Oct. 29, 1935. F. M. SLATER 2,019,163

ROCK DRILL

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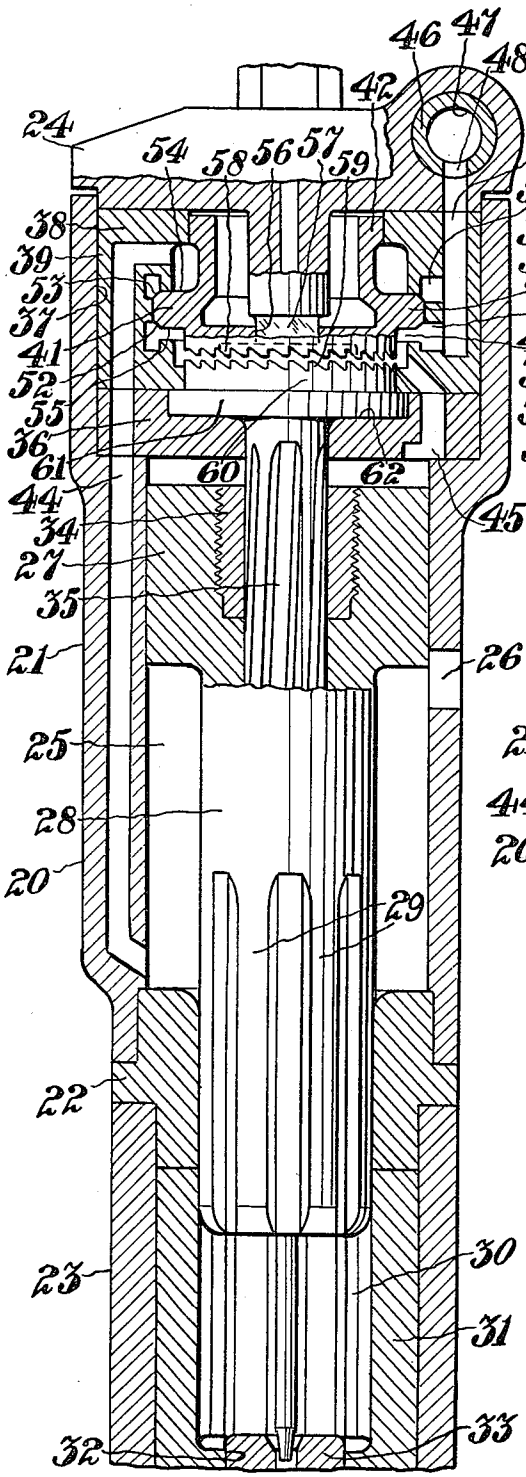


FIG.-1.

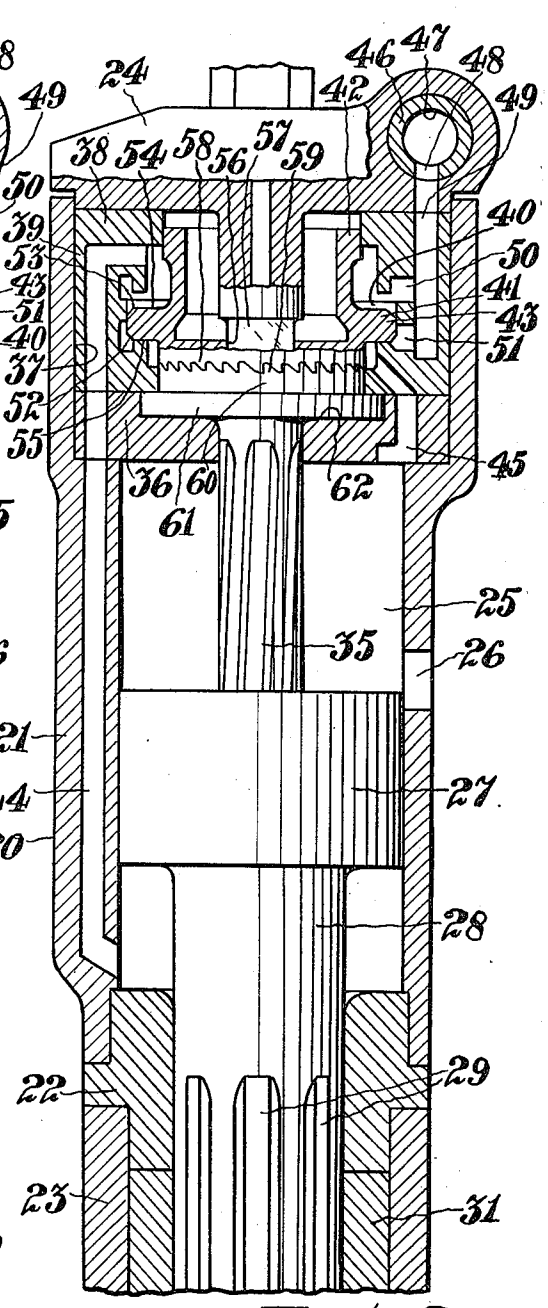


FIG.-2.

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ROCK DRILL

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9 Claims. (Cl. 121—7)

This invention relates to rock drills, and more particularly to a rotation mechanism for fluid actuated rock drills of the reciprocatory hammer type.

One object of the invention is to control the rotative movement of the working implement in a simplified and improved manner.

Another object is to reduce the number of parts of the mechanism employed for effecting rotation of the working implement.

Still another object is to employ the distributing valve as a means for controlling the period of rotation of the working implement.

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 a sectional elevation of a rock drill equipped with rotation mechanism constructed in accordance with the practice of the invention and showing the parts in the positions which they will occupy at the beginning of the working stroke of the piston, and

Figure 2 is a similar view showing the rifle bar restrained against rotation and in consequence of which the piston describes a partial revolution for rotating the working implement during the return stroke of the piston.

Referring more particularly to the drawing, 20 designates a rock drill comprising a cylinder 21, a front cylinder washer 22 and front and back heads 23 and 24, respectively. These parts constitute the casing of the rock drill and may be held in correct assembled relationship with respect to each other in any known manner, for example side bolts (not shown) and which may be disposed on diametrically opposite sides of the drill, as is customary.

Within the cylinder 21 is a piston chamber 25 having a free exhaust port 26 which is controlled by a piston 27 in the piston chamber 25. The front cylinder washer 22 serves as a closure for the front end of the piston chamber and is bored to serve as a guide for a stem 28 on the front end of the piston 27. The forward portion of the stem 28 is provided with longitudinal ribs 29 which interlock with ribs 30 in a chuck 31 arranged within the front head 23 to rotate therein. The chuck 31 is provided with a suitable aperture 32 to receive and interlockingly engage a working implement 33 against which the piston 27 strikes.

In the rearward portion of the piston 27 is a nut 34 which may be fluted to interlockingly engage a rifle bar 35 whereby rotation of the piston, the chuck 31 and the working implement 33 is effected. The rifle bar 35 is journalled in a plate 36 which forms a closure for the rear end of the piston chamber 35 and is seated in the bottom of an enlarged cavity 37 in the cylinder 21.

The cavity 37 also contains valve mechanism designated, in its entirety, by 38 and comprising a valve chest 39 which seats upon the plate 36 and has a valve chamber 40 for the accommodation of a valve 41 whereby the pressure fluid is distributed to the ends of the piston chamber 25. The plate 36 and the valve chest 39 are clamped in the correct assembled positions by the back head 24 of which the front end extends into the cavity 37 and acts against the valve chest 39.

The valve 41, selected for the purpose of illustration, comprises a hollow sleeve-like portion 42 of which the periphery engages slidably the rearward portion of the valve chamber 40. Near the front end of the valve is a flange 43 which controls the admission of pressure fluid to the ends of the piston chamber through front and rear inlet passages 44 and 45, respectively. The inlet passage 44 communicates with the valve chamber 40 at a point rearwardly of the flange 43 and the inlet passage 45 opens into a valve chamber at a point forwardly of the flange 43.

The admission of pressure fluid into the drill is controlled by a throttle valve 46 in the back head 24 and having a central chamber 47 which may be in constant communication with a source of pressure fluid supply. In the wall of the throttle valve is a port 48 adapted to register with a supply passage 49 opening into the valve chamber 40 through ports 50 and 51 and which may be in the form of annular grooves lying rearwardly and forwardly of the portion of the valve chamber containing the flange 43 and communicating with said portion.

On the front and rear ends of the flange 43 are bevelled surfaces which constitute actuating surfaces 52 and 53, respectively, and said actuating surfaces are exposed directly to the pressure fluid within the ports 50 and 51. The portion of the rear end of the flange 43 encircled by the actuating surface 53 serves as a holding surface 54 against which pressure fluid acts to hold the valve 41 in its foremost limiting position during the admission of pressure fluid to the front end of the piston chamber. Likewise, the portion of the front end of the flange encircled by the actuating surface 52 constitutes a holding surface

55 against which the pressure fluid flowing to the inlet passage 45 acts for holding the valve in the rearmost limiting position.

The holding surface 55 extends over the entire front end of the valve and may be interrupted only by an aperture 56 of polygonal form and into which extends a stem 57 carried, in this instance by the back head 24 to restrain the valve 41 against rotary movement.

In addition to its function of distributing the pressure fluid to the piston chamber the valve 41 also serves to control the rotary movement of the piston 27 and interengaged parts. The valve is accordingly provided on its front end with a series of clutch teeth 58 to engage similar clutch teeth 59 on the rear end of the rifle bar 37. More specifically, the clutch teeth 59 are arranged on a head 60 carried by the rifle bar 35 and extending into the front end of the valve chamber 40. The rear portion of the head 60 is journalled in the front end of the valve chest 39, and on the forward end of the head 60 is a lateral flange 61 which lies within a recess 62 in the plate 36 and seats against the valve chest 39 to hold the rifle bar 35 against endwise movement.

The operation of the device is as follows: With the valve 41 in the rear position pressure fluid flows through the port 51 over the actuating surface 52 and the holding surface 55 through the inlet port 45 into the rear end of the piston chamber. During this time the valve is held in the rear end of the valve chamber by the pressure fluid and the clutch members 58 are out of engagement with the clutch members 59. The rifle bar 35 is then free to rotate with respect to the valve.

The pressure fluid admitted into the rear end of the piston chamber drives the piston 27 forwardly against the working implement 33. As the piston proceeds forwardly it uncovers the exhaust port 26 and the pressure fluid employed for motivating it passes to the atmosphere. After the piston covers the exhaust port 26 the air in the front end of the piston chamber is compressed and flows through the inlet passage 44 against the surface 54 to assist the pressure fluid acting against the actuating surface 53 in throwing the valve forwardly for cutting off the flow of pressure fluid to the rear end of the piston chamber.

In the new position of the valve the clutch teeth 58 engage the clutch teeth 59 of the rifle bar and the rifle bar will then be firmly held against rotary movement. During its rearward stroke the piston will, therefore, describe a partial revolution and shift the working implement to a new position preparatory to the delivery of a subsequent blow to the working implement.

When the piston covers the exhaust port 26, during the rearward stroke, the air entrapped in the rear end of the piston chamber is compressed and expelled through the inlet passage 45 against the surface 55 to assist the pressure fluid acting against the actuating area 52 in throwing the valve rearwardly. When the front end of the piston uncovers the exhaust port 26 the pressure fluid in the front end of the piston chamber is exhausted to the atmosphere and the valve is then shifted rearwardly to again admit pressure fluid into the rear end of the piston chamber and to disengage the clutch teeth 58 from the clutch teeth 59, thus completing the cycle of operation.

I claim:

1. In a fluid actuated rock drill, the combination of a casing having a piston chamber and a reciprocatory piston in the piston chamber, a rifle bar interlockingly engaging the piston and being freely rotatable with respect to the casing, and a non-rotatable reciprocatory valve for distributing pressure fluid to the piston chamber, and means shifted into engagement with the rifle bar by the valve to hold the rifle bar stationary for effecting a partial revolution of the piston.

2. In a fluid actuated rock drill, the combination of a casing having a piston chamber and a reciprocatory piston in the piston chamber, a rifle bar interlockingly engaging the piston and being freely rotatable with respect to the casing, and a non-rotatable valve to distribute pressure fluid to the piston chamber and to intermittently engage the rifle bar to hold the rifle bar stationary during one stroke of the piston, thereby causing the piston to describe a partial revolution.

3. In a fluid actuated rock drill, the combination of a casing having a piston chamber and a reciprocatory piston in the piston chamber, a rifle bar interlockingly engaging the piston and being freely rotatable with respect to the casing, a valve for distributing pressure fluid to the piston chamber, means for preventing rotary movement of the valve, and means on the valve to engage the rifle bar for holding said rifle bar stationary and thereby cause the piston to describe a partial revolution.

4. In a fluid actuated rock drill, the combination of a casing having a piston chamber and a reciprocatory piston in the piston chamber, a rifle bar interlockingly engaging the piston and being freely rotatable with respect to the casing, a valve for distributing pressure fluid to the piston chamber, means for preventing rotary movement of the valve, and clutch members on the valve and the rifle bar intermittently engaging each other to hold the rifle bar stationary and thereby cause the piston to describe a partial revolution.

5. In a fluid actuated rock drill, the combination of a casing having a piston chamber and a reciprocatory piston in the piston chamber, a rifle bar interlockingly engaging the piston and being rotatable with respect to the casing, means for preventing endwise movement of the rifle bar, a reciprocatory and non-rotatable valve for distributing pressure fluid to the piston chamber, and clutch members on the rifle bar and the valve intermittently engaging each other to hold the rifle bar stationary and thereby cause the piston to describe a partial revolution.

6. In a fluid actuated rock drill, the combination of a casing having a piston chamber and a reciprocatory piston in the piston chamber, a rifle bar interlockingly engaging the piston and being rotatable with respect to the casing, a reciprocatory valve for distributing pressure fluid to the piston chamber and interlockingly engaging the casing to prevent rotary movement of the valve, and clutch members on the rifle bar and the valve intermittently engaging each other to hold the rifle bar stationary and thereby cause the piston to describe a partial revolution.

7. In a fluid actuated rock drill, the combination of a casing having a piston chamber and a reciprocatory piston in the piston chamber, a rifle bar interlockingly engaging the piston and being rotatable with respect to the casing, a reciprocatory valve for distributing pressure fluid to the piston chamber and being arranged coaxially with the rifle bar, means on the casing interlock-

ingly engaging the valve to prevent rotary movement of the valve, and clutch members in the adjacent surfaces of the valve and the rifle bar intermittently engaging each other to hold the rifle bar stationary and thereby cause the piston to describe a partial revolution.

8. In a fluid actuated rock drill, the combination of a casing having a piston chamber and a reciprocatory piston in the piston chamber, a rifle bar interlockingly engaging the piston and being freely rotatable with respect to the casing, a non-rotatable reciprocatory valve for distributing pressure fluid to the piston chamber and having opposed pressure surfaces, and clutch members in the rifle bar and one pressure surface intermittently engaging each other to hold the rifle bar stationary and thereby cause the piston to describe a partial revolution.

9. In a fluid actuated rock drill, the combination of a casing having a piston chamber and a reciprocatory piston in the piston chamber, a rifle bar interlockingly engaging the piston and being freely rotatable with respect to the casing, a non-rotatable reciprocatory valve for distributing pressure fluid to the piston chamber and having opposed actuating and holding surfaces, and clutch members in the rifle bar and one holding surface intermittently engaging each other to prevent rotary movement of the rifle bar and thereby cause the piston to describe a partial revolution.

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