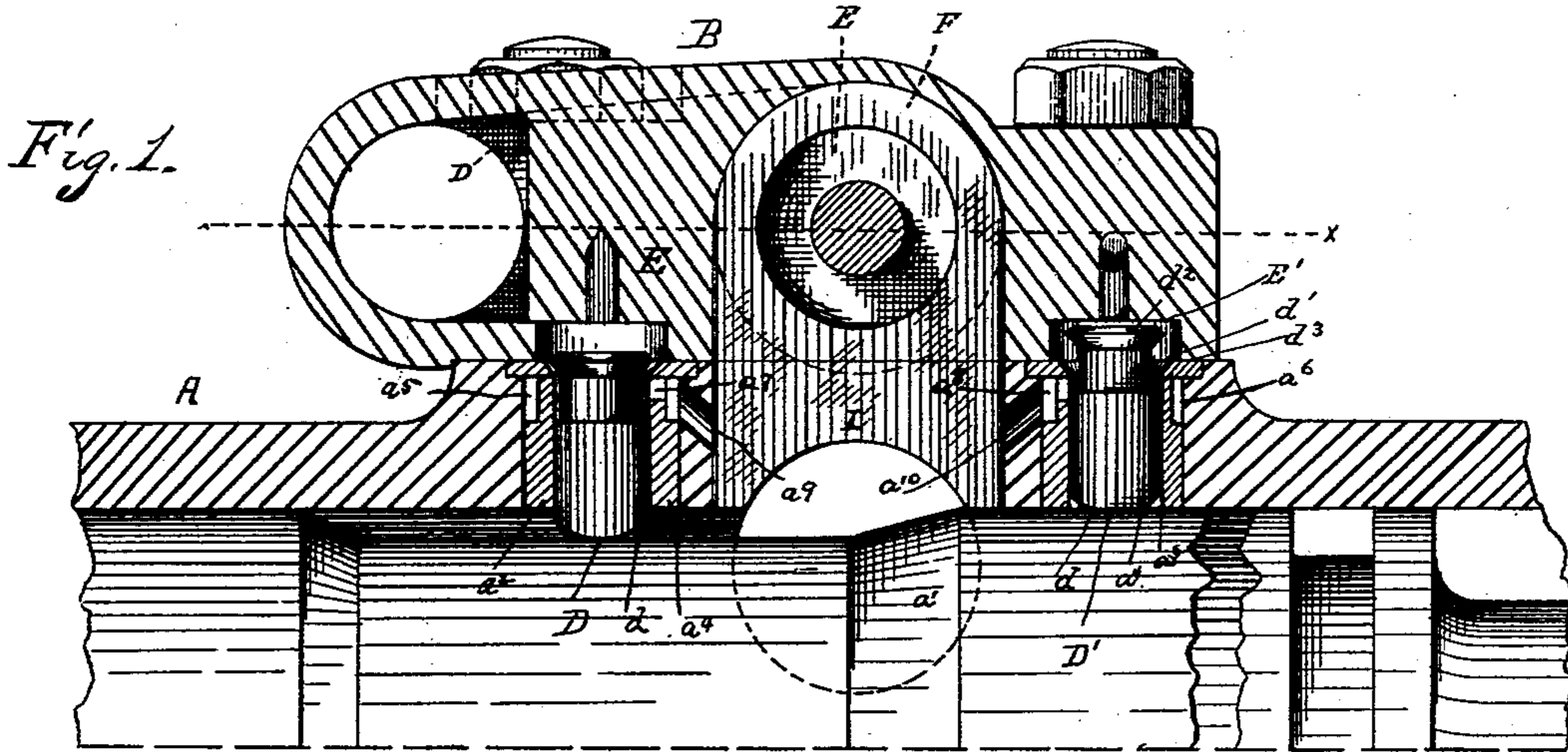


(No Model.)

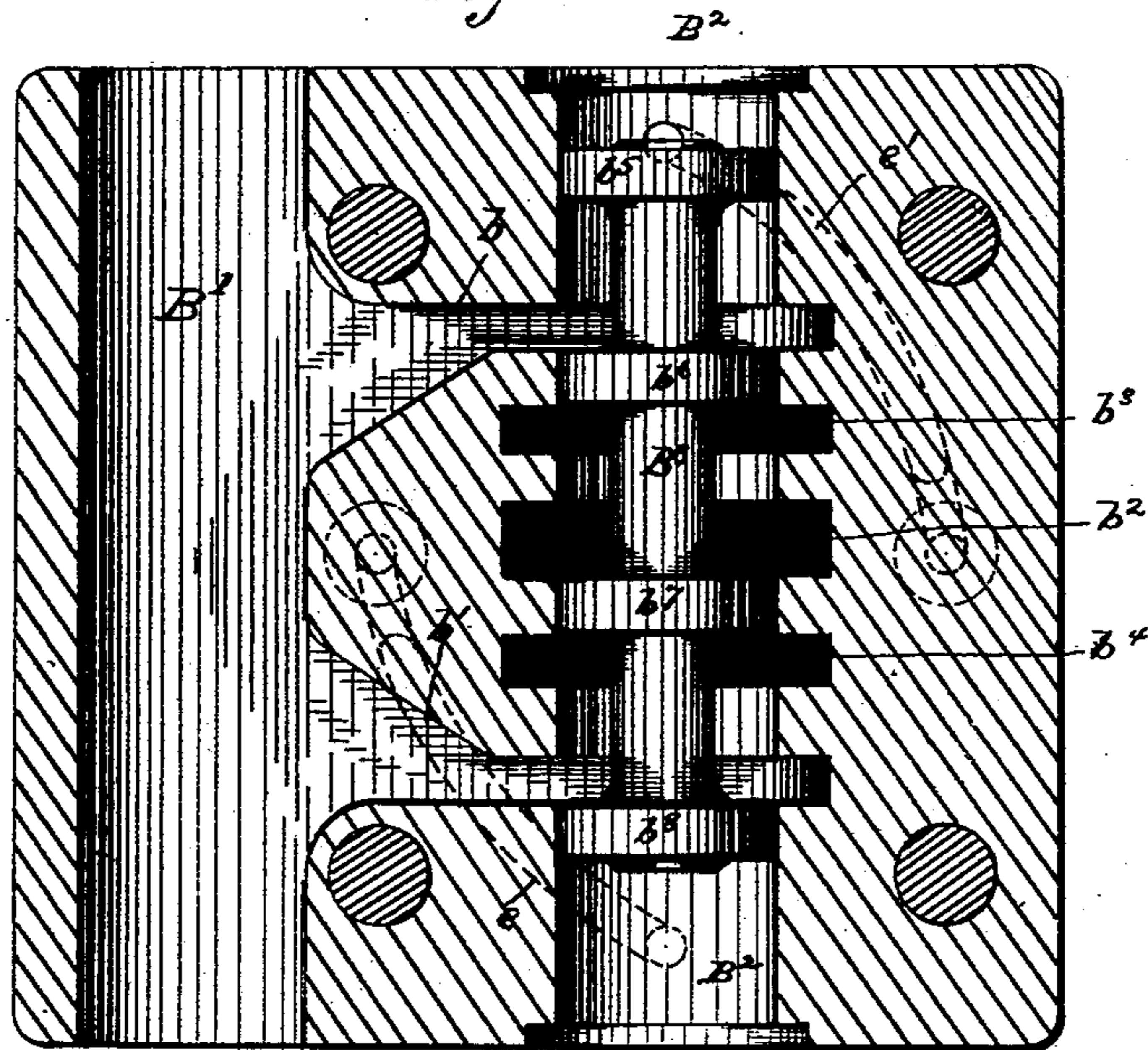
A. J. SYPHER.  
STEAM ROCK DRILL.

No. 405,127.

Patented June 11, 1889.



*Fig. 2.*



WITNESSES  
Howard B. Wyck.  
Edwin R. Miller

INVENTOR  
A. J. Sypher  
by Geo. R. Pyington  
Attorney

# UNITED STATES PATENT OFFICE.

ABRAHAM J. SYPHER, OF IRON MOUNTAIN, MISSOURI.

## STEAM ROCK-DRILL.

SPECIFICATION forming part of Letters Patent No. 405,127, dated June 11, 1889.

Application filed March 9, 1888. Serial No. 266,771. (No model.)

*To all whom it may concern:*

Be it known that I, ABRAHAM J. SYPHER, a citizen of the United States, residing at Iron Mountain, in the county of St. Francois and State of Missouri, have invented certain new and useful Improvements in Steam Rock-Drills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to steam rock-drills.

The object of my invention is to improve the general construction of rock-drills, especially that part that relates to the valve mechanism; and to this end the nature of my invention consists of constructions and combinations, all as will hereinafter be set forth in the specification, and particularly pointed out in the claims, reference being had to the accompanying drawings, in which—

Figure 1 is a longitudinal section; and Fig. 2, a horizontal section on line  $xx$ , Fig. 1.

A is the steam-cylinder, having the usual steam-passages; A', the piston, having the usual inverted inclines  $a\ a'$ ; B, the steam-chest, having a steam-supply port B', shown open at both ends, so that the steam-supply can be secured to either end, the opposite end being closed by a plug; B<sup>2</sup>, a valve-chamber extending transversely across the steam-chest, and closed at each end in the usual manner. It is connected to the steam-supply port by passages  $b$  and  $b'$ , and is provided with exhaust-port  $b^2$  and supply-port  $b^3$  and  $b^4$ .

B<sup>3</sup> is a valve having collars  $b^5\ b^6\ b^7\ b^8$ , for the purpose hereinafter described.

In the wall of the steam-cylinder are openings  $a^2\ a^3$ , having a steel bushing  $a^4$ , provided with an external annular recess to form chambers  $a^5\ a^6$ , communicating by openings  $a^7\ a^8$  with the interior of the bushing, and by openings  $a^9\ a^{10}$  with the exhaust-port B<sup>2</sup>. Placed in the interior of the bushings are steel puppet-valves D D', having their lower ends  $d$  beveled to permit the inverted faces to operate upon the valve without jarring. The upper parts of the valves are reduced in diameter at  $d'$  for a short distance, and are capped by cones  $d^2$ , which form that part of the valve that rests upon the seat  $b^3$  at the top of the bushings.

To permit the valve to operate vertically, chambers E E' are formed in the chest-casting, and are respectively connected by passages  $e\ e'$  (shown in dotted lines, Fig. 2) with the valve-chamber B<sup>2</sup>, as shown, so that the steam will alternately act upon the collars  $b^5\ b^8$  to move the valve, so that the collars  $b^6\ b^7$  will alternately cut off the supply of steam to the steam-supply port.

The operation is as follows: Steam being admitted into the steam-chest B', the main valve B<sup>3</sup> being at the right-hand end of the valve-chamber B<sup>2</sup>, as shown in Fig. 2, the port  $b'$  is open and steam admitted by means of a side pipe (not shown in the drawings) to the top end of the steam-cylinder, forcing the piston downward or outward. When the piston has traveled a certain distance, the incline nearest the back end of the piston will come in contact with and lift the puppet-valve D', forming a direct connection between the left-hand end of valve-chamber B<sup>2</sup> through steam-passage  $e$  and  $a^7$ , connecting with the exhaust I, thereby relieving the pressure on the left-hand end of the valve. The valve B<sup>3</sup> having been relieved of pressure on the left side, the steam will throw said valve to the left-hand end of valve-chamber B<sup>2</sup>, thus bringing the piston-head  $b^7$  past the port  $b^4$ , and by means of the neck or recess in the spool-valve connecting the steam-port  $b'$  and exhaust-port I, exhausting the steam from the top end of the cylinder. At the same instant the piston-head  $b^6$  on main valve B<sup>3</sup> will have moved over and beyond the port  $b^3$ , connecting said port with the steam-passage  $b$ , and by means of the neck or recess in valve B<sup>3</sup> admitting steam through the port  $b^3$  by means of side pipes to the bottom end of the cylinder, forcing the piston upward. When the piston has traveled a certain distance, the incline near the bottom end of the piston will come in contact with and raise the puppet-valve, forming a continuous passage from the end of the valve-chamber through steam-passages  $e'$  and  $a^8$ , connecting the end of the valve-chamber with the exhaust I, thus relieving the steam-pressure on end of valve B<sup>3</sup>, throwing it to the position shown in Fig. 2.

What I claim is—

1. In a steam rock-drill, the combination of a main valve, the valve-chamber having inlet

and outlet ports, and sub ports or passages at or near each end and extending to the exhaust-port, and a puppet-valve in said sub ports or passages and operated by the piston, 5 substantially as described.

2. In a steam rock-drill, the combination of the valve-chamber  $B^2$ , having the supply and exhaust ports  $b^3$ ,  $b^4$ , and  $b^2$ , and the sub ports or passages extending to the exhaust-port, a 10 valve having the collars  $b^5$   $b^6$   $b^7$   $b^8$ , the steam-supply port  $B'$ , having the passages communicating with the valve-chamber, and the puppet-valve in said sub ports or passages  $e$   $e'$  and operated by the piston, substantially 15 as described.

3. In a steam rock-drill, the combination of the cylinder, the puppet-valves having beveled lower ends and annular grooves, the piston having the inverted inclines to operate said 20 puppet-valves, the chamber inclosing the cones, and passages connecting the cone-

chamber with the valve-chamber, and a passage connecting the annular grooves with the exhaust-port, substantially as described.

4. In a steam rock-drill, the combination of 25 the cylinder having the bushings provided with external annular grooves connected by passages with the exhaust-port and the interior of the bushing, the puppet-valves having beveled lower ends and annular grooves 30 and resting upon the bushing, the piston having the inverted inclines to operate said puppet-valves, the chamber inclosing the cone of the puppet-valves, and connected by passages with the ends of the valve-chamber, substan- 35 tially as described.

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

ABRAHAM J. SYPHER.

Witnesses:

GEO. R. BYINGTON,  
LEISY R. MILLER.

It is hereby certified that in Letters Patent No. 405,127, granted June 11, 1889, upon the application of Abraham J. Sypher, of Iron Mountain, Missouri, for an improvement in "Steam Rock-Drills," an error appears requiring the following correction: On page 1, line 51, of the printed specification, the reference letter and figure "b<sup>3</sup>" should read *d*<sup>3</sup>; and that the Letters Patent should be read with this correction therein to make the same conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 18th day of June, A. D. 1889.

[SEAL.]

CYRUS BUSSEY,  
*Assistant Secretary of the Interior.*

Countersigned:

ROBERT J. FISHER,  
*Acting Commissioner of Patents.*