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R. L. AMBROSE.

PRESSURE ACTUATED VALVE FOR ROCK DRILLS.

(Application filed Apr. 19, 1900.)

(No Model.)

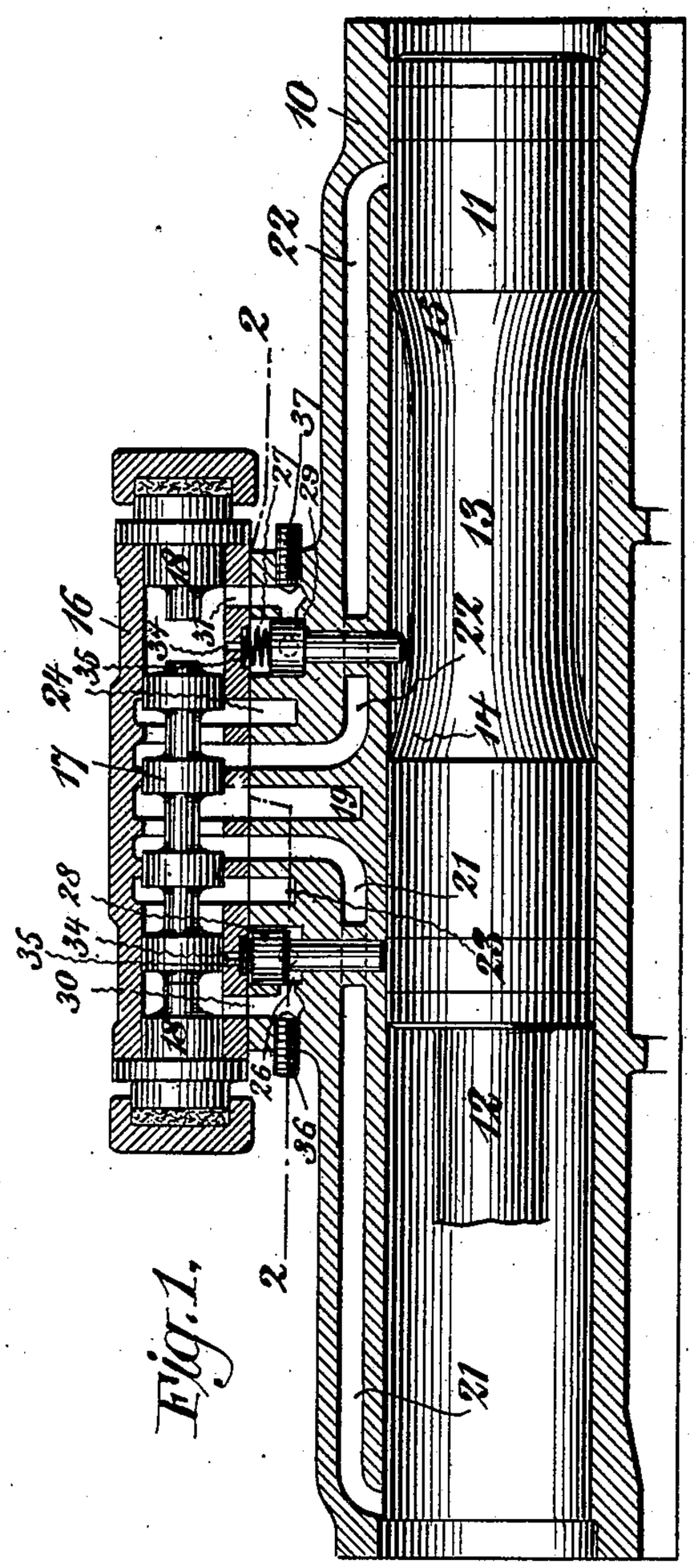

Fig. 1.

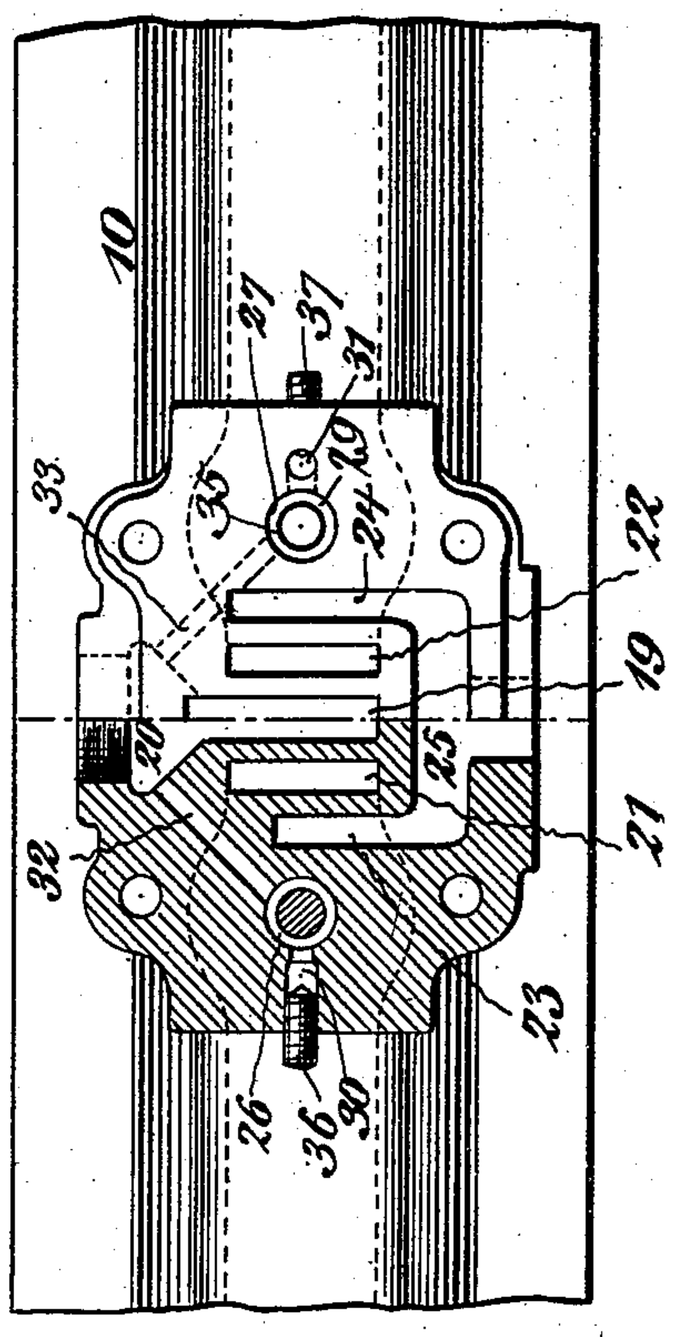

Fig. 2.

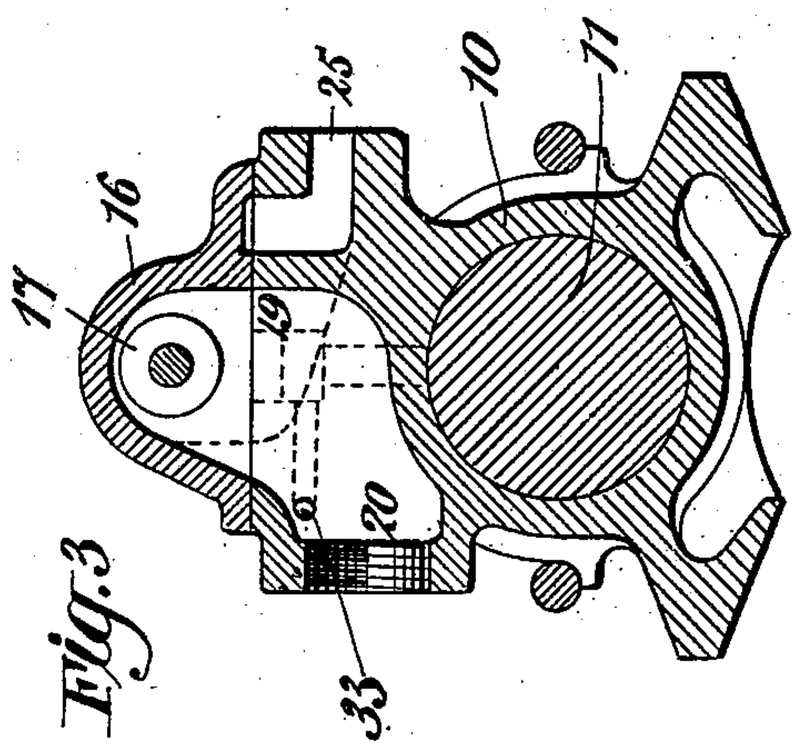

Fig. 3.

WITNESSES:

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PRESSURE-ACTUATED VALVE FOR ROCK-DRILLS.

SPECIFICATION forming part of Letters Patent No. 669,316, dated March 5, 1901.

Application filed April 19, 1900. Serial No. 13,443. (No model.)

To all whom it may concern:

Be it known that I, ROBERT L. AMBROSE, a citizen of the United States, and a resident of Tarrytown, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Pressure-Actuated Valves for Rock-Drills, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to improvements in rock-drills, and particularly to improvements in the valve mechanism of the steam or air engines for operating same.

My invention consists in certain improvements in the valve mechanism and in the disposition of the distributing inlet and exhaust ports of the main cylinder, whereby the valve mechanism may be operated by contact with the piston, but whereby the interior of the cylinder may be free as possible of open or cut-away portions. In carrying out my invention I provide two independently-operated primary valves, which are operated by contact with the piston and which in their operation will control the pressure at the ends of a distributing-valve and cause same to move in one direction or the other, as desired.

My invention further consists in the provision of means for throttling the ports controlled by the movement of the primary valves.

The objects of my invention are to improve the construction of rock-drills, to reduce the wear on the reciprocating piston and in the cylinder, and to regulate the length and speed of the stroke of the piston.

My invention further consists in certain novel details of construction and combination of parts, as shall hereinafter be more fully set forth.

I will now proceed to describe my invention, with reference to the accompanying drawings, and will then point out the novel features in the claims.

In the drawings, Figure 1 represents a central longitudinal section of so much of a rock-drill as is necessary to illustrate my invention. Fig. 2 is a horizontal section looking down upon Fig. 1, the plane of section being taken upon the line 2 2 of Fig. 1. Fig. 3 is a central transverse section of Fig. 1.

Similar reference characters designate corresponding parts in all the figures.

Reference character 10 designates a cylinder of a rock-drill, and 11 a reciprocating piston mounted therein. 12 designates a piston-rod which is suitably secured to or made a part of the said piston, and to the end of this piston-rod (not shown) may be secured the usual or any desired form of drill-head. The piston 11 has a central portion 13, which is of less diameter than the end portions thereof, which fit in the bore of the cylinder. This central or reduced portion rises gradually to the end or head portions of the piston, and the curves which are formed thereby form cam or operating surfaces 14 and 15 for the primary valves in a manner to be presently explained. A valve-chest 16 is secured to the cylinder 10, as by bolting thereto, and within the valve-chest 16 is mounted a distributing-valve 17. The interior of the valve-chest 16 is cylindrically bored, and the valve 17, which is a piston-valve, is fitted thereto. The piston-valve 17 is adapted to reciprocate in the valve-chest 16, and suitable heads 18 are secured to the ends of the valve-chest and form limiting-stops to the movement of the valve.

Suitable ports are provided in the cylinder and valve-chest, and their arrangement is as follows: A central port 19 connects with an exhaust 20 to atmosphere or otherwise. The ports 21 and 22, which lead to the opposite ends of the cylinder 10, as shown, are alternately admission and exhaust ports. The ports 23 24 are the inlet-ports for the motive fluid and are connected together in a chamber 25. A pipe leading from a source of supply of the motive fluid may be connected to this chamber. With the valve in position, as shown in Fig. 1, the inlet-port 24 is in communication with the admission-port 22, leading to the rear end of the cylinder 10, while the port 21, leading from the front end of the cylinder, is in communication with the exhaust-port 19. The piston is ready to make its forward movement. It will be understood, of course, that with the rear cylinder-head (not shown in the drawings) in position the motive fluid, which is compressed between the end of the piston 11 and the said cylin-

der-head at the rearward movement thereof, will give the piston its initial forward movement in a manner well known and common to this type of drill.

The motive fluid which I preferably use and which for the purposes of this description I shall so describe as using herein is compressed air. It will, however, be understood that I may use other motive fluid—such as steam, &c.—as may be desired.

Two cylindrical bores 26 and 27 are arranged in the cylinder-casting 10, and to these cylindrical bores are fitted primary valves 28 and 29. The valves 28 and 29 have each an extension comprising a reduced portion thereof forming a stem, which is fitted to an extension of the cylindrical bores 26 27. These valve-stems pass clear through to the interior of the cylinder 10 and engage with the side of the piston 11. Valves 28 and 29 have a reciprocating movement in their respective cylindrical bores, the relative width of their heads and the depth of the said bores 26 and 27 permitting such movement.

A port 30 leads from the front end of the valve-chest 16 to the interior of the cylindrical bore 26, and a port 31 leads from the rear end of the valve-chest to the interior of the bore 27. A port 32 connects the bore 26 with the exhaust, as shown more clearly in Fig. 2, and a port 33 connects the cylindrical bore 27 with the exhaust in the same manner.

As before stated, the piston-valve 17 is fitted nicely to the interior of the valve-chest 16; but the heads which form the bearing portions thereof are not provided with packing-rings. The consequence is that in action a certain amount of air will always leak past the said heads. A certain amount of air will therefore pass into the ends of the valve-chest in the front and at the rear of the valve. The air which leaks past into the front end of the valve-chest will with the ports in their present position pass down through the port 32 to exhaust. The air which enters the rear end of the valve-chamber will pass into the port 31, but will be cut off from entering the cylindrical bore 27 and from thence passing to exhaust through the port 33 by reason of the fact that the valve 29 is in its lowermost position and the ports 31 and 33 thereby closed. The air under pressure will therefore react upon the end of the valve 17 and will hold the valve in such position as is here shown. The piston 11 will now move forwardly until the cam-surface 15 reaches the stem of the valve 29 and commences to force the same upwardly, and the valve 28 is permitted to fall by reason of its stem riding down the cam-surface 14. The effect of this will be to open the rear end of the valve-chamber to the exhaust through the port 31, the cylindrical bore 27, and the port 33, and to close the front end of the valve-chamber by cutting off communication between the ports 30 and 32 through the cylindrical bore 26. The air now leaking past the piston-valve into the front end of the valve-chamber will react upon the valve and throw it rearwardly. This will place the port 22 to the rear end of the cylinder in communication with the inlet-port 23. The piston will now be moved rearwardly until the position of the primary valves 27 and 28 is again reversed. The valves 28 and 29 are at all times pressed against the said piston 11, in order to engage with the cam-surfaces thereon, by the action of the pressure of the motive fluid above the valves. The motive fluid communicates thereto through the small ports 34, which connect the upper end of the cylindrical bores 26 and 27 with the interior of the valve-chest 16. Springs 35 are also shown as herein provided, which will act to supplement the pressure of compressed motive fluid and will tend to hold the valves in proper position when the supply of motive fluid is turned off and the parts are at rest. These springs might be used alone and connection with the compressed motive supply dispensed with, or the springs might be dispensed with and connection with the compressed motive fluid may be used alone, or both may be used together, as shown herein.

I have shown means for throttling the ports 30 and 31 in the screw-plugs 36 and 37. By adjusting the screws 36 and 37 inwardly, and thereby throttling the exhaust, I am enabled to vary the length of the stroke of the piston.

What I claim is—

1. In a rock-drill, the combination with a cylinder having distributing-ports leading to and from opposite ends thereof, an inlet-port and an exhaust-port, the inlet and exhaust ports being contained within the cylinder-casing but out of communication with the interior of the said cylinder, pressure-chambers arranged at opposite ends of the said distributing-valve, each of the said chambers having a port leading to exhaust, two independent primary valves for said ports arranged in the cylinder-casing and projecting into the interior of the said cylinder, and a reciprocating piston having a reduced central shouldered portion, said primary valves arranged at such a point in the cylinder as to be always covered by the piston during its movements and to be operated by engagement with the central shouldered portion thereof.

2. In a rock-drill, the combination with a cylinder, a reciprocating piston and a distributing balanced slide-valve, of two independent primary valves operated by the piston in its movement, pressure-chambers arranged at opposite ends of the said distributing-valves, each of the said chambers having a port leading to exhaust, the said primary valves adapted in their movement to open and close the said ports, and means independent of the primary valves for throttling the said ports.

3. In a rock-drill, the combination with a cylinder, a reciprocating piston mounted therein, a valve-chest secured to the said cylinder, and a distributing balanced slide-valve

mounted in the said valve-chest, of two independent primary valves operated by the reciprocating piston in its movement and adapted in their movement to control the exhaust of motive fluid from the opposite ends of the valve-chest, and means independent of the primary valves for regulating the movement of the balanced slide-valve.

4. In a rock-drill, the combination with a cylinder, of a reciprocating piston mounted therein, and a valve-chest secured to said cylinder, the said cylinder and valve-chest having distributing-ports for the admission and exhaust of motive fluid to and from the interior of the cylinder, and the said valve-chest having also ports leading from the ends thereof to exhaust independent of said distributing-ports, of a main distributing-valve mounted in the said valve-chest and adapted to control the inlet and exhaust of motive fluid along the said distributing-ports, two primary valves operated by the said reciprocating piston in its movement, and means independent of the primary valves for throttling the said ports leading from the ends of the valve-chest.

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Witnesses:
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