

1,234,097.

Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5. Fig. 6. Fig. 7.

Witnesses:

Inventor:
George H. Gilman,
by *Mary Booth Janny Hickey*
Attys

UNITED STATES PATENT OFFICE.

GEORGE H. GILMAN, OF CLAREMONT, NEW HAMPSHIRE, ASSIGNOR, BY MESNE ASSIGNMENTS, TO SULLIVAN MACHINERY COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

ROCK-DRILL.

1,234,097.

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To all whom it may concern:

Be it known that I, GEORGE H. GILMAN, a citizen of the United States, and a resident of Claremont, county of Sullivan, State of New Hampshire, whose post-office address is Claremont, New Hampshire, have invented an Improvement in Rock-Drills, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to rock drills, being more particularly intended to provide means for removing the dust and cuttings from the drilled hole.

The invention will be best understood by reference to the following description when taken in connection with the accompanying illustration of one specific embodiment thereof, while its scope will be more particularly pointed out in the appended claims.

In the drawings:

Figure 1 shows in elevation a rock drill with its attached bit or cutter embodying one form of my invention.

Fig. 2 is an enlarged view partly in section showing the drill steel or cutter and its connection to the cleansing fluid supply.

Fig. 3 is a sectional elevation on a still larger scale showing the pump attachment.

Fig. 4 is a section in plan on the line 4—4 in Fig. 3.

Fig. 5 is an elevation partly in section showing a drill steel equipped with a modified form of the invention.

Fig. 6 is a sectional elevation on a larger scale showing the pump attachment to the drill steel in Fig. 5.

Fig. 7 is a sectional plan on the line 7—7 in Fig. 6.

Referring to the drawings and to the embodiment of my invention shown in Figs. 1-4 inclusive thereof, I have shown the same applied to a rock drill 1 of a conventional type. It will be obvious from the description of my invention that the latter is independent of and apart from the specific construction of drilling engine employed and that the same may be applied with slight modification or with no change at all to rock drills or other cutting tools of a great variety of constructions.

The drill 1 is shown as equipped with the

drill steel or cutter 2 having the cutting edges 3 of usual shape, the steel, as usual, being reciprocated and at the same time given a slight rotative movement by the drilling engine when the latter is in operation.

In order to remove the cuttings and dust as fast as they are dislodged by the cutter at the bottom of the drilled hole, I cause the introduction of a quantity of water or other suitable cleansing fluid into the drilled hole and forcibly eject the same together with the dust and cuttings by means of a pumping action produced by the movement of the drill steel itself.

To this end I provide the latter with a suitable formation or attachment which serves as a pump piston adapted to work or move within the drilled hole, the latter constituting in effect the pump cylinder. Ordinarily the piston can work with reasonable clearance in direct contact with or proximity to the walls of the drill hole and such a construction is herein shown.

Various formations or attachments may be utilized to provide the piston member for the cutter, but herein the same consists of the perforated plate 4 threaded upon the end of the sleeve 5, the latter seated against a shoulder 6 formed between the shank of the cutter and the upper ends of the cutting edges. The plate or piston head 4 has a diameter slightly less than that of the drilled hole and is provided with one or more perforations 7 (herein eight in number) which are normally closed by the lower flanged edge of the spool valve 9. When the drill steel is lifted, however, and then forced down, the valve will lift and allow the fluid in the hole below the piston 4 to pass up through the perforations to the top of the piston, where it is lifted on the next upward movement of the steel. The sleeve 5 has a flanged head 10 which limits the upward movement of the valve and retains it on the sleeve. The lower threaded end of the sleeve is longitudinally split at one or more places and the thread is tapered so that it may be screwed down into the piston member 4 and thereby caused to grip forcibly against the sides of the drill steel.

It will be seen that this constitutes in effect a lift pump operated by the drill steel

and that this pump forcibly draws the fluid with the accumulated dust and cuttings from the bottom of the hole and from around the cutting edges of the steel up to a point above the piston where it is ejected over the edges of the opening of the drilled hole.

Any suitable method may be employed for introducing the fluid into the bottom of the drilled hole and below the pump piston 4, this being preferably done, however, in such manner as to provide a continuous supply of cleansing fluid in large quantity. In the form of the invention shown in Figs. 1-4 inclusive, the drill steel is circular in cross section, being provided for the major portion of its length with the axial, longitudinal, fluid-supply passage 11 which extends to the cutting edge of the steel and is adapted to carry the cleansing fluid under a suitable head from an appropriate source of supply to the bottom of the drilled hole.

Any suitable means may be adopted for introducing the fluid into this supply passage, but herein the steel is provided with a sleeve or bushing 12 clamped thereto, such bushing having a lateral opening 13 placed in registration with the lateral opening 14 which is formed in the drill steel and communicates with the feed passage 11. The lateral passage 13, in turn, is placed in communication with a supply pipe 15, the latter connected to any suitable source of fluid supply and being preferably flexible for a portion of its length, so as to permit the required reciprocation of the drill steel. If desired, however, the fluid may be introduced through the rifle rod and the piston of the drilling engine itself, or any other desired method of feeding the fluid to the steel may be adopted.

With the described construction of drill-steel pump, the fluid is introduced near the center of the hole where it is most effective for washing cuttings toward the sides thereof whence they are carried up along the sides of the drilled hole to the pump piston, thence being lifted by the pump piston to a point above the latter, and finally ejected from the top of the hole. This circulation of the fluid, to wit, radially outward toward the sides of the hole, is highly effective in that the waste material is removed to the point of greatest clearance and where it interferes least with the action of the cutter, and thence, after passage through the valve, to the ample annular clearance space above the pump piston where its further passage is quite unobstructed. The valve openings 7, being arranged near the outer periphery of the pump piston, can be made large and numerous enough to permit the free passage of the fluid and the cuttings on the down stroke of the drill steel so that the resistance to the downward pumping action is inconsiderable.

In Figs. 5, 6 and 7 I have shown a modified form of my invention which may be utilized in connection with a drill steel 16 of cruciform cross section, or any other form of drill steel which it is not desired to perforate, or where an interior fluid supply passage cannot be conveniently provided. In this construction the piston head 4 and the pump 9 may be provided as before, but the sleeve 5 is prolonged so as to provide the cylindrical inclosing shell 17 extending to a point well above the top of the drilled hole and providing a fluid supply passage space between the inner walls of the shell and the sides of the drill steel. The upper part of this supply space has connection to the principal fluid supply pipe 15 so that the fluid passes down through the interior of the shell 17 and is discharged at the bottom of the drilled hole near the center thereof, producing a circulation of fluid radially outward and upward as before so that the water with the accumulated cuttings and dust are ejected from the top of the drilled hole by the pumping action of the pumping member 4 as before.

While I have herein shown and described for purposes of illustration one specific form or embodiment of the invention, it is to be understood that the same is not limited to the details thereof, but that extensive deviations and modifications may be made in the described form without departing from the spirit thereof.

Claims:

1. The combination with a reciprocatory drilling engine of a percussive cutter for drilling holes, means for introducing cleansing fluid into the hole, and pumping means apart from said drilling engine and attached to the outside of the cutter for circulating cleansing fluid through the drilled hole, the outflow being at the sides of the hole and the path of the inflow within the path of the outflow.

2. The combination with a drilling engine of a percussive cutter, and a valved piston member secured to the cutter and working within the drilled hole, said piston with the drilling engine constituting a pump and the walls of the hole serving as the pump cylinder.

3. The combination with a drilling engine, of a cutter, a pump piston carried by the cutter and having an aperture there-through, means for controlling the flow through said aperture, and a fluid supply passage for supplying fluid to the drilled hole passing through said pump piston.

4. The combination with a drilling engine, of a cutter, a fluid supply conduit for the drilled hole, and pumping means distinct from the engine and carried by the cutter, said pumping means including a

valve operating to cause the discharge of the cleansing fluid upwardly about the outside of said conduit.

5 5. The combination with a drilling engine, of a reciprocable cutter, a pump piston thereon having a rearwardly opening aperture therethrough, and a valve for opening or closing said aperture controlled by the reciprocation of said cutter.

10 6. The combination with a reciprocatory drill of a percussive cutting tool, a rigid connection between the tool and the drill, said connection and tool having an interior water supply passage through which water
15 may be supplied to the cutting edge of the tool, a piston member encircling and attached to the cutter, and a rearwardly opening valve in the piston member whereby the water introduced at the cutting edge of
20 the tool may be expelled radially outward and then upward with the cuttings at the sides of the drilled hole.

7. The combination with a reciprocatory drill of a percussive cutting tool, a rigid
25 connection between the tool and the drill, said connection and tool having an interior water supply passage through which water may be supplied to the cutting edge of the tool, a piston member encircling and at-
30 tached to the cutter and approximately fitting the drilled hole, and a rearwardly opening valve in the piston member whereby the water introduced at the cutting edge of the tool may be expelled radially outward and
35 then upward with the cuttings at the sides of the drilled hole.

8. The combination with a drilling engine of a cutter comprising a shank and a cutting head, a pump piston carried by
40 said shank and having a rearwardly opening aperture therethrough, automatically acting valve mechanism controlling the flow through said aperture, and a water supply passage for supplying fluid to the drilled
45 hole passing through said piston.

9. The combination with a drilling engine, of a cutter, a pump piston carried by the cutter and having a rearwardly open-

ing aperture therein, a water supply pas-
sage for supplying fluid to the drilled hole 50 passing through said piston, and a valve for said aperture reciprocable relative to said cutter.

10. The combination with a drilling engine, of a cutter, a pump piston carried by 55 the cutter and having a rearwardly opening aperture therein, a sleeve carried by the cutter, a valve for said aperture reciprocable on said sleeve, and a fluid supply passage for supplying fluid to the drilled hole 60 passing through said pump piston.

11. The combination with a drilling engine, of a reciprocable cutter, a pump piston thereon having a series of rearwardly opening apertures therethrough, said piston being of substantially the diameter of 65 the drilled hole, and a single valve for said apertures controlled by the reciprocation of said cutter.

12. The combination with a drilling engine, of a cutter, a pump piston thereon having a series of rearwardly opening apertures therein, said piston being of substantially the diameter of the drilled hole, a valve for said apertures reciprocable rela- 75 tive to said cutter, and a sleeve carried by said cutter and disposed between the latter and said valve and piston.

13. The combination with a drilling engine, of a cutter having a shoulder thereon, 80 a pump piston carried by said cutter, having a rearwardly opening aperture therein, a sleeve carried on said cutter and having a flange thereon, a valve for said aperture reciprocable between said piston and the 85 flange on said sleeve, and a fluid passage for supplying fluid to the drilled hole passing through said pump piston.

In testimony whereof, I have signed my name to this specification, in the presence 90 of two subscribing witnesses.

GEORGE H. GILMAN.

Witnesses:

E. J. BOUCHARD,
C. J. JONES.