W. L. BROOKINS.

ROCK DRILL.

APPLICATION FILED OCT. 26, 1910.

1,036,180.

Patented Aug. 20, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

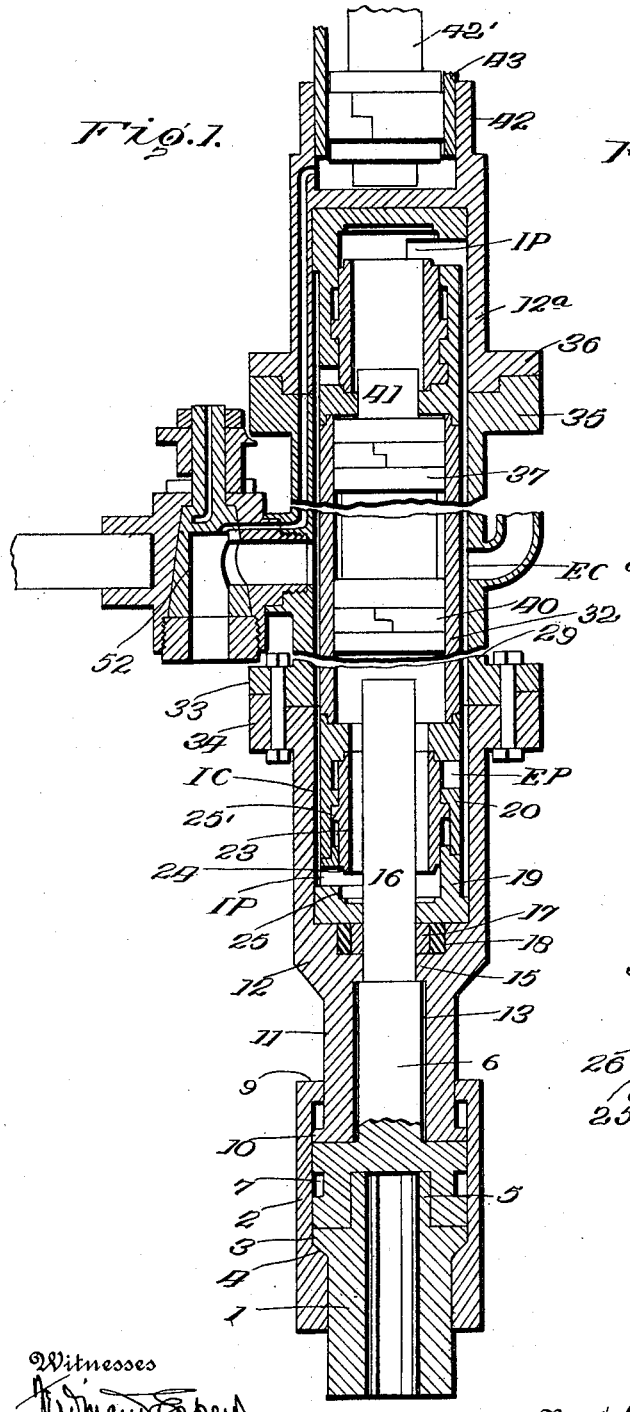
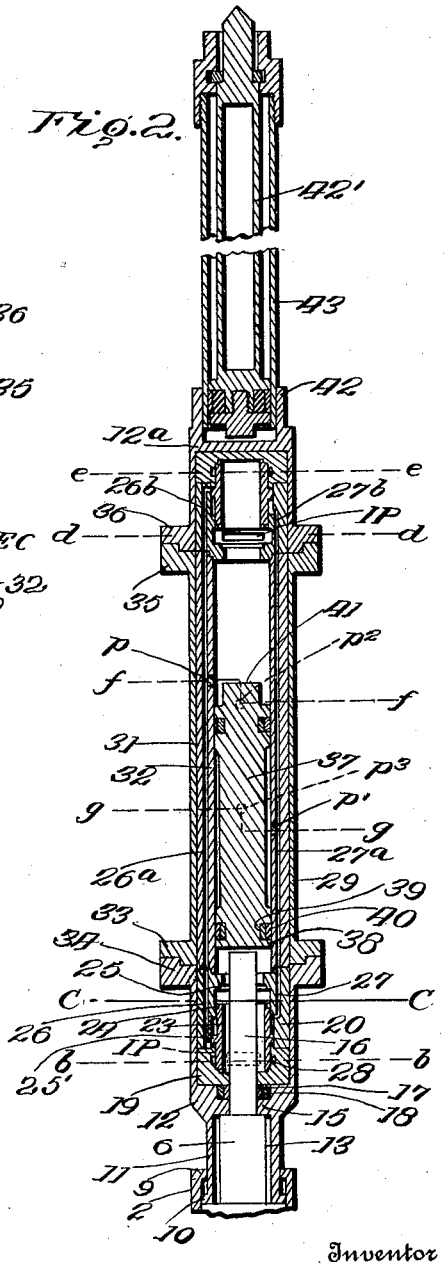


Fig. 2.



Witnesses

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2 SHEETS—SHEET 2.

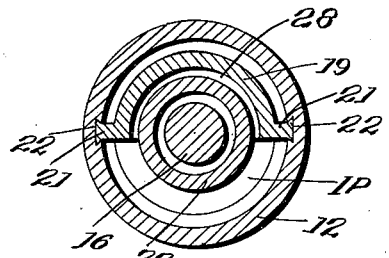

Fig. 3.

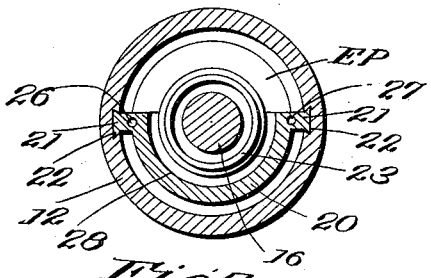

Fig. 4.

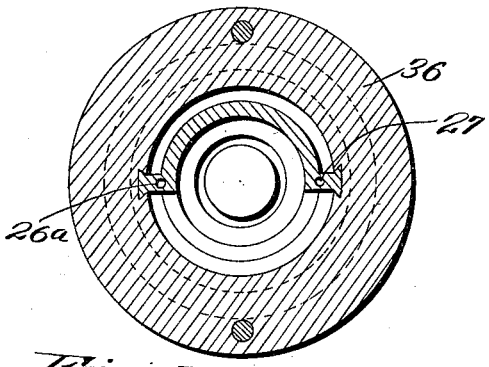

Fig. 5.

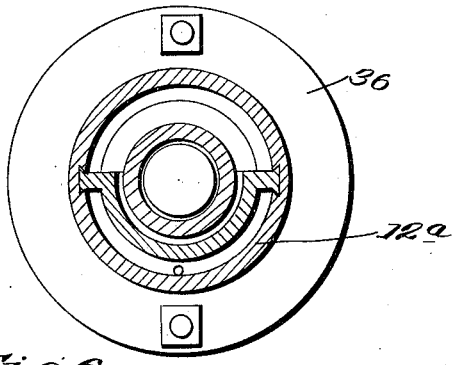

Fig. 6.

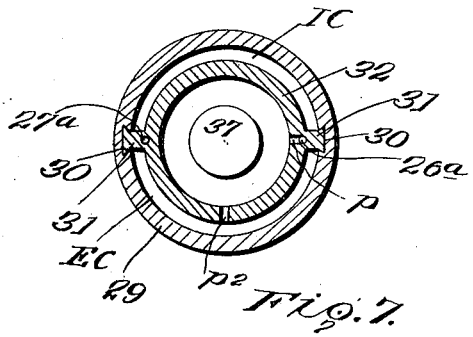

Fig. 7.

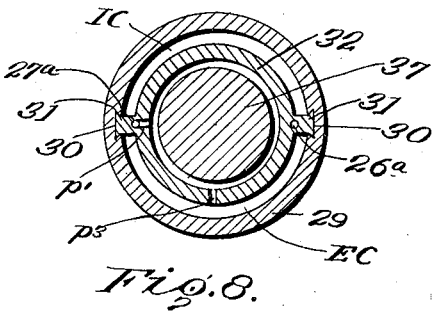

Fig. 8.

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UNITED STATES PATENT OFFICE.

WILLIAM L. BROOKINS, OF TELLURIDE, COLORADO.

ROCK-DRILL.

1,036,180. Specification of Letters Patent. Patented Aug. 20, 1912.

Application filed October 26, 1910. Serial No. 589,185.

To all whom it may concern:

Be it known that I, WILLIAM L. BROOKINS, citizen of the United States, residing at Telluride, in the county of San Miguel and State of Colorado, have invented certain new and useful Improvements in Rock-Drills, of which the following is a specification.

This invention comprehends certain new and useful improvements in rock drills and relates particularly to that class of drills that are designed especially for excavating ore, rock, and the like, above and below a level and commonly called stoping drills.

The invention has for its object an improved rock drill, the parts of which are so constructed and arranged that they may be readily assembled and disassembled and held securely in operative relation to each other.

The invention has for a still further object an improved rock drill embodying a novel and highly advantageous system or arrangement of automatically operated reversing valves designed to control the movements of the hammer.

Another object of the invention is, in a machine of this character, an improved construction and arrangement of parts whereby the hammer, on its rear stroke, will, in addition with other parts, produce a compression at the rear end of the cylinder in which the hammer operates, thereby obtaining a cushioning effect on the rear stroke and providing against injury to the rearmost reversing valve, while at the same time cushioning effects will be entirely obviated at the front end of the cylinder, the hammer thereby striking a hard and uncushioned blow on the tappet which transmits the blow to the bit. And the invention also has for its object the improvement of this class of drills so as to increase their utility and general efficiency.

For a full understanding of the invention, reference is to be had to the following description and accompanying drawings, in which:

Figure 1 is a longitudinal sectional view of a portion of the machine, parts being broken away; Fig. 2 is a longitudinal sectional view of the drill, the section of Fig. 2 being taken at right angles to the section of Fig. 1; Figs. 3, 4, 5, 6, 7 and 8 are transverse sectional views on the lines, *b*—*b*, *c*—*c*, *d*—*d*, *e*—*e*, *f*—*f*, and *g*—*g* of Fig. 2.

Corresponding and like parts are referred to in the following description and indicated in all the views of the drawings by the same reference characters.

The impact engine which forms the subject matter of the invention in the present rock drill is used in combination with other elements in common use, of which those illustrated in the drawings may be accepted as examples and of which the following is a brief description.

A bushing 1 fits in a dust ring 2 and is provided with a collar 3 having a beveled face 4 to fit against the dust ring 2. The bushing is provided with a reduced neck 5 which fits in a socket in the end of a tappet 6. Said tappet fits in the dust ring 2 and is provided with an annular groove 7 designed to receive bolts which pass through the dust ring and hold the parts together. The dust ring 2 is provided with a flange 9 adapted to coöperate with a flange 10 formed on the neck 11 of a head 12. The tappet 6 is located within the head 12 and is held therein by means of ribs 13 which fit in grooves formed in the said head 12. The head 12 is provided with a transverse web 15 and the tappet has a shank 16 which passes through the said web. A washer 17 surrounds the shank 16 and in turn is surrounded by a packing washer 18.

The upper relatively large chamber of the head 12 is designed to accommodate and hold a lower valve casing, said casing being preferably constructed in two superposed parts, one of which is designated 19 and the other designated 20. Each of these sections of the valve casing is formed with diametrically opposite longitudinal ribs 21 designed to fit in correspondingly formed longitudinal grooves 22 with which the head 12 is provided, so as to provide for the easy connection of the valve sections and head and the ready detachment of the sections from the head, while so long as the parts are in place the sections will be securely held from turning independently of the head. The section 19 of the valve casing is formed in its lower wall with an opening through which the stem or shank 16 of the tappet 6 extends and with a recessed upper end designed to mate with the lower end of the section 20.

The section 19 is formed with a fluid pressure inlet IP disposed on one side of the ribs 21 of said section, while the section 20 is correspondingly formed on the opposite side of its ribs, with a fluid pressure exhaust port EP, said ports being controlled and alternately opened and closed by means of an automatically operated reciprocating reversing valve 23, the said valve being tubular, as shown, and preferably provided with chamfered ends 24 designed to fit against annular shoulders 25 that are formed in the inner wall of the casing sections 19 and 20, as clearly illustrated in the drawings, the shoulders limiting the movement of said valve. The valve 23 is also formed intermediate of its ends with an annular band or collar 25 which constitutes the abutment element against which the fluid pressure acts in reversing the position of the valve. The valve section 20 is formed, as shown, with diametrically opposite fluid pressure inlet passages 26 and 27 designed to open into the interior of the casing on opposite sides of the collar 25 of the valve, to effect the movements of the valve, in an evident manner. Preferably, the valve 23 is balanced in its movements by means of balance passages 28 that are formed in the respective sections 19 and 20, as clearly illustrated in Figs. 3 and 4.

The main cylindrical shell 29 of the drill is formed on its inner wall with longitudinal undercut grooves 30 designed for engagement by correspondingly formed longitudinally extending ribs 31 that are formed on and that project outwardly from the shell lining or main cylinder 32 that is adapted to be slipped by an endwise movement into the shell 29 up against the lower section 20 of the valve casing, the abutting ends of the cylinder and valve casing preferably forming a lap or scarf joint, as shown. By the provision of the ribs 31, the cylinder 32 is held in spaced relation to the shell 29 in order to form, on opposite sides of said cylinder, fluid pressure spaces or chambers, one of these being the inlet chamber and designated IC, while the other is the exhaust chamber, designated EC. These chambers are continued into the head 12 by the provision of the alined ribs 21 of the sections 19 and 20, whereby to communicate with the fluid pressure inlet and exhaust ports, respectively. The cylinder 32 is also formed with fluid pressure passages 26^a and 27^a designed to communicate with the passages 26 and 27 before described and also communicating with the interior of the cylinder by means of ports p p' arranged out of longitudinal alinement with each other, as clearly illustrated in Fig. 2.

The shell 29 is formed at one end with a flange 33 fitting against and bolted to a corresponding flange 34 on the head 12, and the shell is correspondingly formed on its upper end, as indicated at 35, with a corresponding flange bolted to a flange 36 that is formed on the lower end of the upper head 12^a. The head 12^a contains a valve casing and valve, which I do not deem necessary to describe in detail, said valve being exactly like the valve 23 before described, and the sectional valve casing in the upper head being exactly like that in the lower head, except that the upper valve casing does not require any opening in its upper end wall for the shank 16, as is required by the lower valve casing, and the fluid pressure inlet port IP of the upper valve casing is larger than the exhaust port EP, while on the other hand, the inlet port of the valve casing is relatively small and the exhaust port thereof relatively large, this arrangement imparting an uncushioned blow of the hammer on the tappet and producing compression in the upper end of the cylinder which assists in keeping the hammer from hitting the upper valve on its rearward stroke.

The cylinder 32 contains a hammer or piston 37, the same being substantially cylindrical, as shown, and formed near each end with an annular groove 38 in which is fitted a preferably rubber packing washer 39 encircled by an expansive metallic split washer 40, the latter preferably having its ends overlapped with a scarf joint. Intermediate of its ends the hammer is preferably reduced to form between it and the interior wall of the cylinder 32, an annular fluid pressure space adapted to overlap and register with the ports p, p' and to also overlap and register with the exhaust ports p^2 and p^3 that are formed in the cylinder 32 so as to establish communication between the interior thereof and the exhaust chamber EC. The hammer 37 is formed at one end with a reduced neck 41 designed to enter the lower valve casing on the rearward stroke of the hammer for the purpose of obtaining the compression by cutting off the exhaust, thereby obtaining, to a certain extent, a cushioning effect on the hammer, and preventing injury to the upper reversing valve. It is, of course, to be understood that the passages 26^a and 27^a are continued into the upper valve casing, the extensions being designated 26^b and 27^b and corresponding in extent, location and purpose to the passages 26 and 27 hereinbefore described. The upper head 12^a is formed with a tubular extension 42 in which is secured the end of an auxiliary or supporting cylinder 43, the latter containing a longitudinally movable stope rod 42.

From the foregoing description in connection with the accompanying drawings, the operation of my improved rock drill will be apparent.

In the practical use of the device, the drill is set up and the cock 52 with which it is

provided is turned so as to let the compressed air into the space or chamber IC, whereupon, as is evident, the hammer 37 will be rapidly reciprocated or vibrated longitudinally in the cylinder 32, while at the same time, or just previous to the starting of the hammer, if desired, the stope rod is projected and the drill securely held up against the work. In the reciprocation of the hammer 37, the downward traverse will finally uncover the port p, the fluid pressure thereupon passing through the passages 26^a, 26, so as to reach the lower side of the valve 23, thereby reversing the valve from the position it was in and opening the upper air inlet port IP and closing upper exhaust port EP. At the same time the port P is opened by the hammer or immediately before, the port p^2 will be opened so as to exhaust to the atmosphere the fluid pressure back of the hammer. Upon the reversing of the valve 23, as just described, the compressed air will flow through the port IP into the cylinder 32 below the hammer and consequently the hammer will be driven back until the ports p' and p^3 are opened, whereupon a reversal of the valve will take place, as is manifest, these repeated actions which take place very quickly providing for the rapid reciprocation of the hammer and resulting in repeated uncushioned blows upon the tappet 6, the blows being thereby transmitted to the drill shank.

In the preferred arrangement of the parts, the flange 9 is adapted to strike the flange 10 before the hammer shall have moved on its down stroke far enough to strike the upper valve casing, said casing and the valve contained therein being thereby safeguarded. On the reverse stroke of the hammer, as before stated, the neck 41 thereof will pass into the upper valve casing and thereby secure a compression by cutting off the exhaust, the upper valve being thereby safeguarded. While the upward stroke of the hammer is thus cushioned, it is to be particularly noted that the active stroke of the hammer is absolutely uncushioned, a hard blow on the tappet being thereby insured. To stop the drill, it is only necessary to reverse the controlling cock 52, the fluid pressure supply being thereby cut off.

What I claim is:

1. A drill, embodying a head, a bushing and tappet supported by said head, the head being formed with oppositely disposed longitudinally extending grooves in its inner wall, a valve casing formed with oppositely disposed longitudinally extending ribs adapted to fit in said grooves and hold the valve casing in spaced relation to the head whereby to form two opposite and distinct fluid pressure passages, one for the inlet and the other for the exhaust, the valve casing being formed at opposite sides with inlet and exhaust ports designed to establish communication between the interior of the casing and the said chambers, and the casing being further provided with fluid pressure passages, a valve mounted to reciprocate in the valve casing and arranged to be reversed therein by fluid pressure entering said passages, whereby to close and open the inlet and exhaust ports respectively and alternately, a cylinder connected to the head, and a hammer mounted in the cylinder and adapted to strike the tappet.

2. A drill, embodying a head, a bushing and tappet supported by said head, a valve casing mounted in the head, said casing being composed of two sections adapted to fit against each other end to end, whereby to permit of the insertion of a valve, one of said sections being formed with a fluid pressure inlet port and the other section being formed with a fluid pressure exhaust port and with longitudinally extending passages, a valve mounted in said casing and provided with a ring adapted to move between the ends of said passages whereby fluid pressure is admitted to one of said passages and then to the other to effect a reciprocating movement of the valve to alternately open and close the ports, the head being formed exterior of the valve casing and inside of the head with distinct fluid pressure chambers communicating with the respective ports, a cylinder connected to the head and formed with corresponding chambers communicating with the first named chambers and with fluid pressure inlet and exhaust openings, means for controlling the inlet opening of the cylinder, and a hammer mounted in the cylinder and adapted to strike the tappet.

3. A drill, embodying a head, a bushing and tappet supported by the head, a cylinder, a shell surrounding the cylinder and connected to the head, a hammer mounted in the cylinder and adapted to strike the tappet, means for reversing the movement of the hammer in the cylinder, the cylinder being formed on opposite sides with oppositely disposed longitudinally extending ribs, and the shell being formed on its inner wall with corresponding grooves in which the ribs fit, the ribs holding the cylinder with portions in spaced relation to the inner wall of the shell whereby to form two distinct fluid pressure chambers, the shell being formed with inlet and outlet openings communicating with the respective chambers, the cylinder being also provided with longitudinally extending fluid pressure passages forming part of the means for reversing the movement of the hammer in the cylinder, said means also including reversing valves, valve casings therefor formed with inlet and exhaust ports communicating with the respective chambers, and supports for the valve casings, one of said supports being consti-

tuted with a head and another head forming the support for the other valve casing, said heads being formed with fluid pressure passages forming continuations of the fluid pressure passages in the cylinders.

4. A drill, embodying a bushing, a tappet, a head supporting the bushing and tappet, a cylinder to which the head is connected, a hammer mounted in the cylinder and adapted to strike the tappet, valve casings, another head, the valve casings being mounted in the two heads respectively, reversing valves mounted in said valve casings, the valve casing below the hammer being provided with an opening leading thereinto and an exhaust port, and the hammer being provided at its lower end with a neck adapted to project into said opening to retard the fluid pressure medium as it passes out through said exhaust port on the backward stroke of the hammer.

In testimony whereof, I affix my signature in presence of two witnesses.

WILLIAM L. BROOKINS. [L. S.]

Witnesses:
AXEL NELSON,
JNO. F. DENCHLER.