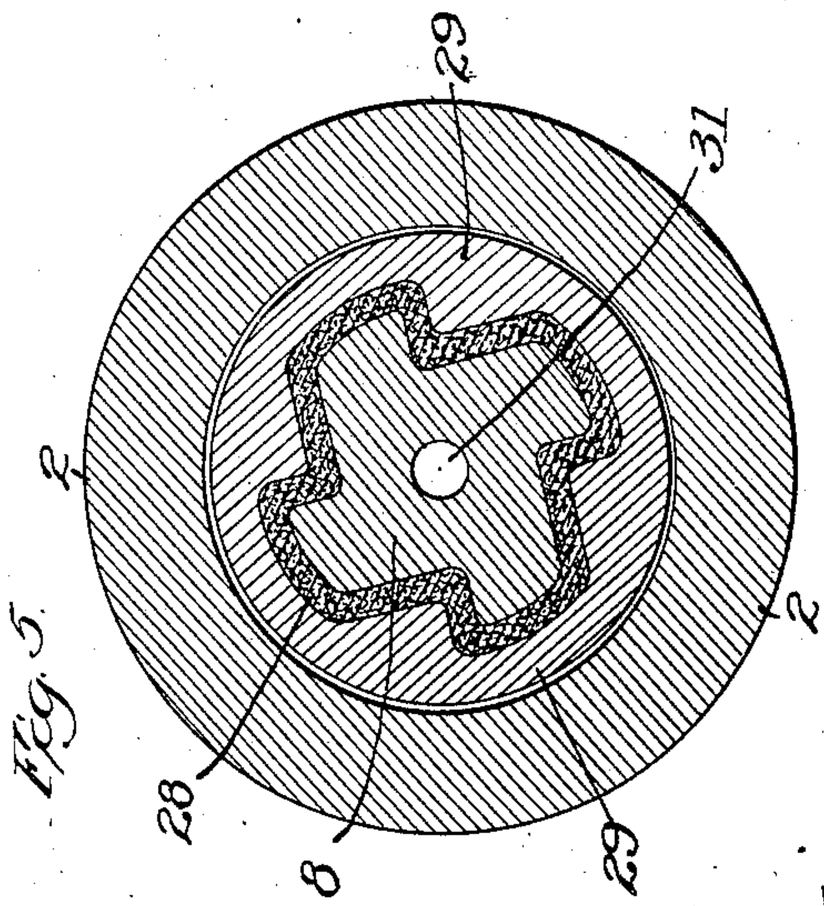

Fig. 5.

Fig. 4.

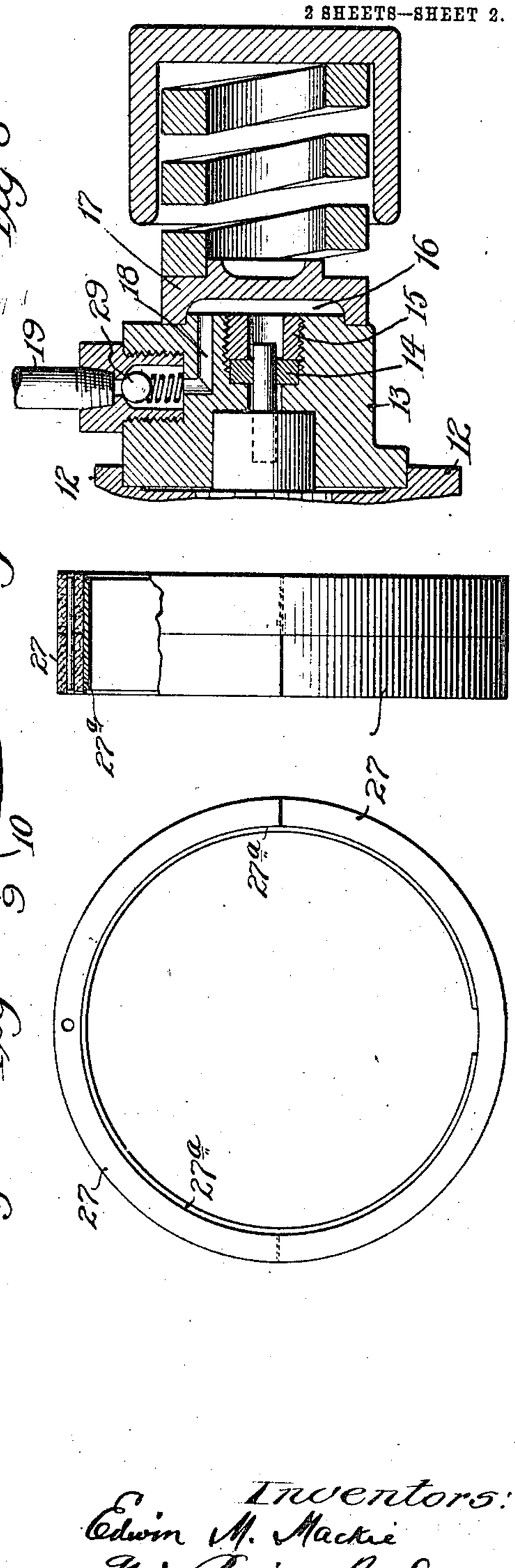

Fig. 6.

Fig. 7.

Fig. 8.

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UNITED STATES PATENT OFFICE.

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ROCK-DRILL.

965,474. Specification of Letters Patent. Patented July 26, 1910.

Application filed January 19, 1909. Serial No. 473,150.

To all whom it may concern:

Be it known that we, EDWIN M. MACKIE and PERCIVAL F. DOYLE, both residing at Franklin, Venango county, Pennsylvania, the former being a citizen of the United States and the latter a citizen of the Dominion of Canada, have invented certain new and useful Improvements in Rock-Drills, of which the following is a specification.

Our invention relates to rock drills and the object thereof is to provide novel and efficient means incorporated therein for supplying water or air and water to the drill steel, the fluid being discharged through such drill steel for several purposes as for instance to thoroughly clean the hole of cuttings, to keep the cutting end of the steel cool thereby enabling it to retain its temper and so keep its cutting edges in condition for effective work, to increase the drilling or cutting power of the machine by enabling the cutting end of the steel to strike on a clean fresh surface at each blow, to keep the hole free from "mud" thereby making the rotative effort easier and so increasing the speed of the machine, and also to prevent dust or grit from the drilling mixing with the air which the operators have to breathe, thereby saving them from the danger of contracting what is known as "miners' phthisis". In practice we provide for both an intermittent fluid service or a continuous fluid service and also provide for the mixture of the fluids referred to or the use of either one of such fluids although it is preferred to employ water either alone or mixed with air except where the supply is scarce in which event air alone may be employed.

In the preferred embodiment of our invention as herein shown, the construction and arrangement is such that the rock drilling mechanism forms a coöperative part of the fluid service and serves substantially as a pump in pumping the fluid through the drilling mechanism and through the drill steel to the hole in which such steel is performing its work. The various features of novelty and utility in our construction will be apparent from the description hereinafter given.

In the drawings Figure 1 is a central longitudinal section of a rock drill embodying our invention; Fig. 2 a front elevation thereof; Fig. 3 a section on the irregular line 3—3 of Fig. 1; Fig. 4 an elevation of the rear portion of the drill piston and a part of the rifle bar, the same being on a larger scale than the preceding figures; Fig. 5 a cross-section on the line 5—5 of Fig. 4; Fig. 6 a side elevation of one of the packing rings; Fig. 7 an edge elevation of such packing ring with a portion thereof broken away; and Fig. 8 a detail of a modification.

Referring to the present embodiment of our invention as illustrated in the drawings, the rock drill elements are for the most part of the usual and well-known construction so that it will be necessary to refer only to those parts thereof which are directly concerned or affected by the incorporating of our invention therein.

Referring to Fig. 1 the cylinder 1 is provided with the usual piston chamber within which reciprocates the piston 2 having at its front end the piston rod or chuck rod 3 carrying at its outer end a chuck 4 containing a suitable bushing 5. As usual the rear end of the piston is provided with a central bore 6 to receive the rifle or rotating bar 7 adapted to coöperate with the rifle bar nut 8 screwing into a counterbore in said central bore or chamber 6 of the piston. The extreme rear end of the piston is provided with suitable packing—in the present instance a cup leather packing 9 being employed together with a packing retainer 10 screwing upon the reduced diameter of the rifle bar nut as clearly indicated in Fig. 4. The rifle bar coöperates in the usual manner with a thrust ring 11 and also the usual ratchet slip ring 12, said latter parts being held in place by means of the upper or back-head 13. This back-head is provided with a central bore within which is arranged flexible packing 14 for packing an extension of the rifle bar as hereinafter explained, such packing being provided with an adjusting ring 15 screwing into said bore. At the extreme rear end of the back-head and in communication with said bore is formed a chamber 16 by means of a cap 17. The back-head 13 is provided with a supply passage 18 communicating with the chamber 16 for supplying the fluid through a suitable inlet pipe 19 to the drill steel in the manner hereinafter described and the cylin-

der is provided with the usual operating ports and passages 20 for admitting and releasing the operating fluid to and from opposite ends of the piston for the purpose of reciprocating the same, such passages being controlled by the main valve 21 which is operated by the rocker 22 in the usual and well-known manner.

The piston rod or chuck rod 3 is provided with a central fluid passage 23 adapted to communicate at its front end with a corresponding central passage 24 in the drill steel 25. As shown in Fig. 1 suitable packing 26 is arranged at the rear end of the drill steel and interposed between the bushing 5 and the bottom of the socket formed in the front end of the chuck rod. The piston 2 is provided toward its front with a packing 27 which in practice is a piston ring of leather. Between the rifle bar and the inner walls of the chamber 6 is interposed a suitable packing 28 which by reason of the peculiar formation of the rifle bar is correspondingly fluted or rifled. This packing is of the cup leather type and as indicated in the enlarged view, Fig. 4, the same is provided with a retaining ring 29. This packing 28 is adapted to permit the fluid admitted back of the piston to pass by it between the rifle bar and the walls of the chamber 6 and to enter the front end of such chamber when the pressure therein is less than the pressure behind the piston, but to prevent the flow of fluid in the opposite direction.

In the present instance the rifle bar has a rearward extension 30 which extends into the central bore in the back-head 13 which extension as well as the entire rifle bar is provided with a fluid passage 31. This extension of the rifle bar is packed by means of the packing 14 hereinbefore referred to. Likewise the ratchet ring 11 may be provided with suitable packing 32 to prevent leakage at its periphery.

For an intermittent service of water and air, water under suitable pressure is admitted from the supply pipe 19 (through any suitable valve mechanism not shown) to the chamber 16 from whence the water will flow through the passage 31 in the rifle bar to the rifle bar chamber 6, thence through the passage 23 in the chuck rod and through the passage 24 to the front end of the drill steel. Thus a communication is established for the passage of the fluid under pressure from the fluid passage 18 in the back-head to the front end of the drill steel, the working parts of the drill through which the fluid passes being adequately and efficiently packed for the prevention of leakage of the fluid.

When the drill is in operation and with the water under pressure admitted to the back-head in the manner already explained, the size of the chamber 6 in front of the rifle bar will be increased upon the outward stroke of the piston and the size of the fluid ports is such that such space will be increased faster than the fluid can fill it. As a result the pressure in the chamber 6 will be reduced and inasmuch as the inner or rear end of the piston chamber is filled with the operating fluid under a greater pressure than the reduced pressure in the chamber 6, a portion of the former pressure will pass by the packing 28 which acts as a sort of a check valve permitting such pressure to pass forwardly along the walls of the chamber 6, but preventing the return thereof. Thereupon on the inward stroke of the piston, the chamber space in front of the rifle bar will be decreased and the pressure of the fluid therein will be increased by the continued rearward movement of the piston in the regular operation of the drill. As a result the fluid which is a mixture of water and air inasmuch as the operating fluid of the drill is usually air, will be expelled forcibly through the passages 23 and 24 to the front end of the drill steel 25 and into the hole in which the steel is drilling, thereby cleaning out such hole with the attendant advantages hereinbefore recited.

For continuous water and air service, the action will be the same, only instead of water alone being allowed to enter the supply passage 18, the greater portion of the fluid will be air, only enough water being mixed with it to prevent dust while the air will supply the force to clean the hole. This method is to be used where the supply of water is scarce.

By preference the packing ring 27 is made in two pieces as detailed in Figs. 6 and 7, such packing comprising the leather packing proper 27 which is kept in contact with the inner walls of the piston chamber by a circular steel spring 27^a, which construction of ring efficiently seals against leakage while on account of its absorbent qualities the leather becomes saturated with oil and so acts as a distributer of lubrication along its path in the cylinder 1.

The construction and arrangement described as well as the freedom of the passages to the drill steel are such that no appreciable or detrimental back pressure is created in practice but if desired a check valve might be interposed at any suitable point as for instance in the supply passage—as shown in the modification Fig. 8, wherein the check valve 29 is of ball type. However, where the working is in material or soil where there is possibility of the hole in the drill steel becoming plugged up with cuttings notwithstanding the flow of fluid therethrough, it is preferable to omit the check valve in order to prevent accumulation of

pressure in the rifle bar chamber which would eventually stop the machine and possibly burst the packings.

We claim:

1. In a rock drill, the combination of a cylinder having a piston chamber, a piston therein having at one end a bore forming a rifle bar chamber, a rifle bar operating therein, the piston being provided with a longitudinal passage for fluid, and means for permitting the working fluid to enter said passage from the piston chamber but preventing the flow in the opposite direction.

2. In a rock drill, the combination of a cylinder having a piston chamber, a piston therein having at one end a bore forming a rifle bar chamber, a rifle bar therein, the piston being provided with a passage for fluid, packing between such bar and piston permitting passage of pressure fluid from the piston chamber to the rifle bar chamber and to the passage in the piston but preventing flow in the opposite direction, whereby the movement of the piston will cause forcible ejection of fluid at the front end of the drill.

3. In a rock drill, the combination of a cylinder having a piston chamber, a piston therein having at one end a bore forming a rifle bar chamber, a rifle bar therein, said bar and piston having communicating fluid passages adapted to communicate with a source of fluid, and means for permitting the pressure fluid from the piston chamber to enter the rifle bar chamber but preventing flow in the opposite direction.

4. In a rock drill, the combination of a cylinder having a piston chamber, a piston therein having at one end a bore forming a rifle bar chamber, a rifle bar therein, said bar and piston having communicating fluid passages adapted to communicate with a source of fluid, and a fluted cup packing interposed between the rifle bar and the piston.

5. In a rock drill, the combination of a cylinder having a piston chamber, a piston therein having at one end a bore forming a rifle bar chamber, a rifle bar therein, said bar and piston having communicating fluid passages adapted to communicate with a source of fluid, a fluted cup packing interposed between the rifle bar and the piston, and a retaining ring 29 for such packing.

6. In a rock drill, the combination of a cylinder having a piston chamber, a piston therein having at one end a bore forming a rifle bar chamber, a rifle bar therein, said bar and piston having communicating fluid passages adapted to communicate with a source of fluid, a fluted cup packing interposed between the rifle bar and the piston, a thrust ring 11 for the rear end of said rifle bar and packing 32 to prevent leakage.

7. In a rock drill, the combination of a cylinder having a piston chamber, a piston therein having at one end a bore forming a rifle bar chamber, a rifle bar therein, said bar and piston having communicating fluid passages adapted to communicate with a source of fluid, said rifle bar having a rearward extension, a head in which the latter is mounted, packing for the extension, and packing between the rifle bar and piston.

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