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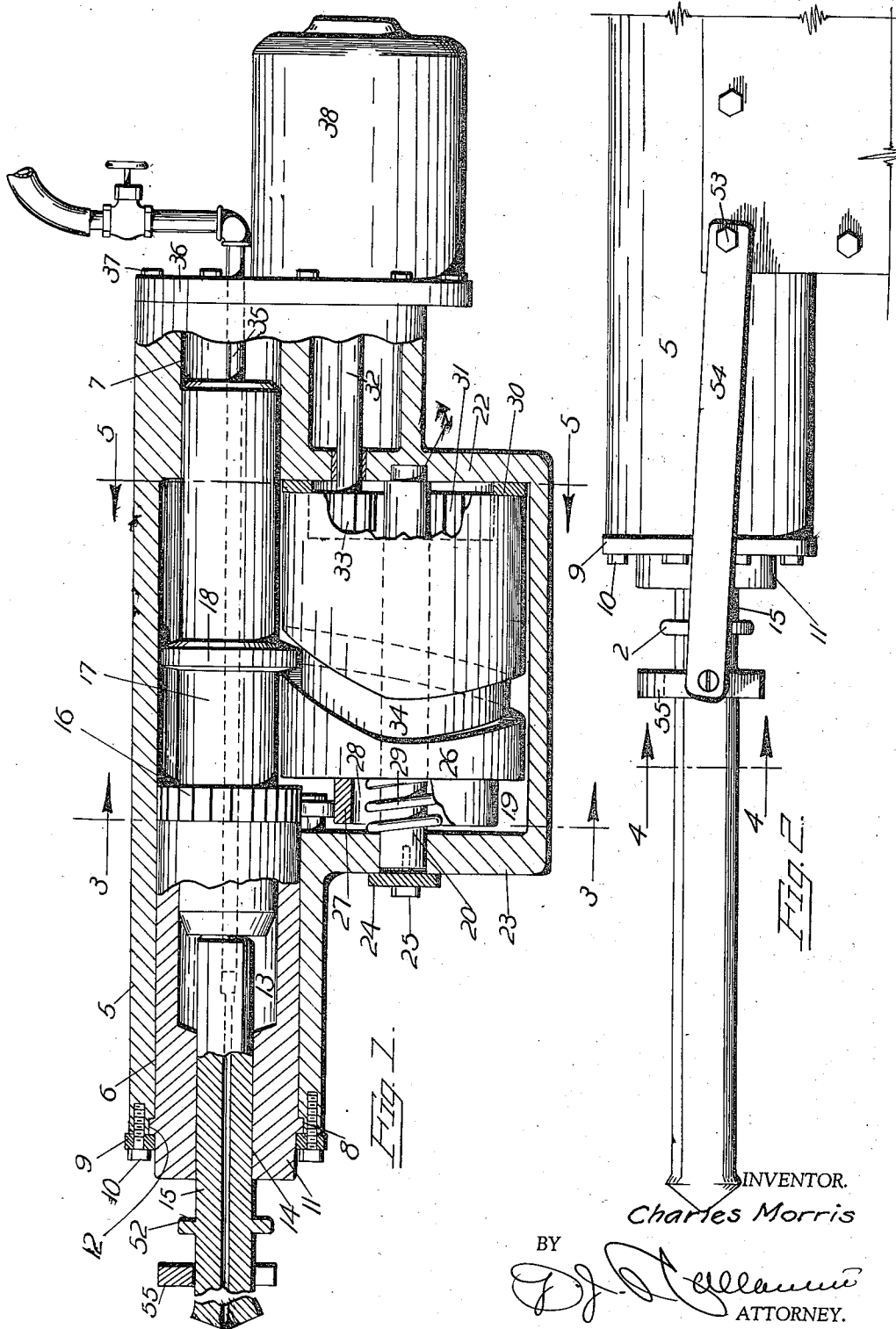
C. MORRIS

2,051,053

ROCK DRILL

Filed May 18, 1935

2 Sheets-Sheet 1



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ROCK DRILL

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2 Sheets-Sheet 2

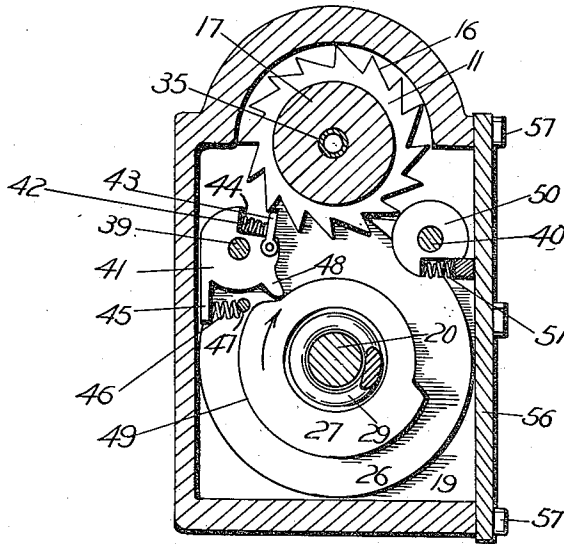


Fig. 3.

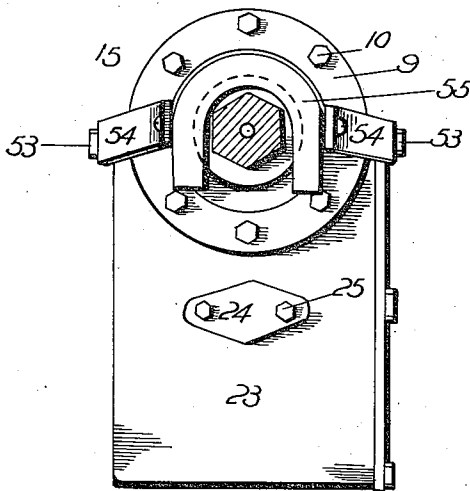


Fig. 4.

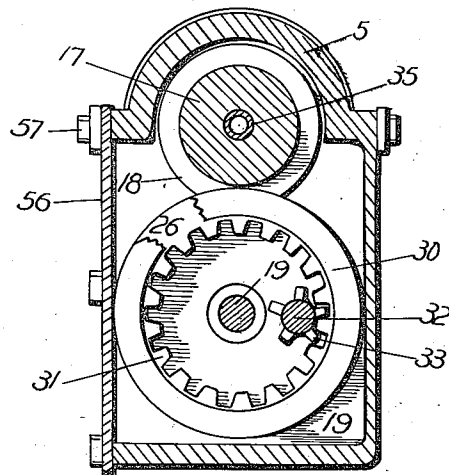


Fig. 5.

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UNITED STATES PATENT OFFICE

2,051,053

ROCK DRILL

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Application May 18, 1935, Serial No. 22,213

9 Claims. (Cl. 255—42)

This invention relates to improvements in rock drills and has reference more particularly to an electrically operated drill.

In mining operations and road construction work, and in many other places, rock drills are an essential part of the equipment. Owing to the difficulty of obtaining electrical power, rock drills have usually been operated by compressed air. Today electricity is available in most parts of this country and electric power is being rapidly substituted for steam in the operation of mines. Where electricity is not available from regular power transmission lines it can be easily generated by means of power from internal combustion engines.

It is the object of this invention to produce an electrically operated rock drill of a simple and substantial construction that can be substituted for the ordinary pneumatic rock drill and which shall be free from springs and other delicate parts that are easily broken.

Another object of the invention is the provision of a reciprocating drill mechanism which is readily adapted for drilling, riveting, channeling and various other uses where a rapid power stroke and slow return is the desideratum.

A further object of the invention resides in an arrangement of parts, permitting the operating parts of the mechanism to be constantly immersed in oil, or other lubricant, when the mechanism is in operation.

Another object of this invention is to produce a rock drill having a hammer piston that is operated by a rotatable cam in such a way that it will rotate as well as reciprocate so as to attain a uniform distribution of wear and lubricant.

Still another object of the invention is to provide a drill mechanism having a short fast power stroke and a slow return stroke of greater duration, and which will be at all times positive in its operation.

Other objects reside in novel combinations and arrangements of parts as will more fully appear in the course of the following description.

Briefly described, this invention comprises an elongated casing in one end of which a drill chuck is rotatably mounted. A hammer piston is mounted for free reciprocation in the casing and in axial alinement with the chuck.

A cylindrical cam is mounted for rotation about an axis that is parallel with the axis of the piston and is located along the side of the piston. The cam has an endless cam groove in its outer surface, and the piston is provided with a projection that extends into the groove in position to

be engaged by the sides thereof so that when the cam is rotated the piston will be reciprocated and strike the end of the drill steel when it moves in one direction. Means is also provided for rotating the drill by a step-by-step movement and for supplying water to the drill.

The objects above set out are attained by means of the construction briefly described, and which will now be described in detail, reference for this purpose being had to the accompanying drawings, in which the invention has been illustrated, and in which

Figure 1 is a longitudinal view partly in section and partly in elevation, and with parts broken away to better disclose the construction; 15

Figure 2 is a side elevation of a portion of the device;

Figure 3 is a section taken on line 3—3, Figure 1;

Figure 4 is a section taken on line 4—4, Figure 2; and

Figure 5 is a section taken on line 5—5, Figure 1.

In the drawings reference numeral 5 designates the casing which is elongated and provided with an opening extending from one end to the other thereof; this opening comprises two coaxial cylindrical sections 6 and 7 of which section 7 has the smaller diameter. A rabbet 8 is provided in the outer end of the wall of section 6 and a removable ring 9 is secured to the end of the casing by bolts or screws 10.

Located in the front end of the cylinder section 6 is a drill chuck which has been designated by numeral 11 and which is provided with an outwardly extending flange 12 that fits the rabbet 8. The inner end of the drill chuck has a cylindrical opening 13 which is in axial alinement with the hexagonal opening 14 in which the drill steel 15 is located. In this connection it is to be understood that while the opening has been described as hexagonal, it may be round, square or of any other form. The drill chuck is provided at its inner end with ratchet teeth 16, the purpose of which will be hereinafter explained.

A cylindrical hammer piston 17 has its front end mounted in the socket 13 and its rear end mounted in the cylindrical section 7. An annular flange 18 surrounds the piston at a point near its center.

The casing has a chamber 19 on one side and in communication with the inner end of the cylindrical section 6. A shaft 20 extends through chamber 19 so as to be substantially parallel with

the axis of the piston. One end of shaft 20 is reduced in diameter as indicated by reference numeral 21 and this is positioned in an opening in wall 22. The other end of the shaft is located in an opening in wall 23. A plate 24, held in place by screws 25, holds the shaft against longitudinal movement.

Mounted for rotation on shaft 20 is a cylindrical cam 26. The front end of cam 26 has a hub 27 whose outer surface is shaped to form a cam whose purpose will later appear, and has an axial opening 28 in which is located a powerful coil spring 29. A thrust washer 30 is located on the shaft 20 between the end of the cam 26 and the inner surface of wall 22.

The end of member 26 adjacent wall 22 is provided with an internal gear 31. A drive shaft 32 is journaled in a bearing in wall 22 and carries a pinion 33.

The outer surface of cam 26 has an endless cam groove 34 into which the flange 18 projects. The cam groove has a portion of positive pitch and another portion of negative pitch and follows such a path that when the cam is rotated the piston will be reciprocated, and the width of the cam groove is greater than the width of flange 18 so as to permit considerable lost motion.

Piston 17 is hollow and a pipe 35 projects into the axial opening of the piston and extends through the wall of the casing so as to permit attachment to be made to a supply of water under pressure.

The rear end of the casing is closed by means of a plate 36 held in place by suitable bolts 37. An electric motor 38 is attached to the plate and has its shaft coupled to the shaft 35 by suitable means or shaft 32 may be formed by an extension of the motor shaft.

In Figure 3 the mechanism employed for rotating the drill chuck has been illustrated. Two stub shafts or pivot pins 39 and 40 are attached at one end to the inside of the wall 23.

Carried on pin 39 is a block 41 provided on one side of the pivot with a recess 42 in which is pivotally positioned a pawl 43 that is urged outwardly by the action of the spring 44. An arm 45 extends radially from the block 41 and this is acted upon by a coil spring 46 that extends between it and the pin 47. A lug 48 projects from block 41 and engages the cam surface 49 on the outside of hub 27. When the cam 26 is rotated by the motor the cam surface 49 serves to rock member 41 about its pivot and this moves the pivot point of the pawl sufficiently to move the point of the pawl from one tooth to the next and therefore turns the drill chuck through the angular distance of one ratchet tooth for each turn of the cam.

Pivoted to the shaft or pin 40 is a pawl 50 that is acted on by a spring 51 which urges it against the ratchet teeth 16; the function of pawl 50 is to prevent reverse rotation of the drill chuck.

The drill steel is provided with a collar 52 and pivoted to the outside of the casing at points 53 are two straps 54 whose free ends are connected by a plate 55 which has a notch for the reception of the drill steel. The plate 55 serves to engage the collar 52 for removing the drill from a hole.

Chamber 19 is provided with a removable cover plate 56 that is held in place by cap screws 57 and contains a lubricant so that the parts are always properly lubricated. The ends of the hammer piston 17 fit quite snugly in their bearings so that the lubricant will be confined to chamber 19.

The spring 29 serves to cushion the shocks when the device is operated with the drill steel absent.

The drill steel has an axial opening for the passage of the water or air that is introduced through pipe 35.

Attention is called to the fact that the cam 26 is located to the side of the hammer piston instead of being axially aligned therewith as this makes it possible to make the device shorter and more compact.

The cam groove 34 is wider than the flange 18 so as to permit considerable lost motion as this allows the hammer piston to move freely and to deliver a sudden blow whose force is proportional to its momentum. The pitch of the cam groove is such that the piston is given a high velocity when moving toward the drill steel, but is returned at a smaller velocity.

The forward movement of the piston is preferably accomplished by a 90° rotation of the cam 26 and the return by a 270° rotation.

What I claim and desire to secure by Letters Patent is:

1. In a rock drill, in combination, a casing having an opening, a drill chuck mounted for rotation in one end thereof, the inner end of the chuck having a socket, a hammer piston having one end located in the socket for both rotary and longitudinal movement therein, a cylindrical cam mounted for rotation about an axis parallel with the axis of the piston, the cam having its outer surface provided with an endless cam groove, the piston having a continuous flange projecting into the groove and cooperating with the sides thereof whereby when the cam is rotated about its axis the piston will be rotated and reciprocated, and means controlled by the rotation of the cam for turning the drill chuck.

2. In a rock drill, in combination, an elongated tubular casing, a drill chuck mounted for rotation in one end thereof, the inner end of the chuck having a cylindrical socket, a hammer piston having one end mounted in the socket for both rotary and longitudinal movement therein, the socket serving as a guide and bearing for one end of the hammer piston, a cam member mounted for rotation about an axis that is substantially parallel with the axis of the piston, the cam having continuous cam surfaces extending around the same, means carried by the piston for engaging with the cam surfaces to produce both a longitudinal reciprocation and a rotary movement of the piston when the cam is rotated, the inner end of the chuck having means for engaging with cooperating means carried by the cam member for producing rotation of the chuck when the cam rotates.

3. In a rock drill, in combination, a tubular casing, a drill chuck mounted for rotation in one end thereof, the inner end of the chuck having a cylindrical socket, a hammer piston having one end mounted in the socket for both rotary and longitudinal movement therein, a cam member mounted for rotation about an axis that is substantially parallel with the axis of the piston, the cam having continuous cam surfaces extending around the same, means carried by the piston for engaging with the cam surfaces to produce a longitudinal reciprocation of the piston when the cam is rotated, the inner end of the chuck having ratchet teeth, means engaging the ratchet teeth to prevent movement in one direction while permitting movement in the other direction, means for turning the chuck by a step-by-step movement when the cam rotates, and resilient yielding means for resisting longitudinal movement of the cam.

4. In a rock drill, in combination, a tubular casing, a drill chuck mounted for rotation therein, the inner end of the chuck having a cylindrical socket, a hammer piston having one end mounted in the socket for both rotary and longitudinal movement therein, a cam member mounted for rotation about an axis that extends in the general direction of the axis of the piston, the cam having continuous cam surfaces extending around the same, means carried by the piston for engaging with the cam surfaces to produce both a longitudinal reciprocation and a rotation of the piston when the cam is rotated, the inner end of the chuck having means engaging the ratchet teeth and operated by a cam surface on the rotating cam member for turning the chuck, means engaging the chuck to inhibit movement thereof in the reverse direction, and resilient yielding means for resisting longitudinal movement of the cam.

5. In a rock drill, a casing, a drill chuck rotatably secured therein, a hammer piston mounted for both rotation and reciprocation in the casing, a cam mounted for rotation about an axis located to one side of the axis of the piston, the cam having its surface provided with a cam groove, an endless flange on the piston, extending into the groove for engaging the sides thereof, whereby when the cam is rotated the piston will be rotated and reciprocated and means operated by rotation of the cam to turn the drill chuck.

6. In a rock drill, a casing, a drill chuck rotatably secured therein, a hammer piston mounted for both rotation and reciprocation in the casing, a cam mounted for rotation about an axis parallel to the axis of the piston and alongside of the latter, the cam having its surface provided with a cam groove, a circular flange on the piston, extending into the groove, for engaging the sides thereof, whereby when the cam is rotated the piston will be both rotated and reciprocated and means operated by the cam to turn the drill chuck, said means comprising a pawl movably connected with a casing and a cam surface operatively associated with the pawl to move the latter when the cam is rotated.

7. In a rock drill a casing having a drill chuck rotatably secured therein, the inner end of the chuck having a socket, a hammer piston having one end mounted in the socket for rotary and

longitudinal movement, the other end thereof engaging the inside wall of the casing, the casing having an enlarged portion along one side of the piston, a shaft located in the enlargement in parallel relation to the axis of the piston, a cam carried by the shaft and rotatable about the axis thereof, resilient shock absorbing means between one end of the cam and the adjacent wall of the casing, the outer surface of the cam having a cam groove, means on the piston extending into the cam groove, for imparting to the piston a reciprocating movement in conformity with the configuration of the groove whenever the cam rotates, and means operated by the cam for turning the drill chuck.

8. In a rock drill, a casing having a drill chuck rotatably secured therein, the inner end of the chuck having a socket, a hammer piston having one end mounted in the socket for rotary and longitudinal movement, the other end thereof engaging the inside wall of the casing, the casing having an enlarged portion along one side of the piston, a shaft located in the enlargement in parallel relation to the axis of the piston, a cam carried by the shaft and rotatable about the axis thereof, resilient shock absorbing means between one end of the cam and the adjacent wall of the casing, the outer surface of the cam having a cam groove, means on the piston extending into the cam groove, for imparting to the piston a reciprocating movement in conformity with the configuration of the groove whenever the cam rotates, means operated by the cam for turning the drill chuck, one end of the cam having an internal gear, a shaft mounted for rotation in the casing, and a pinion on the end of the shaft for engaging the internal gear.

9. A rock drill comprising a casing having an opening, a drill chuck mounted for rotation in said opening, an end of the chuck having a socket therein, a hammer piston fitted in the socket for both rotation and longitudinal movement therein, the socket forming a bearing for one end of the piston, a rotary cam-element adjacent the piston, having its outer surface provided with an endless cam groove, the piston having an outwardly projecting flange extending into and fitted in said groove, and driving means for the cam-element.

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