(No Model.)

J. K. FIRTH.

ROCK DRILL.

No. 596,149. Patented Dec. 28, 1897.

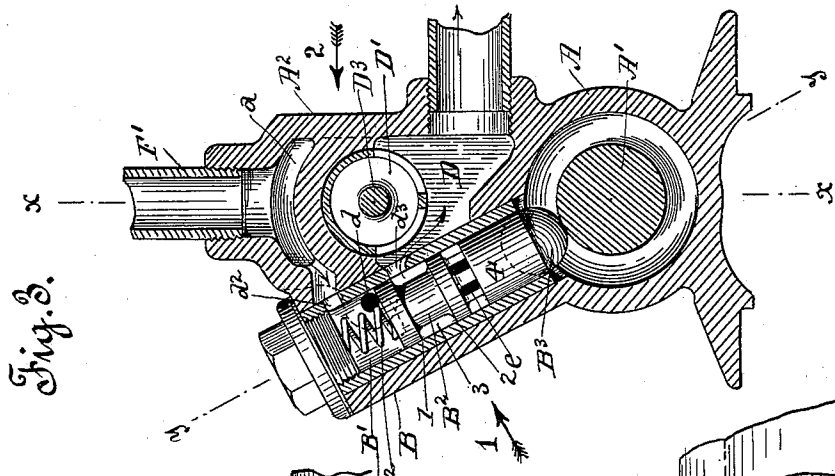

Fig. 3.

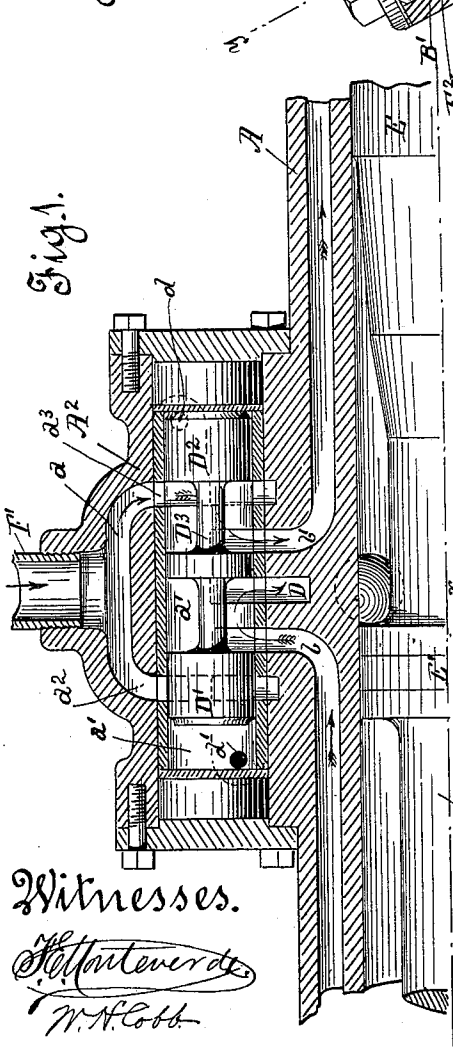

Fig. 1.

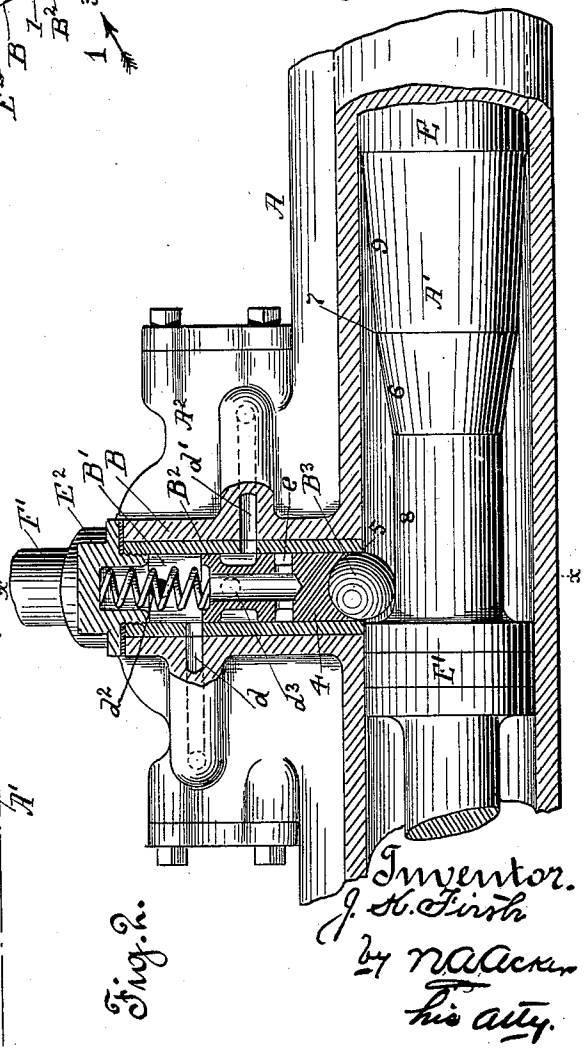

Fig. 2.

Witnesses.

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UNITED STATES PATENT OFFICE.

JOSEPH K. FIRTH, OF SAN FRANCISCO, CALIFORNIA.

ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 596,149, dated December 28, 1897.

Application filed December 16, 1896. Serial No. 615,905. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH K. FIRTH, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Rock-Drills; and I do hereby declare that the following is a full, clear, and exact description thereof.

The present invention relates to certain new and useful improvements in rock-drills, and more especially the auxiliary-valve mechanism for operating and controlling the main valves; and it consists in the arrangement of parts and details of construction, as will be hereinafter fully set forth in the drawings and described and pointed out in the specification.

In the pneumatic or pressure-operated rock-drills the auxiliary valve for operating the main valves becomes quickly worn out and rendered useless by the movement of the drill-piston, which is a constant source of annoyance and creates considerable delay in the work, for as the said valve becomes worn the working of the drill must cease until the worn-out valve is replaced by a new one.

The object of my invention is to so construct the auxiliary valve that undue wear thereof by frictional contact with the drill-piston will be obviated or overcome, thus prolonging the durability and life of the drill mechanism and reducing the cost attached to the constant repair of the auxiliary-valve mechanism.

In order to fully comprehend the invention, reference must be had to the accompanying sheet of drawings, wherein—

Figure 1 is a broken longitudinal sectional view in side elevation, taken on line $x\,x$, Fig. 3, showing the piston-casing and the main-valve chamber, the valve of the main-valve chamber, and the port communication between said chamber and the piston-casing, said mechanism being viewed in the direction of the arrow 2 in Fig. 3. Fig. 2 is a similar view taken on line $y\,y$, Fig. 3, and viewed from the rear, or in the direction of the arrow 1, said view showing the auxiliary-valve chamber, the location of the valve-stem and the valve therein, the port communication between said chamber and the main-valve chamber and the piston-casing; and Fig. 3 is a vertical cross-sectional view taken on line $x\,x$, Fig. 2.

In the drawings the letter A is used to indicate the casing of the dirll, within which works the piston A′. This casing has secured to the top thereof at any suitable point the main-valve casing A^2, which casing is formed with the steam or air chamber a and the valve-chamber a', the two chambers communicating by means of the ports a^2 and a^3, while the chamber a' communicates with the piston-chamber of the drill-casing by means of the ports $b\ b'$.

To the rear wall of the main-valve casing is formed the auxiliary-valve casing B, within the valve-chamber B′ of which works the hollow valve B^2. This valve is cut away between the points 1 2, so as to form an annular space 3 between the wall of the valve and the inner wall of the valve-casing.

Within a socket formed in the lower end of the valve B^2 is fitted a ball B^3. This ball works through an opening 5, formed in the drill-casing and rests upon the face of the piston A′, as shown in the drawings. This ball being free to rotate in all directions it does not become worn in any particular place by contact with the piston. The valve is raised and lowered by the movement of the piston, for as the piston is moved forward the ball rides upon the inclined portion 6 of the said piston, so that it is gradually raised from the level portion 8 of the piston until the point 7 is reached, after which it remains upheld by the straight portion 9 of the piston until the piston moves upon its backward stroke. As the piston moves upon its backward or return stroke the valve is gradually lowered. It will be observed that the ball bears at all times on the piston and that no additional means, such as a retaining bushing or flange in the valve-casing, is required to hold the ball in its socket. The ball B^3 being seated in the semispherical socket in the valve is capable of a universal movement, and it is caused to rotate freely during the forward-and-backward stroke of the piston by frictional engagement therewith and likewise rotates with the turning or twisting movement of the piston. Consequently it will be observed that the ball rotates or turns so as to present a new surface or point of contact with each movement of the piston, for, as is well known, the piston of the rock-drill not

only has a reciprocating movement, but it likewise revolves upon its stroke in order to impart a twisting movement to the drill.

Communication is established between the valve-chamber B′ and each end of the main-valve chamber a' by means of the portways d d', Figs. 1 and 2, and with the steam or air chamber a by ports d^2. Connection is also made between the valve-chamber B′ and the main-valve chamber a' by the exhaust-port d^3. Through the main-valve casing is formed the exhaust D, which conveys the exhaust steam or air from within the main-valve chamber. Within this chamber are located the main valves D′ D^2, connected by the ball D^3. These valves, being connected, may be called a "reciprocating," "main," or "slide" valve, which control the inlet-ports a^2 a^3, leading from the chamber a, and the outlet-ports b b', leading to the piston-chamber. The air or steam flowing through these ports enters the piston-chamber back of the enlarged head E and in advance of the shoulder or collar E′, respectively, of the piston.

Above the head 4 of the hollow valve is formed a series of outlet-openings e, which permit the steam or air flowing therethrough to escape into the port d' as the valve is raised. This valve is maintained downward, so as to maintain the ball against the piston A′ by means of the spring E^2.

The air or steam enters the chamber a by the pipe F′, which leads from any suitable source of supply.

As the ball B^3 is raised and lowered the ports d' and d, respectively, are opened and closed, so as to control the supply of air or steam to the main-valve chamber to operate the valve located therein.

The working of the valve mechanism being well known and well understood by those familiar with this line of machinery a detailed description thereof in this application is not deemed necessary.

Having thus described my invention, what I claim as new, and desire to secure protection in by Letters Patent, is—

1. In a rock-drill, the combination with the piston-chamber, piston, and main valve, of a spring-pressed auxiliary valve, a ball at the end thereof projecting into the piston-chamber and engaging and supported solely by the piston.

2. In a rock-drill, the combination with the piston provided intermediate its ends with a reduced portion, spring-pressed auxiliary valve operated by said piston, a ball in engagement with said valve, and said reduced portion, and adapted to be rotated by the movement of the piston.

In testimony whereof I affix my signature, in presence of two witnesses, this 10th day of December, 1896.

JOSEPH K. FIRTH.

Witnesses:
N. A. ACKER,
LEE D. CRAIG.