(No Model.)

G. M. GITHENS.

ROCK DRILL ENGINE.

No. 597,902. Patented Jan. 25, 1898.

Fig. 2.

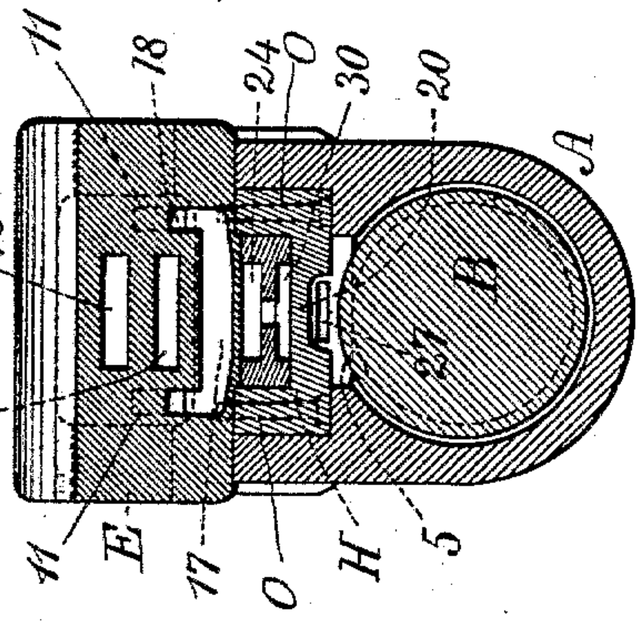


Fig. 3.

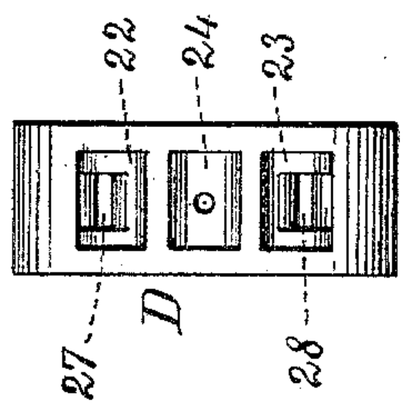


Fig. 5

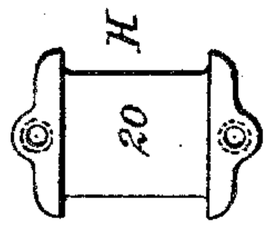


Fig. 1.

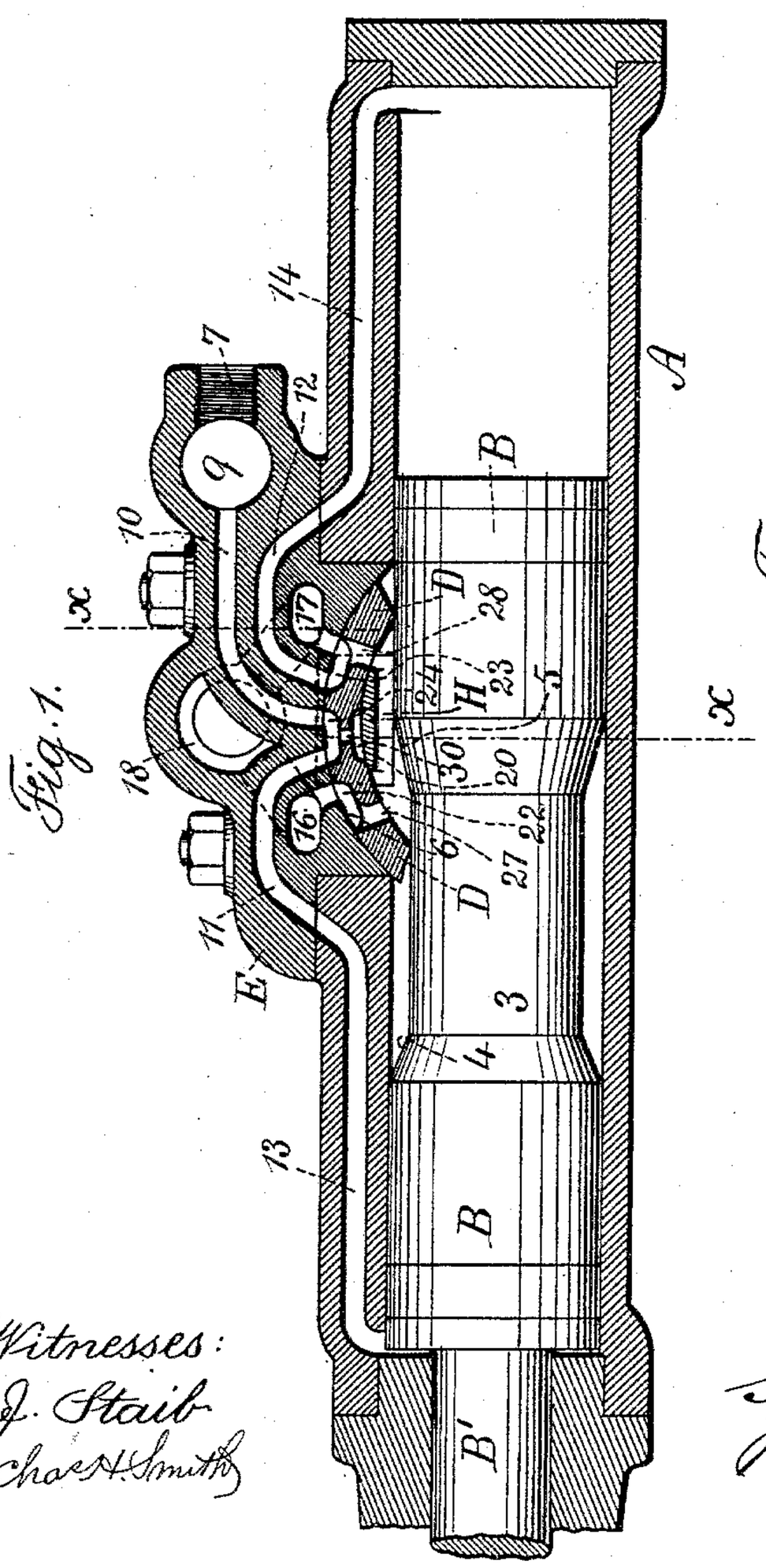
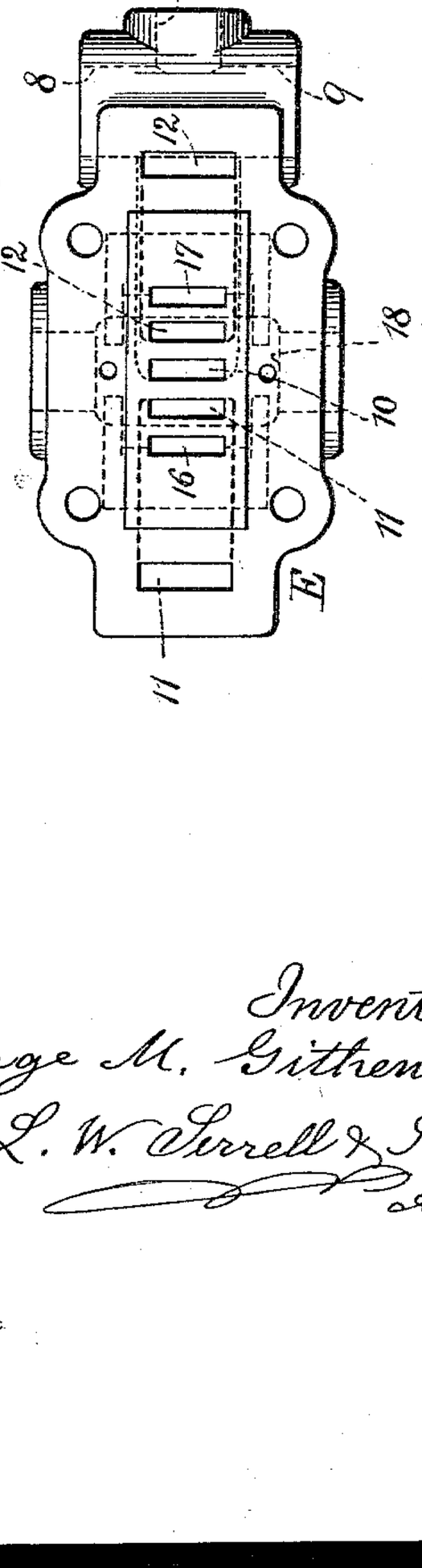


Fig. 4.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

GEORGE M. GITHENS, OF BROOKLYN, NEW YORK.

ROCK-DRILL ENGINE.

SPECIFICATION forming part of Letters Patent No. 597,902, dated January 25, 1898.

Application filed July 21, 1897. Serial No. 645,358. (No model.)

To all whom it may concern:

Be it known that I, GEORGE M. GITHENS, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented an Improvement in Rock-Drill Engines, of which the following is a specification.

In Letters Patent No. 247,819, granted to me October 4, 1881, a piston is represented having the middle portion of smaller diameter and an arc-shaped valve moved first in one direction and then in the other by the inclined surfaces at the ends of the smaller portion of the piston, and in Letters Patent No. 212,598, granted to me February 25, 1879, a similar piston and an arc valve are represented, there being a rest at the concave side of the arc valve.

In rock-drilling engines I have experienced difficulty in consequence of the valve resting upon its seat and being held there by the pressure of air or steam and requiring considerable force to commence the movement of such valve, and the inclined surfaces of the piston coming into contact with the ends of such valve injure and wear the same in consequence of concussion, and the steam or air pressure is liable to accumulate and remain within the cylinder around the smaller portion of the piston and exert its force in holding the valve to its seat.

The object of the present invention is to maintain an opening to the exhaust from the space within the cylinder and around the smaller diameter of the piston, thus preventing an accumulation of pressure in this space and also to balance the steam or gaseous pressure in its action upon the valve, so that there will be but little tendency of the pressure to hold the valve to its seat, and the valve will therefore move with but little friction and wear upon the valve and concussion by the parts of the piston striking the valve is reduced to a minimum.

In the drawings, Figure 1 is a section of the cylinder and valve-chest and valve. Fig. 2 is a cross-section at the line x x of Fig. 1. Fig. 3 is a plan view of the valve. Fig. 4 is an inverted plan view showing the face of the steam-chest, and Fig. 5 is a plan view of the cross-bearer detached.

The cylinder A is of any ordinary construction, and the piston B is provided with a piston-rod B′, extending out through one end of the cylinder and receiving the drill or other tool to be actuated, and the cylinder-heads are to be of any desired character, and the middle portion of the piston B is reduced, as shown at 3, there being inclined surfaces 4 and 5 for giving motion to the arc-shaped valve D, and this valve is against the face of valve-seat 6 of the chest E. This valve-chest E is advantageously provided with the screw-threaded holes 7 8 9 at one end for the reception of the supply-pipe for steam or other fluid under pressure, such pipe being brought in whatever is the most convenient direction to the chest, the other screw-threaded holes being closed by movable plugs and the fluid under pressure passes by the port 10, and there are ports 11 and 12 in the chest leading to the ports 13 and 14 in the cylinder by which pressure reaches the ends of the cylinder to act upon the piston as usual, and there are also in the chest ports 16 and 17 with branches at the ends opening into the cross-port 18 of the exhaust, the pipe for the exhaust being connected at either one side or the other of the chest E.

The arc valve D has a face that is the segment of a cylinder seating against the similar-shaped seat 6 of the valve-chest, and the valve-bearing H is advantageously received at its ends in recesses in the cylinder, so that such bearing comes at each edge of the arc valve, and its inner surfaces are in line with the portion of the valve-chest that extends down into the recess of the cylinder, and there is a cross-piece 20 against the concave side of the arc valve, and these parts are fitted and advantageously ground so as to be steam-tight, but yet sufficiently loose to allow the valve to be moved endwise with freedom by the action of the inclines 4 and 5 of the piston B.

In the valve D there are ports 22 23 24, the port 24 being between the ports 22 and 23 and serving as a steam-port to connect the inlet-port 10 with the port 11 to one end of the cylinder or with the port 12 to the other end of the cylinder, and the ports 22 and 23 connect the port 11 with the exhaust 16 and the port 12 with the exhaust 17, so that when the valve is in the position shown in Fig. 1 the steam will pass by the port 13 to withdraw the drill

or other tool, the exhaust from the opposite end of the cylinder passing by 14, 12, 23, and 17 to the exhaust 18, and when the valve has been moved to the opposite position the exhaust will be from the other end of the cylinder through 13 11 22 to 16, and the steam will pass by 10, 24, 12, and 14 to project the drill or other tool.

The small holes 27 and 28, passing through the valve, are always open to the exhaust, so that an accumulation of pressure in the cylinder and around the reduced portion of the piston is prevented.

In the concave side of the valve is a counterbalance-port 30, opening to the port 24, and the size of this port 30 is nearly the same as the size of the port 24 and advantageously is slightly greater, and steam or air pressure is constantly acting both in 24 and 30 and in opposite directions, the pressure in 24 tending to force the valve against the cross-bar 20 and the pressure in 30 to force the valve against the seat. Hence these two forces can be balanced, but the force acting to keep the valve upon its seat should slightly preponderate.

By the aforesaid construction the valve is balanced so that the pressure produces but little friction, and hence the valve can be moved upon its seat with great freedom and there is but little wear to the parts.

The valve-bearing being a separate piece from the valve-chest allows for the easy and accurate fitting of the respective parts, and the bearing can be adjusted to bring the cross-bar to the proper proximity to the concave side of the valve, and the surfaces can be ground or dressed off, as may be necessary from time to time, thus insuring durability to the valve and its supporting parts.

The valve-bearing H is advantageously attached to the valve-chest by the screws O.

I do not limit myself to the location shown for the balancing-port, as this should always be opposite to the pressure to be balanced.

I claim as my invention—

1. The combination with the cylinder and the reciprocating piston having a reduced central portion and inclined surfaces, of a valve-chest having supply and exhaust ports, an arc valve acted upon by the piston and a valve-bearing having a cross-bar at the concave side of the valve, such bearing being separate from the cylinder and from the valve-chest, so as to be adjusted to the valve, substantially as set forth.

2. The valve-chest having inlet and exhaust pipe connections, and pressure and exhaust ports, in combination with an arc valve having in its convex surface pressure and exhaust ports and an opening into the cylinder through such arc valve from one of the exhaust-ports, substantially as set forth.

3. In a reciprocating engine for rock-drills or other devices, a piston having a reduced central portion with inclines, a valve-chest with an arc-shaped valve-seat, a valve acted upon by the inclines of the piston and a valve-bearing having a cross-bar at the concave side of the valve and a port at the concave side of the valve for balancing the pressure, substantially as set forth.

4. The combination with the cylinder and piston having a reduced central portion, of a removable valve-chest having pressure and exhaust ports and connections for the pipes, an arc valve having three ports in its convex face and a port in its concave face, a cross-bar at the concave side of the arc valve against which the balancing-pressure acts, substantially as set forth.

5. The combination with the cylinder and piston having a reduced central portion, of a removable valve-chest having pressure and exhaust ports and connections for the pipes, an arc valve having three ports in its convex face and a port in its concave face, a cross-bar at the concave side of the arc valve against which the balancing-pressure acts, a valve-bearing connected with the cross-bar and separate from the valve-chest for adjusting the cross-bar to the valve, substantially as set forth.

6. The combination with the cylinder and piston having a reduced central portion, of a removable valve-chest having pressure and exhaust ports and connections for the pipes, an arc valve having three ports in its convex face and a port in its concave face, a cross-bar at the concave side of the arc valve against which the balancing-pressure acts, a valve-bearing connected with the cross-bar and separate from the valve-chest for adjusting the cross-bar to the valve, the valve-bearing also extending at the edges of the valve and being within recesses in the valve-chest, substantially as set forth.

7. The combination in a reciprocating engine for rock-drills or other devices, of a piston having upon it inclines, a valve-chest with an arc-shaped valve-seat, a valve acted upon by the inclines and a port for balancing the pressure upon the arc valve, substantially as specified.

Signed by me this 19th day of July, 1897.

GEO. M. GITHENS.

Witnesses:
CHAS. H. SMITH,
S. T. HAVILAND.