

Aug. 2, 1932.

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POWER OPERATED ROCK DRILL

Filed Dec. 19, 1930

2 Sheets-Sheet 1

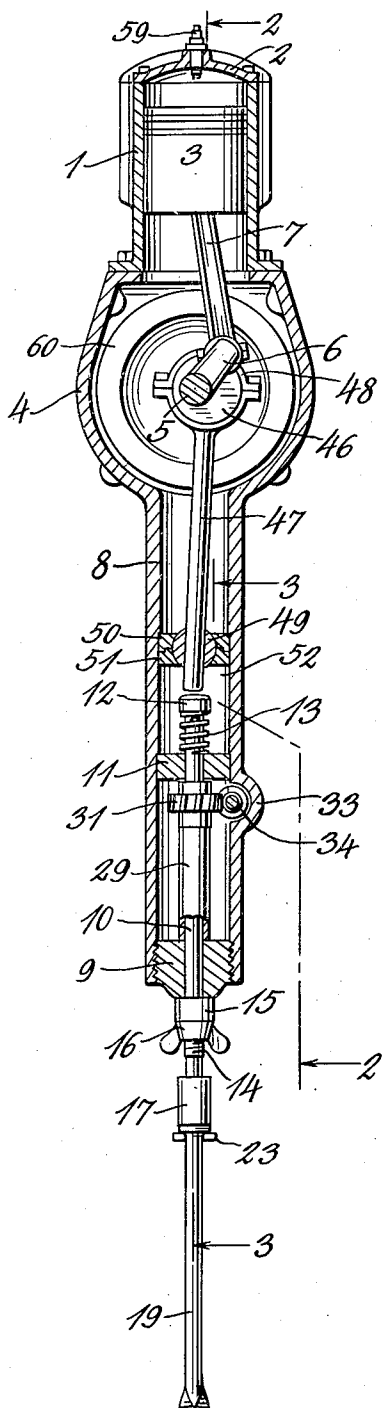


Fig. 1.

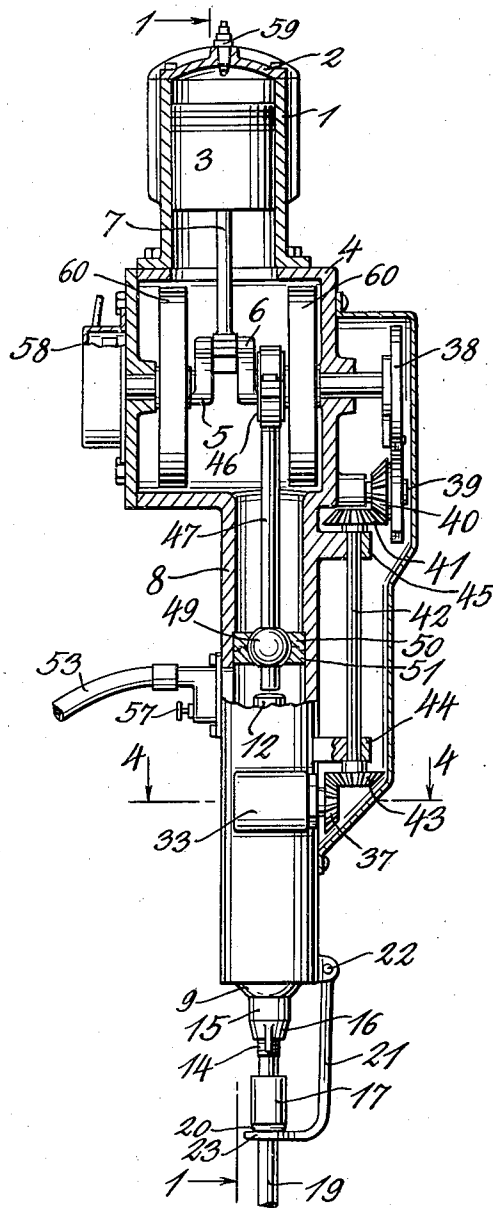


Fig. 2.

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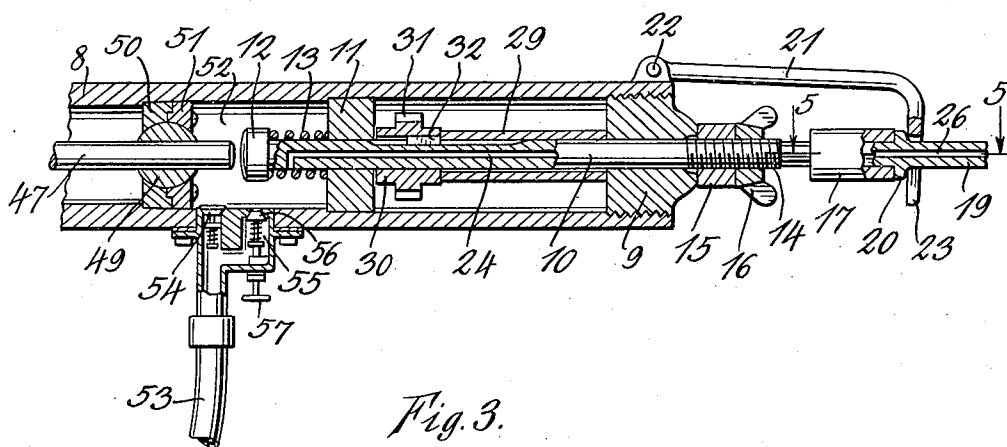


Fig. 3.

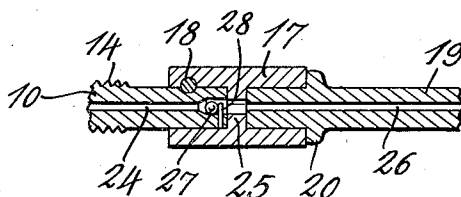


Fig. 5.

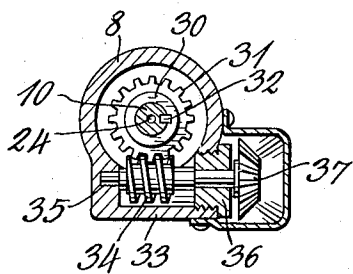


Fig. 4.

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POWER OPERATED ROCK DRILL

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This invention relates to improvements in rock drills of the type employed in mining and similar operations, and has reference more particularly to a self-contained drill mechanism in which the power for operating the drill is obtained from a two-cycle internal combustion engine attached to the drill and forming with it a unitary device.

Prospectors who make it a business to search for minerals always find that a rock drill would greatly facilitate their labors and enable them to investigate prospects where the labor of hand drilling makes this impractical. The ordinary rock drills are operated by compressed air and require in addition to the drill mechanism an air compressor and a prime mover of some kind for operating the compressor, and this makes it impossible to transport it for the purpose of prospecting as prospectors must go into places inaccessible except for men, horses or other quadrupeds.

It is the object of this invention to produce a unitary rock drill mechanism that shall be of comparatively light weight and of simple construction and which is operated by means of an internal combustion engine that forms part of the drill mechanism, and the latter can therefore be transported on burros or other burden bearing animals to any place where it may be needed.

This invention, briefly described, consists of an internal combustion engine having a crank shaft and a crank casing and in which the crank casing is provided with a tubular extension that projects from it in a direction perpendicular to the axis of rotation of the crank shaft. Associated with the tubular extension is a drill rod that is mounted for reciprocation and which extends partly into and partly out of the tubular member. The crank shaft is provided with an eccentric which operates an eccentric rod for the purpose of delivering blows to the inner end of the drill rod. Means is also provided for rotating the drill rod when the crank shaft rotates.

Having thus briefly described the invention, the same will now be described in detail, and for this purpose reference will be

had to the accompanying drawings, in which the preferred embodiment of the invention has been illustrated, and in which:

Fig. 1 is a longitudinal section of my improved power operated rock drill, taken on line 1—1, Fig. 2;

Fig. 2 is a section taken on line 2—2, Fig. 1;

Fig. 3 is a section taken on line 3—3, Fig. 1;

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

Fig. 5 is a section taken on line 5—5, Fig. 3.

In the drawings reference numeral 1 designates the cylinder of an internal combustion engine and 2 the removable cylinder head. Located within the engine is the piston 3 which is of the usual construction. The cylinder is secured to a crank case 4 in which is journaled a crank shaft 5. The crank shaft has a crank 6 that is connected with the piston by means of a connecting rod 7. The engine does not form part of this invention except insofar as it forms an element of the combination and it will therefore not be described in detail, and only such parts thereof will be shown and described as are necessary to a proper understanding of this invention as a whole.

The crank casing has a tubular extension 8 that projects downwardly from the bottom thereof in the manner shown in the drawings. The end of the tubular projection is closed by means of a plug 9 that has an opening through which the drill rod 10 extends. A bearing 11 is located within the tubular extension some distance above the plug 9 and the inner end of the drill rod extends through an opening in this bearing. The inner end of the drill rod is provided with a head 12 that forms an abutment for the spring 13. The lower end of the drill rod is provided with a threaded section 14 to which is secured a nut 15 and a wing nut 16 that serves to clamp the nut 15 in adjusted position. Nuts 15 and 16 form a stop that limits the inward movement of the drill rod. The outer or lower end of the drill rod is provided with a socket 17 that is held in place by means of a pin 18 or by some other suitable means. The drill steel 19 is secured to the socket as shown in Figs. 3 and 5. The drill steel is provided with a

shoulder 20 and a forked arm 21 is pivotally attached to the lower end of the tubular member by means of a pin 22. The free end of the forked arm has two fingers 23 that embrace the drill steel and hold it against removal from the socket as shown in the drawings. The drill rod has an axial opening 24 and the partition 25 in the socket 17 is also provided with an opening that forms a communicating passage between the opening 24 in the drill bar 10 and the opening 26 in the drill steel. The outer end of the opening 24 is slightly enlarged and contains a ball 27 that acts as a check valve that permits liquid to flow outwardly but prevents it from flowing inwardly. The ball is held in place by means of a projecting member 28. That part of the drill bar between the plug 9 and the bearing 11 is surrounded by a sleeve 29 that serves as an abutment for the lower end of the hub 30 of the worm gear 31. This worm gear is held against rotation by means of a spline 32 which, however, permits the drill bar to reciprocate with respect to the gear wheel. Referring now to Fig. 4, it will be seen that at the point where the gear wheel 31 is located, the tubular member has an enlargement 33 within which is located a worm 34. This worm is formed on a shaft, one end of which is journaled in a bearing 35, and the other of which is journaled in a removable plug 36. The outer end of the shaft of the worm is provided with a bevel gear 37. One end of the crank shaft has secured to it the driving portion 38 of an intermittent gear whose driven part 38 is mounted for rotation about the axis of a shaft 39. Member 38 is provided on its inner surface with a bevelled gear 40 that meshes with another bevelled gear 41 carried on the upper end of shaft 42. The lower end of this shaft has a bevelled gear 43 that meshes with the gear 37. Shaft 42 is journaled in bearings 44 and 45. When the crank shaft rotates, one revolution, the member 38 is turned through an angle of ninety degrees, and this motion is transmitted by means of the mechanism described to the drill rod which is therefore intermittently rotated about its axis.

The crank shaft is provided with an eccentric 46 to which the upper end of the eccentric rod 47 is secured by means of the ordinary strap 48. The lower end of the eccentric rod is mounted for reciprocation in a spherical bearing 49 that in turn is held in place by means of two annular rings 50 and 51. When the engine operates and turns the crank rod, the eccentric rod is reciprocated in a manner quite evident from an inspection of Figs. 1 and 2. The upper end of the drill rod 10 is spaced from the axis of the crank shaft so that when the eccentric rod approaches its lowermost position, it will engage the head 12 and strike it a blow, which blow is transmitted to the drill steel.

Since the eccentric rod reciprocates into and out of the chamber between the bearing 11 and the ring 51, it serves the function of a piston and is therefore used in this drill mechanism for the purpose of forcing water through the drill rod and through the drill steel. In order to obtain the pumping action, the space 52 is connected with a source of water by means of a hose or pipe 53. The place where this pipe communicates with the chamber 52 is provided with a check valve 54 that permits water to enter, but prevents it from flowing back into the pipe. Since the capacity of the pump is preferably greater than that necessary to maintain a continuous stream of water through openings 24 and 26, it is necessary to provide a relief valve in order to prevent the formation of excessive pressures. A passageway 55 has therefore been provided between the chamber 52 and the pipe 53 and this is normally closed by means of a spring pressed valve 56 that opens only when the pressure within the chamber exceeds a predetermined value. By means of a threaded stem 57, the pressure at which the relief valve opens can be altered to suit the conditions.

The end of the crank shaft opposite from that which carries the intermittent gear mechanism is provided with a distributor or timing device 58 that controls the functioning of the spark plug 59. The engine is preferably of the two-cycle type, although the exact type of engine is immaterial and a four-cycle engine may be employed if it is found to possess any advantages over the two-cycle engine shown. The crank shaft is preferably provided with two fly-wheels 60.

From the above description, it will be seen that I have produced a rock drill having as part thereof an internal combustion engine that can be operated by any suitable fuel such as a liquid hydrocarbon or by acetylene gas and which therefore is a self-contained unit that can be used in any place without the necessity of providing air compressors as must now be done where the ordinary compressed air drills are employed. When the drill is to be operated, it is preferably supported by some suitable support or tripod of the type employed with the ordinary rock drills, but which has not been illustrated, as it forms no part of this invention. Where dry drilling is used instead of wet drilling, compressed air may be introduced through the pipe 53, or the exhaust of the engine may be directed into the chamber 52 for the purpose of blowing the dust out of the drill hole.

In the drawings the crank shaft has been shown as provided with an eccentric for reciprocating the eccentric rod, but this is illustrative only, as a cam can be employed instead and the latter may be preferable because the eccentric rod can then be given a

simple reciprocating motion only instead of the compound motion now given it.

Having described the invention what I claim as new is:

5 1. In a device of the class described, in combination, a crank shaft, a casing enclosing the crank shaft, said casing having an elongated tubular portion whose axis lies in a plane perpendicular to the axis of the
10 crank shaft, the outer end of the tubular portion having a bearing, a drill rod slidably mounted in the bearing, an eccentric secured to the crank shaft, a rod having one end connected with the eccentric and the other
15 end slidably supported in a bearing adjacent the inner end of the drill rod whereby the drill rod will be subjected to a succession of blows when the crank shaft rotates, means interposed between the crank shaft
20 and the drill rod for imparting to the latter a step by step rotation when the crank shaft rotates, the drill rod being provided with an opening extending longitudinally thereof and a pump mechanism operated by
25 the rotation of the crank shaft for forcing water through the opening.

2. A rock drill comprising, in combination, a crank shaft provided with an eccentric, a casing enclosing the crank shaft, said
30 casing having a tubular extension whose axis is substantially perpendicular to the axis of rotation of the crank shaft, the outer end of the tubular extension having a bearing, a drill rod slidably mounted in the bearing,
35 a second bearing located within the tubular member and spaced from the first bearing, the inner end of the drill rod extending through the inner bearing, an eccentric rod having one end connected with the eccentric
40 and the other end slidably mounted in a bearing, the inner end of the eccentric rod terminating adjacent the inner end of the drill rod, the maximum distance between the inner ends of the two rods being less
45 than the eccentricity of the eccentric whereby the inner end of the eccentric rod will strike the inner end of the drill rod when the crank shaft rotates and means operated by the rotation of the crank shaft for inter-
50 mittently rotating the drill rod through a small angle.

3. A rock drill comprising, in combination, a crank shaft provided with an eccentric, a casing enclosing the crank shaft, said
55 casing having a tubular extension whose axis is substantially perpendicular to the axis of rotation of the crank shaft, the outer end of the tubular extension having a bearing, a drill rod slidably mounted in the bearing,
60 a second bearing located within the tubular member and spaced from the first bearing, the inner end of the drill rod extending through the inner bearing, an eccentric rod having one end connected with the eccentric
65 and the other end slidably mounted in

a bearing, the inner end of the eccentric rod terminating adjacent the inner end of the drill rod the maximum distance between the inner ends of the two rods being less than the eccentricity of the eccentric whereby the
70 inner end of the eccentric rod will strike the inner end of the drill rod when the crank shaft rotates, means operated by the rotation of the crank shaft for intermittently rotating the drill rod through a small angle, the
75 drill rod having an opening extending longitudinally thereof and means operated by the rotation of the crank shaft for forcing water through the opening in the drill rod.

In testimony whereof I affix my signature. 80
EDWARD J. WARREN.

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