March 8, 1932. G. H. GILMAN 1,848,340

ROCK DRILL

Filed Sept. 23, 1926

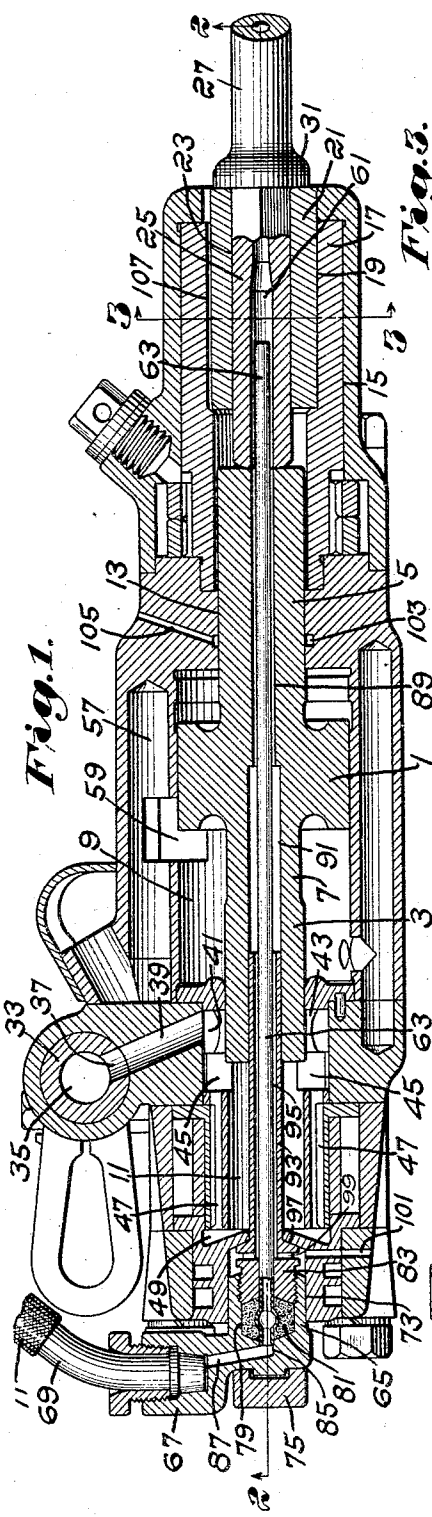

Fig. 1.

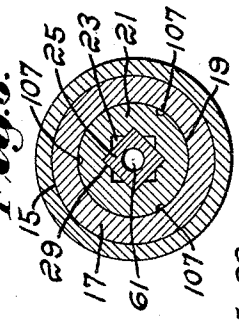

Fig. 3.

Fig. 2.

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UNITED STATES PATENT OFFICE

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ROCK DRILL

Application filed September 23, 1926. Serial No. 137,261.

My invention relates to rock drills, particularly but not exclusively to those of the fluid pressure operated hammer type having provision for preventing the formation of dust.

The invention will be best understood from the following description when read in the light of the accompanying drawings of an example of the invention, while the scope of the invention will be more particularly pointed out in the appended claims.

In the drawings:—

Fig. 1 is an axial longitudinal section of a rock drill embodying the invention; and

Figs. 2 and 3 respectively are sections on the lines 2—2 and 3—3 of Fig. 1, Fig. 2 showing the piston in a different position.

Referring to the drawings I have shown a casing in which reciprocates a hammer piston having a cylindrical head 1, the cylindrical rearward extension 3, and the cylindrical hammer bar 5, the rearward extension adjacent its juncture with the piston being of reduced cross-section as shown at 7.

The casing contains a piston chamber having the large bore 9 and a smaller rearward bore 11 the walls of which have a fluid tight fit with the head 1 and rearward extension 3 of the piston respectively, while the hammer bar extends through an opening 13 in the front wall of this chamber, fitting the opening in a substantially fluid tight manner, the parts as shown being so proportioned that in all positions of the piston the hammer bar is received by the opening 13.

As illustrated, forwardly of the opening 13 the casing is provided with a chuck chamber 15 in which is rotatably mounted a chuck sleeve 17. Herein the sleeve 17 at its forward end is provided with an enlarged bore 19 into which is driven a removable bushing 21, said bushing having a bore 23 for receiving the shank 25 of the drill steel 27. As illustrated, the shank 25 is square in cross-section, while the bore 23 is in the form of a regular eight-pointed star having the star points 29, four of which points receive and prevent rotation of the drill steel relative to the chuck.

It will be understood that when the machine is in operation, for each blow of the hammer the shank of the drill steel reciprocates relative to the chuck with great resulting wear on the bore of the bushing 21 receiving the drill shank. Consequently by the present construction of shank and bore 23, when one set of star points receiving the drill steel is worn the other set may be utilized for non-rotatably securing the shank to the chuck.

As shown the drill steel is provided with a collar 31 which normally rests against the front end of the bushing so as to determine the position of the end of the shank relative to the end of the hammer bar when the blow is struck, and it will be observed that herein the hammer bar constitutes means for imparting the momentum of the head 1 and shank 3 of the piston to the drill steel.

The mechanism shown herein for rotating the chuck and reciprocating the piston is of the same general construction as shown in my allowed application Serial No. 361,170, filed February 25, 1920, now Patent 1,605,715, and as it forms no part of my present invention it will not be described with any more particularity than necessary to understand the present invention.

As illustrated, rotatably mounted in the casing is a valve 33 having a bore 35 in communication with a motive fluid supply hose (not shown), the valve being provided with a port 37 for placing the bore 35 of the valve in communication with the intake passage 39 for the hammer. In communication with the passage 39 is an annular passage 41 placed in communication with the small bore 11 of the piston chamber by a pair of radial passages 43 and by slots 45, which latter communicate laterally with said annular passage and radial passages. Extending through the casing parallel to the bore 11 are passages 47 in communication at one of their ends with the slots 45 and at their other ends with the enlargement 49 of the bore 11. As shown by Fig. 2 the casing is provided with passages 51 which at their rearward ends open through ports 53 into the forward portion of the bore 11, and at their other ends through ports 55 into the forward portion of the bore 9, the ports 53 being in approximately the same plane as the slots 45 so that when

the piston is in the position shown by Fig. 1 motive fluid supplied the bore 11 passes through the passages 51 and is effective to cause the return stroke of the hammer against the pressure of the motive fluid continuously exerted against the rear end of the rearward extension 3 of the piston. When the parts are in the position shown by Fig. 2 the reduced diameter portion 7 of the extension 3 of the piston places the radial passages 43 (Fig. 1) in communication with the rear end of the bore 9 of the piston so as to admit motive fluid from the passage 39 and annular chamber 41 to said bore and drive the piston forward aided by the pressure of the motive fluid on the rear end of the rearward extension 3 of the piston.

For alternately exhausting the motive fluid from opposite ends of the bore 9 the casing herein is provided with an exhaust conduit 57 in communication with the atmosphere and communicating with the bore 9 through a port 59. As will be understood by those skilled in the art the head 1 of the piston controls the port 59 so as to exhaust the front end of the bore 9 on the latter part of the rearward stroke and the rear end of said bore on the latter part of the forward stroke.

As illustrated, the drill steel is provided with an axial bore 61, which bore, as will be understood by those skilled in the art, extends throughout the entire length of the steel. The bore receives the front end of a water tube 63, which may be utilized for injecting cleansing fluid, such as water under pressure, into the bore 61 for washing the cuttings from the drill hole in the rock. As shown the water tube 63 extends rearwardly through the piston and piston chamber, and at its rear end is received in a plug 65 forming part of a water connection 67. Herein the water connection carries the swivelled tube 69 for attachment to a hose 71 conducting water under pressure to the machine from a suitable source of supply.

As illustrated, the plug 65 is received in a bore 73 opening on the rear end of the back head of the casing, the plug being retained in said bore by means of a yoke member or bar 75 which engages the back end of the plug and is secured to and drawn toward the casing by means of screw bolts 77. As shown the plug 65 is provided with a bore 79 which receives a packing 81 of rubber or other suitable material compressed about the end of the tube by means of a plug 83 screw threaded into the end of the bore 79. At the bottom of the bore 79 the water connection is provided with a passage 85 receiving the extreme rearward end of the tube, the passage 85 having in communication therewith a lateral passage 87 in communication with the interior of the swivelled member 69.

In the present embodiment of my invention the bore 89 of the piston, through which the water tube 63 passes, is of greater diameter than the exterior diameter of the tube, so as to maintain said bore in fluid conducting relation with the portion of the chuck chamber about the end of the drill shank. Herein the rearward portion of the bore 89 is enlarged as shown at 91, and slidably fitting this enlarged portion of the bore is a tube 93 which as shown is formed integrally with the plug 83 and is provided with a bore 95 of greater diameter than the exterior diameter of the water tube. As shown the plug 83 has a frusto-conical end surface 97 which fits a corresponding frusto-conical bottom of the bore 73 so as to render the joint between the back head of the casing and plug fluid tight. Leading from the bore 95 through the plug to the exterior thereof are radial passages 99, while leading from the bore 73 to the atmosphere forwardly of the plug 65 is a radial passage 101.

It will be observed that by the above described construction leakage of air to the chuck chamber by way of the bore of the piston receiving the water tube is prevented, and that the chuck chamber is vented to the atmosphere by way of such bore.

As illustrated, the opening 13 which receives the hammer bar is enlarged intermediate its length to form an annular groove 103 placed in communication with the atmosphere by a passage 105 so as to vent motive fluid which may leak from the forward end of the bore 9 toward the chuck chamber.

As illustrated, the removable bushing 21 received in the bore 19 of the chuck sleeve 17 is provided on its exterior with longitudinally extending grooves 107 which open into the space in the chuck chamber about the end of the shank of the drill steel and communicate at their forward ends with the atmosphere. These passages in the normal operation of the machine will serve to drain water from the chuck, which may find its way from the chuck into the bore of the drill steel.

The mechanism for rotating the chuck illustrated herein is of the same general construction as that described in United States Patent 1,605,715 hereinbefore referred to. At the rear of the machine is a motor indicated at 109 which drives a pair of shafts 111, the latter being mounted in bearings 113 and operating reduction gearing mechanism 115 for rotating the chuck. As shown the shafts 111 are each provided with a bore 117 which is closed at its front end and which communicates through its rear end with passages 119 opening in the lubricant reservoirs 121 in the handle members 123 carried by the back head of the casing. Communicating with the bores 109 are radial passages 125 for conducting the lubricant from the bores to the various bearings associated with the shafts. As shown the reservoirs 121 are

placed in communication by means of the communicating passages 127—129, one of the reservoirs being provided with a screw threaded lubricant opening 131 normally closed by a screw thread plug 133, which opening enables the lubricant receiving parts to be filled with lubricant by use of a pressure grease gun or the like.

Although I have described for purposes of illustration a specific example of my invention it is to be understood that I am not limited thereto, and that within the scope of my invention wide deviations may be made without departing from the spirit of my invention.

Claims:

1. A rock drill having, in combination, a casing, a piston a fluid conducting tube extending into said casing coaxially of said piston, a mounting for said tube comprising a part rotatably received by a rearwardly opening bore in said casing, a radially extending water hose connection rigidly carried by said part, a detachable yoke-like member for securing said part in said bore, said part and yoke being formed with cooperating portions for positively securing said part in different predetermined rotative positions relative to said casing.

2. A rock drill having, in combination, a casing, a piston, coaxially arranged tubes extending into said casing coaxially of said piston, said casing having a rearwardly opening bore, a plug received by said bore, said plug having a forwardly opening concavity for receiving the rear end of the inner tube of said coaxially arranged tubes, a resilient packing in said concavity, the outer tube of said coaxially arranged tubes being formed integrally with a head screw-threaded into said concavity for compressing said packing about said inner tube, and means for removably securing said plug in said bore.

3. A rock drill having, in combination, a casing, a hammer piston, a cylinder chamber for said piston formed in said casing, means for admitting compressed air to opposite ends of said chamber for actuation of said piston, said casing having a chuck chamber containing a rotary chuck for a hollow drill steel, independent motor means for rotating said chuck relative to said casing, said piston having an axial passage opening on opposite ends thereof, a water tube for said drill steel carried at its rear end by the rear end of said casing and extending through said piston into said chuck chamber; and means for preventing leakage of air from said cylinder chamber to said hollow drill steel comprising a forward reduced diameter extension on said piston, which extension is freely rotatable relative to said chuck and in all positions of said piston closes communication between said cylinder chamber and said chuck chamber, and a tube for venting said chuck chamber carried by said rear end of said casing and fitting the rear end of said axial passage in a fluid tight manner, said tube surrounding said water tube in spaced relation to the exterior of the latter, said casing also formed with an annular groove vented to the atmosphere, which groove surrounds said forward extension of said piston in contacting relation therewith.

4. A rock drill having, in combination, a casing, a hammer piston, a cylinder chamber for said piston formed in said casing, means for admitting compressed air to opposite ends of said chamber for actuation of said piston, said casing having a chuck chamber containing a chuck for a hollow drill steel, said piston having an axial passage opening on opposite ends thereof, a water tube for said drill steel carried at its rear end by the rear end of said casing and extending through said piston into said chuck chamber; and means for preventing leakage of air from said cylinder chamber to said hollow drill steel comprising a forward reduced diameter extension on said piston, which extension in all positions of said piston closes communication between said cylinder chamber and said chuck chamber, and a tube for venting said chuck chamber carried by said rear end of said casing and fitting the rear end of said axial passage in a fluid tight manner, said tube surrounding said water tube in spaced relation to the exterior of the latter, said casing also formed with an annular groove vented to the atmosphere, which groove surrounds said forward extension of said piston in contacting relation therewith.

5. A rock drill having in combination, a casing, a hammer piston, a cylinder chamber for said piston formed in said casing, means for admitting compressed air to opposite ends of said chamber for actuation of said piston, said casing having a chuck chamber containing a rotary chuck for a hollow drill steel, independent motor means for rotating said chuck relative to said casing, said piston having an axial passage opening on opposite ends thereof, a water tube for said drill steel carried at its rear end by the rear end of said casing and extending through said piston into said chuck chamber; and means for preventing leakage of air from said cylinder chamber to said hollow drill steel comprising a forward reduced diameter extension on said piston, which extension is freely rotatable relative to said chuck and in all positions of said piston closes communication between said cylinder chamber and said chuck chamber, a rearward reduced diameter extension on said piston extending from said cylinder chamber, and a tube for venting said chuck chamber carried by said rear end of said casing and fitting in a fluid tight manner that portion of said axial passage which is in said rearward extension, said casing also

formed with an annular groove vented to the atmosphere, which groove surrounds said forward extension of said piston in contacting relation therewith.

6. A rock drill having, in combination, a casing, a hammer piston, a cylinder chamber for said piston formed in said casing, means for admitting compressed air to opposite ends of said chamber for actuation of said piston, said casing having a chuck chamber containing a chuck for a hollow drill steeel, said piston having an axial passage opening on opposite ends thereof, a water tube for said drill steel carried at its rear end by the rear end of said casing and extending through said piston into said chuck chamber; and means for preventing leakage of air from said cylinder chamber to said hollow drill steel comprising a forward reduced diameter extension on said piston, which extension in all positions of said piston closes communication between said cylinder chamber and said chuck chamber, a rearward reduced diameter extension on said piston extending from said cylinder chamber, and a tube for venting said chuck chamber carried by said rear end of said casing and fitting in a fluid tight manner that portion of said axial passage which is in said rearward extension, said casing also formed with an annular groove vented to the atmosphere, which groove surrounds said forward extension of said piston in contacting relation therewith.

In testimony whereof, I have signed my name to this specification.

GEO. H. GILMAN.