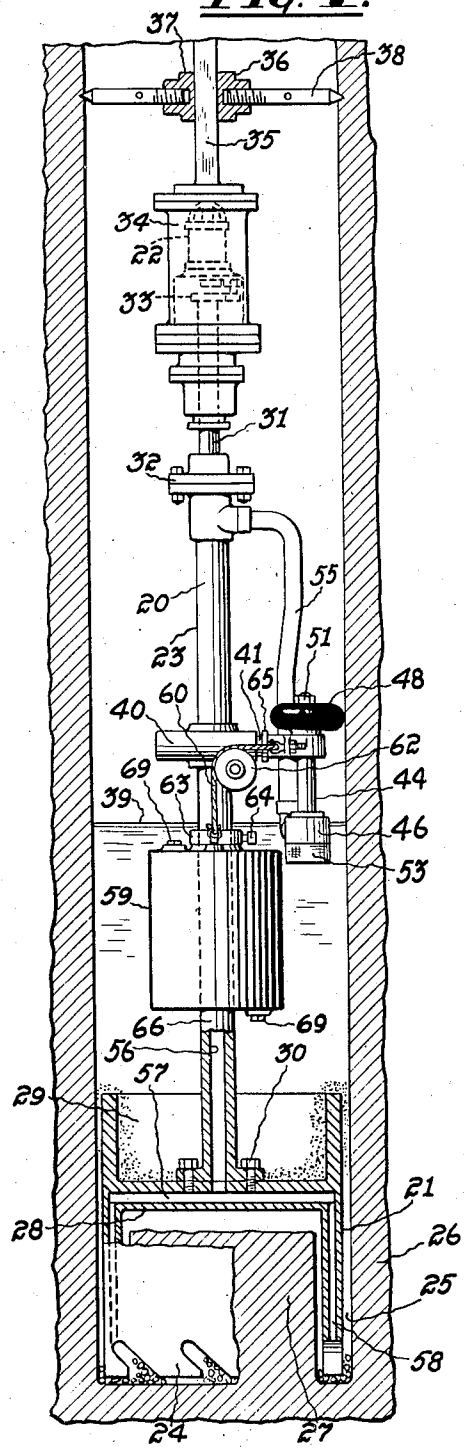
May 29, 1945. F. MILLER 2,376,974

DRILLING APPARATUS

Filed May 21, 1943

FIG.-1.



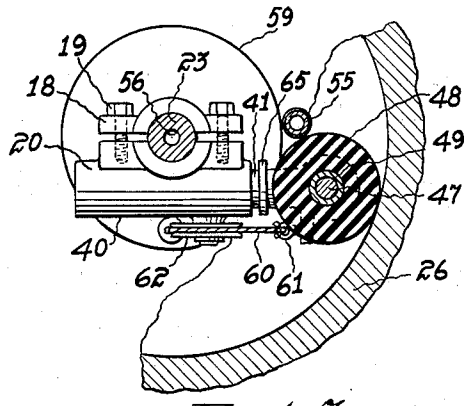


FIG.-3.

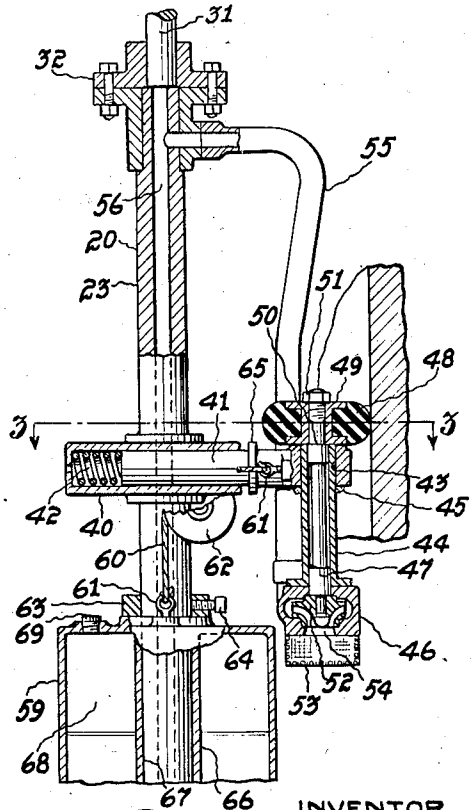


FIG.-2.

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Patented May 29, 1945

2,376,974

UNITED STATES PATENT OFFICE

2,376,974

DRILLING APPARATUS

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Application May 21, 1943, Serial No. 487,871

9 Claims. (Cl. 255—24)

This invention relates to drilling apparatus, and more particularly to core drilling apparatus of the rotary type.

In machines of this type the cutting tool is in the form of a toothed cylinder that cuts an annular channel in the earth formation, and the column separated thereby from the rock bed is broken off in convenient lengths and removed from the drill hole. This operation is repeated as often as may be necessary to form a hole of the desired depth.

In order to maintain a clean working surface for the cutting tool water is introduced into the drill hole to remove the cuttings as rapidly as they are formed. Heretofore it has been customary to supply water constantly from a source to the work during the entire drilling operation. This mode of procedure is, however, often unsatisfactory for the reason that an unduly large volume of water may accumulate in the drill hole, and since such water must be removed before the core may be extracted a great deal of time is lost between drilling periods.

It is accordingly an object of the invention to eliminate the necessity of handling unnecessarily large quantities of flushing liquid.

Another object is to equip the drilling apparatus with means operable within the drill hole for pumping the flushing liquid in the drill hole to the cutting portion of the drilling apparatus.

Other objects will be in part obvious and in part pointed out hereinafter.

In the drawing accompanying this specification and in which similar reference numerals refer to similar parts,

Figure 1 is an elevation, partly broken away, of a drilling apparatus constructed in accordance with the practice of the invention,

Figure 2 is a similar view, somewhat enlarged, of a fragmentary portion of the apparatus, and

Figure 3 is a transverse view taken through Figure 2 on the line 3—3.

Referring more particularly to the drawing, the drilling apparatus, designated in its entirety by 20, comprises a cutting tool 21, a motor 22 for rotating it and a stem 23 for transmitting movement from the motor to the cutting tool.

The cutting tool 21 is of the tubular type having teeth 24 at its leading end for cutting an annular channel 25 in the rock 26. The core 27 of material thus severed from the bed extends upwardly into the cutting tool and its length is limited by a transverse wall 28 in said tool. The wall 28 is located intermediate the ends of the cutting tool, and the space above the wall 28 constitutes a receptacle 29 for rock cuttings that may precipitate from the flushing liquid.

The lower end of the stem 23 is attached to the wall 28 by bolts 30 and at its upper end to an extension 31 by a coupling 32. Rotary motion is transmitted to the extension 31 by a gear train 33.

The motor 22 and the gear train 33 are housed in a casing 34 the upper end of which is attached to a rod 35 to which a lifting device (not shown) may be connected for raising and lowering the drilling apparatus. The rod is of rectangular cross sectional form and carries a spider 36 for holding it against rotary movement. The spider comprises a body 37 that is slidably interlocked with the rod 35 and carries pointers 38 to engage the wall of the drill hole. The pointers 38 are threadedly connected to the body 37 and are, therefore, conveniently adjustable for placing them into and out of engagement with the supporting material.

In accordance with the practice of the invention, the drilling apparatus 20 is provided with means for pumping water, designated 39, from the drill hole and to deliver such water to the working surface. To this end the stem 23 carries a cylinder 40 that lies in a plane at right-angles to the axis of rotation of the cutting tool and contains a plunger 41 that is urged outwardly toward the wall of the drill hole by a spring 42 in the cylinder. The cylinder is secured to the stem by a clamp-plate 18 and bolts 19 and is conveniently adjustable endwise of the stem for varying its position with respect to the cutting tool.

In the outer end of the plunger 41 is a bore 43 to receive an end of a tubular casing 44 that may be secured to the plunger by welding 45. The casing 44 is arranged in parallelism with the stem 23 and supports a centrifugal pump 46 the shaft 47 of which extends upwardly through the casing 44 and carries at its upper end a wheel 48 for driving the pump.

The wheel 48 is of somewhat larger diameter than the pump 46 and preferably consists of a rubber disk mounted upon a bushing 49 that is clamped against a shoulder 50 on the shaft 47 by a nut 51. The lower end of the shaft 47 carries the pump impeller 52, and a screen 53 overlies the inlet opening 54 of the pump 46 to prevent the entrance of coarse cuttings into the pump.

The liquid is discharged from the pump 46 through a discharge conduit 55 that may be connected to the stem 23 in any suitable manner and opens into a passage 56 in the stem. The

upper end of the passage 56 may be sealed, as shown, by the end of the extension 31, and the lower end of said passage communicates, through a channel 57 in the wall 28, with waterways 58 extending through the cutting tool to the teeth 24.

Means are provided for holding the wheel 48 out of contact with the wall of the drill hole during the lowering and raising of the drilling apparatus into and from the drill hole. To this end a float 59 is disposed slidably upon the stem 23 between the cylinder 40 and the cutting tool in such position that it will normally be immersed in the flushing liquid and subjected to the buoyancy of such liquid. The float is connected to the plunger 41 by a cable 60 the ends of which are fastened to eye-bolts 61 carried by the plunger and the float. The cable is trained over a sheave 62 adjacent the cylinder 40 and positioned in such wise that one end portion of the cable will move in the longitudinal plane of the stem and the other end of the cable will move in a plane at a right angle thereto.

In order to limit the upward movement of the float 59 on the stem 23 a stop member in the form of a collar 63 is locked to the stem 23 above the float by a set screw 64. The collar 63 is thus rendered adjustable upon the stem 23 and can be raised or lowered when necessary to permit of an increased or shortened travel of the plunger 41.

If desired, the plunger 41 may also be provided with a collar 65 positioned to engage the open end of the cylinder 40 for limiting the distance that the plunger may be retracted into the cylinder.

In the form illustrated, the float 59 is of annular shape and its inner wall 66 defines a bore 67 to slidably receive the stem 23. The interior of the tank constitutes a chamber 68 for liquid that combines with the weight of the float for retracting the plunger 41 when the float 59 emerges from the water in the drill hole. Suitable openings, sealed by plugs 69, are provided in the ends of the float for adding to or reducing the body of liquid in the chamber 68.

In the operation of the device, let it be assumed that the drilling apparatus is in the operative position for extending a drill hole and that water of sufficient depth to cover the float 59 and the pump 46 is present in such drill hole. Under these conditions the buoyancy of the water will raise the float 59 against the collar 63 and the cable 60 is positioned to permit the spring 42 to move the plunger 41 outwardly toward the wall of the drill hole for pressing the wheel 48 into frictional contact with such wall.

During the rotation of the cutting tool this pressure of the spring will be augmented by centrifugal force and the wheel 48 will be held firmly against and roll over the surface of the wall and drive the impeller 52 for pumping water through the discharge conduit 55, the passages 56, 57 and 58 to the working surface. Such operation of the pump will take place only when the cutting tool is being rotated within the drill hole, and whenever the apparatus is lifted from the work, the float 59, upon emerging from the water 39 will slide downwardly along the stem 23 and move the wheel 48 out of contact with the surrounding wall. The entire apparatus may then be removed to the surface without danger of damaging either the wheel 48 or the pump 46 through contact of these parts with the rough surface of the drill hole.

I claim:

1. A drilling apparatus, comprising a rotary member having a cutting portion for drilling a hole, a pump located exteriorly of and carried by the member for pumping liquid from the hole being drilled and delivering such liquid to the cutting portion, support means on the exterior of the rotary member for pump, means rotatable on the wall of the hole being drilled for driving the pump, and means for transmitting rotary movement from the first mentioned means to the pump.

2. A drilling apparatus, comprising a rotary member having a cutting portion for drilling a hole, a pump located exteriorly of and carried by the member for pumping liquid from the hole being drilled and delivering such liquid to the cutting portion, support means on the exterior of the rotary member for the pump, means moving in a path around the axis of the member and rotatable on the wall of the hole being drilled for driving the pump, and means for transmitting rotary movement from the first mentioned means to the pump.

3. A drilling apparatus, comprising a rotary member having a cutting portion for drilling a hole, a pump located exteriorly of and carried by the member for pumping liquid from the hole being drilled and delivering such liquid to the cutting portion, support means on the exterior of the rotary member for the pump, means rotatable on the wall of the hole being drilled for driving the pump, means for transmitting rotary movement from the first said means to the pump, and means for urging the first mentioned means into frictional contact with such wall.

4. A drilling apparatus, comprising a rotary member having a cutting portion for drilling a hole, a pump located exteriorly of and carried by the member for pumping liquid from the hole being drilled to the cutting portion, a support on the rotary member for the pump adjustable transversely of the rotary member, a wheel for driving the pump and being movable in a path around the axis of the member, means for transmitting movement from the wheel to the pump, and means for holding the wheel in frictional contact with the wall of the hole being drilled.

5. A drilling apparatus, comprising a rotary member having a cutting portion for drilling a hole, a pump for pumping liquid from the hole being drilled to the cutting portion, a support member on the exterior of the rotary member for the pump and being adjustable transversely and longitudinally of the rotary member, a wheel operatively connected to the pump for driving said pump, and means for actuating the support member to hold the wheel in frictional contact with the wall of the hole being drilled.

6. A drilling apparatus, comprising a rotary member having a cutting portion for drilling a hole, a pump for pumping liquid from the hole being drilled to the cutting portion, a bearing on the exterior of the rotary member, a rod slidable in the bearing to support the pump, a wheel operatively connected to the pump for driving said pump, and a spring to move the rod in a direction for pressing the wheel into frictional contact with the wall of the hole being drilled.

7. A drilling apparatus, comprising a rotary member having a cutting portion for drilling a hole, a pump for pumping liquid from such hole to the cutting portion, a support member on the

exterior of the rotary member for the pump movable relatively to the rotary member, a wheel operatively connected to the pump for driving the pump, means to shift the support member in one direction for pressing the wheel into contact with the wall of a drill hole during the drilling thereof, and a float to shift the support member in an opposite direction to move the wheel out of engagement with such wall.

8. A drilling apparatus, comprising a rotary member having a cutting portion for drilling a hole, a pump exteriorly of and carried by the rotary member for pumping liquid from such hole to the cutting portion, a wheel for driving the pump, means for transmitting movement from the wheel to the pump, means for pressing the wheel into frictional engagement with the wall of a hole being drilled, and a float to move the wheel out of engagement with such wall.

9. A drilling apparatus, comprising a rotary member having a cutting portion for drilling a hole, a pump located exteriorly of and carried by the rotary member for pumping liquid from such hole to the cutting portion, a wheel rotatable on such wall and operatively connected to the pump for driving the said pump, a support member on the exterior of the rotary member for the pump and the wheel movable in opposite directions for placing the wheel into and out of contact with such wall, means for moving the support member in one direction, and a float for moving the support member in the other direction.

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