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H. HELLMAN & L. C. BAYLES.

ROCK DRILL OR ROCK DRILLING MACHINE.

APPLICATION FILED NOV. 23, 1904.

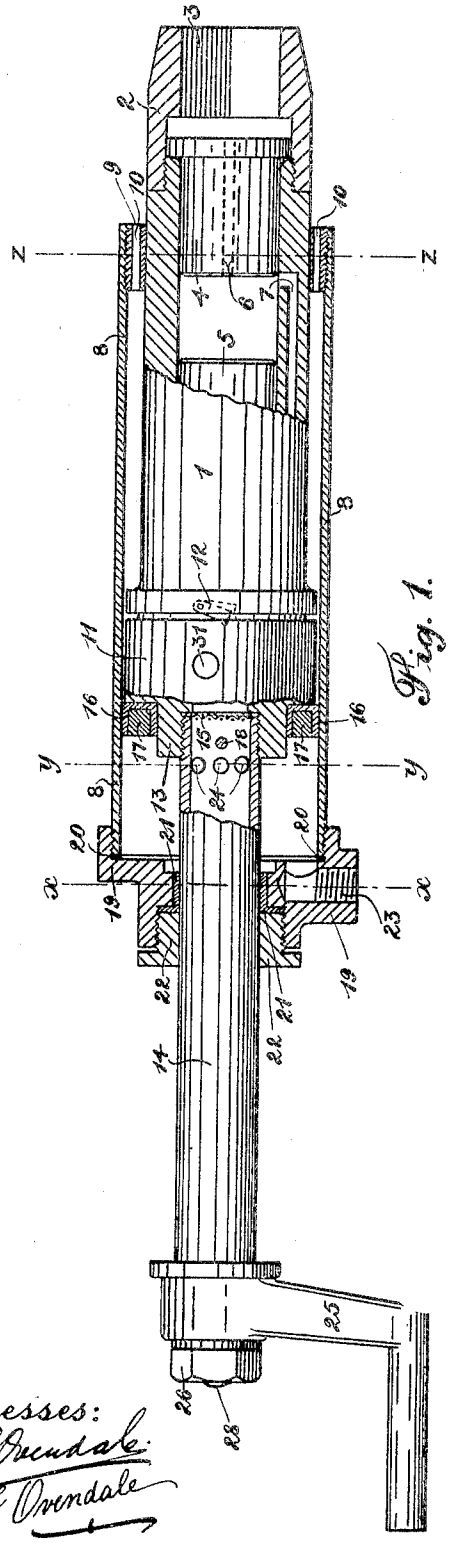

Fig. 1.

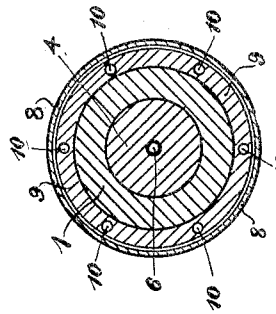

Fig. 4.

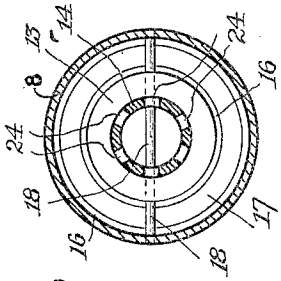

Fig. 3.

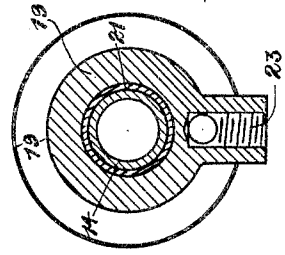

Fig. 2.

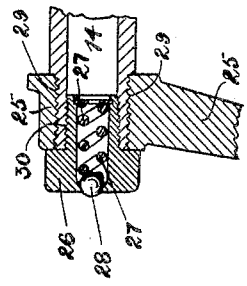

Fig. 5.

Witnesses:
R. Ovendale
F. Ovendale

Inventors:
Henry Hellman
Lewis Condict Bayles
by Chas Ovendale
Attorney

UNITED STATES PATENT OFFICE.

HENRY HELLMAN AND LEWIS CONDICT BAYLES, OF JOHANNESBURG, TRANSVAAL.

ROCK-DRILL OR ROCK-DRILLING MACHINE.

No. 797,111. Specification of Letters Patent. Patented Aug. 15, 1905.

Application filed November 23, 1904. Serial No. 233,934.

To all whom it may concern:

Be it known that we, HENRY HELLMAN and LEWIS CONDICT BAYLES, citizens of the United States, residing at Johannesburg, Transvaal, have invented certain new and useful Improvements in and Appertaining to Rock-Drills or Rock-Drilling Machines, of which the following is a specification.

This invention has reference to rock-drills or rock-drilling machines or engines operated by means of compressed air or other elastic gaseous fluid for boring or drilling holes in rock, stone, or the like to receive explosive charges for blasting purposes.

The improvements are designed with the object of providing an efficient machine or engine of small dimensions and compact and simple construction.

A machine or engine embodying the invention has its vital parts completely inclosed, thus preventing the possibility of the same being damaged by rough usage.

The improvements comprise, first, an arrangement for utilizing the pressure or expansive force of the actuating fluid in its passage through the machine for automatically effecting the feed or advancement of the drilling bit or tool as the latter penetrates the rock; secondly, an arrangement for lubricating the several operative parts of the machine or engine; thirdly, means for directing the exhaust or escaping actuating fluid forward toward or in the direction of the rock-face, so as to prevent mud or dust produced by the machine from rising or being thrown into the face of the operator; fourthly, an arrangement for straining or removing any particles of solid matter that may be suspended in or carried by the actuating gaseous fluid between the intake and valve or before it enters the valve-box (when a valve is employed) or the power-cylinder when the actuating fluid is controlled by the piston or percussive reciprocating member; and the invention consists in the general construction, arrangement, and combination of parts, as will hereinafter be described in detail and as claimed in the appended claims.

In order to facilitate the description of the several improvements, we append hereto an explanatory sheet of drawings, which is marked with characters of reference corresponding to the following description.

In the drawings, Figure 1 shows the machine or engine in part longitudinal sectional elevation. Fig. 2 represents a transverse section on line $x\,x$, Fig. 1. Fig. 3 is a transverse section on line $y\,y$, Fig. 1. Fig. 4 is a transverse section on line $z\,z$, Fig. 1; and Fig. 5 is a section of a portion of the actuating-fluid-inlet pipe 14 and crank or handle 25 and illustrating the means for introducing lubricant into the machine.

1 designates the power-cylinder, shown fitted with a cap 2 at the forward end, which cap 2 may, as illustrated, be formed with a bore 3, of square or other polygonal section, to correspond to the shank of the drilling-bit or boring-tool, (not shown in the drawings,) so that the bit is compelled to rotate in unison with said power-cylinder 1.

In the forward end of the power-cylinder 1 is shown an impact-piece 4, against the forward end of which the inner end of the shank of the bit or tool abuts.

5 represents the reciprocating percussive member, which on its forward stroke strikes the inner end of the impact-piece 4, which transmits the blow to the drilling-bit or boring-tool. The impact-piece 4 is shown formed with a longitudinal hole 6, along which a quantity of the gaseous actuating fluid may pass from the interior of the cylinder to be conducted along the bit or tool to or in proximity to the cutting extremity thereof for the purpose of expelling the particles of pulverized rock from the cutting-face.

In the drawings we do not illustrate any arrangement for controlling the admission of the actuating gaseous fluid alternately to either end of the power-cylinder 1 or either side of the reciprocating percussive member 5. This may be accomplished by means of a valve located in a valve box or chamber provided at the rear end of the power-cylinder 1, or it may be effected by or through the medium of the percussive reciprocating member 5 in an analogous manner to a valveless chipping or riveting machine or in any other suitable manner.

7 is the port which serves to conduct the actuating fluid into the front end of the power-cylinder 1 to return the percussive reciprocating member 5 on its return and idle stroke.

8 represents an outer cylindrical protecting-casing, in which the power-cylinder 1 is slidably mounted. In the forward end of the casing 8 is screwed or otherwise suitably fixed

a ring or cylindrical piece 9, through which the power-cylinder 1 works. In the cylindrical piece 9 are formed a number of holes or ports 10, which are formed parallel with the longitudinal axis of the cylinder 1 and place the interior of the casing 8 in communication with the atmosphere. These ports 10 constitute the escape-ports for the exhaust, and being made parallel with the longitudinal axis of the power-cylinder 1 they direct the exhaust forward toward the rock-face, and so prevent any mud or dust that issues from the bore-hole rising in the face of the operator of the machine.

At the rear end of the power-cylinder 1, inside the casing 8, is screwed or otherwise fixed a cap 11, which incloses the valve, (when one is employed,) or in the case of a valveless machine serves for closing the rear end of the cylinder. When the cap 11 is screwed over the end of the cylinder 1, we provide a detent or catch 12, fixed in the flange or rear end of the cylinder 1, which detent or catch 12 engages notches, teeth, or indentations on the inner end of the valve-box cap 11, and so operates to prevent the valve-box cap 11 being unscrewed off the end of the cylinder 1 in the operation of the machine. The valve-box cap 11 is formed with a rearward extension or boss 13. Into the extension 13 of the valve-box cap 11 is screwed or otherwise fixed a pipe 14. Between the end of the pipe 14 and the interior of the valve-box or power-cylinder 1 is located a wire-gauze strainer 15, which serves for preventing the ingress of any particles of solid matter that may be suspended or carried in the actuating gaseous fluid.

Arranged round the rearward extension 13 of the valve-box cap 11 is a U or cup leather or other suitable packing 16. A metal ring 17 is fitted in the cup-leather 16, and the metal ring 17 and cup-leather 16 are retained in position by means of a pin 18, whose length is equal or approximately equal to the diameter of the casing 8. This pin 18 passes through the rearward extension 13 and pipe 14, so that its extremities project over the metal ring 17 and cup-leather 16 at two opposite sides of the rearward extension 13. The pin 18 also secures the pipe 14 in the valve-box-cap extension 13.

On the rear end of the casing 8 is screwed or otherwise fixed a cap or cover 19. Between the end of the casing 8 and the cover 19 is placed a leather or other suitable packing-ring 20. In the cover 19 and surrounding the pipe 14 is a cup-leather or other suitable packing 21, and into the rear end of the cap 19 is screwed a gland-nut 22, which serves for retaining said cup-leather 21 in position.

In the cap 19, over the rear end of the casing 8, is formed the actuating-fluid inlet or intake 23, which inlet 23 communicates with the rear end of the casing 8.

In the forward end of the pipe 14 (see Figs. 1 and 3) are formed a number of holes 24, through which the actuating gaseous fluid passes from the casing 8 to the interior of the valve-box and power-cylinder 1. The fluid as it passes from the pipe 14 must pass through the gauze strainer 15, as previously explained. The pipe 14 projects in a rearward direction and at its outer extremity has screwed onto it the crank 25, which serves for rotating the power-cylinder 1, and with it the drilling-bit or boring-tool. The method of attaching the crank 25 to the pipe 14 is shown more particularly in Fig. 5, and the arrangement whereby lubricant is introduced into the machine is shown in the same figure of the drawings. This consists of a nut 26, which is screwed into the rear end of the pipe 14, which nut carries a spiral spring 27 and ball or sphere 28, which closes a hole formed in the nut 26. The depression of the sphere 28 against the spring 27 allows the lubricant to be injected into the interior of the pipe 14. The spring 27 by forcing the ball 28 onto its seat inside the nut 26 closes the aperture and prevents the escape of any of the actuating gaseous fluid from the pipe 14. The external screw-thread 29, formed on the rear end of the pipe 14 for the crank 25, is made of a suitable pitch, while the internal thread 30 for the nut 26 is made of a finer pitch. This difference in the pitches of the two threads 29 30 causes the nut 26 to act as a lock-nut for the crank 25 and prevents the latter being screwed off the end of the pipe 14 in the operation of the machine.

31 is the exhaust-port through which the exhaust gaseous fluid passes into the casing 8 between the cup-leather 16 round the valve-box-cap extension 13 and the ring 9 fitted round the power-cylinder 1 in the front end of the casing 8.

In the operation of the machine the actuating fluid enters at the inlet 23 and passes into the cylindrical casing 8 at the rear of the valve-box cap 11. The cup-leather 16 forms an air-tight joint with the interior of the casing 8, and the fluid acting on the rear surface of the valve-box cap 11 and valve-box-cap extension 13 moves the power-cylinder 1 forward in its casing 8 and keeps the drilling-bit or boring-tool in contact with the rock-face or bottom of the hole being drilled. The actuating fluid being free to pass through the holes 24 in the pipe 14 into the valve-box and power-cylinder 1, the percussive member 5 is thereby reciprocated in the cylinder 1. The blows of the reciprocating percussive member 5 are transmitted to the drilling-bit or boring-tool through the medium of the impact-piece 4. The rotation of the bit or tool is effected by rotating the crank 25, which rotates the pipe 14, and with it the power-cylinder 1 and the drilling bit or tool. The exhaust escaping into the outer casing 8 through the port 31 in front of the cup-leather 16 is free to pass through the holes or ports 10 in

the ring 9, being thereby directed toward the rock-face and preventing the dust or mud rising in the face of the operator, as previously explained.

What we claim as our invention, and desire to protect by Letters Patent, is—

1. In a rock-drilling machine or engine, in combination, a power-cylinder carrying the percussive apparatus and the drilling-bit or boring-tool, a casing surrounding said cylinder, a packing located at the rear of the cylinder forming an air-tight joint with the interior of the casing, a pipe attached to the rear end of the cylinder formed with holes placing the casing in communication with the interior of the cylinder, a cover fitted on the rear end of the casing formed with an inlet through which the actuating fluid enters the casing, said cover serving as a guide or support for the pipe, and means for rotating the power-cylinder and bit or tool, substantially as described.

2. In a rock-drilling machine or engine in combination a power-cylinder and a protecting-casing in which said cylinder is slidably mounted, means for admitting the actuating fluid to the rear end of said casing to feed the drill, a packing located at the rear of the cylinder and a transverse pin for retaining said packing in position substantially as described.

3. In a rock-drilling machine or engine, in combination, a power-cylinder, and a protecting-casing surrounding the same and provided at its forward end with exhaust-ports surrounding said cylinder and directed toward the front end thereof.

4. In a rock-drilling machine or engine, in combination, a power-cylinder and a protecting-casing surrounding the same, and a ring fitted in the forward end of the casing formed with ports or holes through which the exhaust may pass to be directed toward the rock-face to prevent the mud or dust issuing from the bore-hole rising in the face of the operator.

5. In a rock-drilling machine or engine, in combination, a protective casing, a power-cylinder carrying the percussive apparatus, and slidable in said casing a pipe or tube fixed at the rear of said cylinder for conducting the actuating fluid thereto and passing through the rear end of said casing, and a gauze strainer in said pipe through which the actuating fluid is caused to pass in its passage to the power-cylinder for the purposes specified.

6. In a rock-drilling machine or engine, in combination, a power-cylinder and a protecting-casing in which said cylinder is slidably mounted, a cap for inclosing the valve and valve-box located at the rear of the cylinder, a pipe screwed into the valve-box cap formed with apertures for permitting the passage of the actuating fluid through the pipe to the valve-box and a gauze strainer located between the pipe and valve-box for preventing particles of solid matter entering the valve-box with the actuating fluid, substantially as described.

7. In a rock-drilling machine or engine in combination, a power-cylinder carrying the percussive apparatus a pipe fitted to the rear end of said cylinder, said pipe serving as the means for rotating the cylinder, a crank screwed on the rear extremity of said pipe and a nut screwed into the rear extremity of said pipe for retaining said crank in position, the screw-thread of the nut being made finer than the screw-thread of the crank to serve as a lock-nut for the latter.

8. In a rock-drilling machine or engine, in combination a power-cylinder carrying the percussive apparatus and drilling-bit or boring-tool, a pipe fitted at the rear end of said cylinder, said pipe serving as the means for rotating the cylinder and introducing the motive fluid thereinto, a crank screwed on the rear extremity of said pipe and a nut screwed into the rear extremity of said pipe for retaining said crank in position, the screw-thread of the nut being made of a finer pitch than the screw-thread for the crank to serve as a lock-nut for the latter, and a spiral spring and sphere located in the nut to serve as a means for introducing a lubricant into the machine substantially as described.

9. In a rock-drilling machine or engine, in combination a power-cylinder carrying the percussive apparatus and the drilling-bit or boring-tool, a casing surrounding said cylinder, a cover arranged on the rear end of said cylinder, a packing located on the cover forming an air-tight joint with the interior of the casing, a pipe fixed to the cap at the rear of the cylinder formed with apertures placing the casing in communication with the power-cylinder, a gauze strainer between said pipe and cap for preventing the ingress of particles of solid matter with the actuating fluid, a cover for the rear end of the casing formed with an aperture communicating with the casing for the introduction of the actuating gaseous fluid, a packing and gland-nut fitted in said cover for making an air-tight joint with the pipe, a crank screwed on the rear extremity of the pipe and a nut screwed into the rear extremity of the pipe, said nut serving as a lock-nut for the crank and a ring arranged in the front end of the casing formed with holes or apertures for directing the exhaust toward the rock-face to prevent mud or dust issuing from the bore-hole, rising in the face of the operator, substantially as described and shown.

10. In a rock-drilling machine or engine, in combination, a power-cylinder carrying the percussive apparatus and the drilling-bit or boring-tool, a casing surrounding and slidably supporting said cylinder, a packing located at the rear of the cylinder forming an air-tight joint with the interior of the casing, a pipe attached to the rear of the cylinder formed

with holes placing the casing in communication with the interior of the cylinder, a cover fitted on the rear end of the casing formed with an inlet through which the actuating fluid enters the casing, said cover serving as a guide or support for the pipe, and means for rotating the power-cylinder and bit or tool through the medium of the pipe, substantially as described.

In witness whereof we have hereunto set our hands in the presence of two subscribing witnesses.

HENRY HELLMAN.
LEWIS CONDICT BAYLES.

Witnesses:
CHAS. OVENDALE,
R. OVENDALE.