No. 643,077. Patented Feb. 6, 1900.

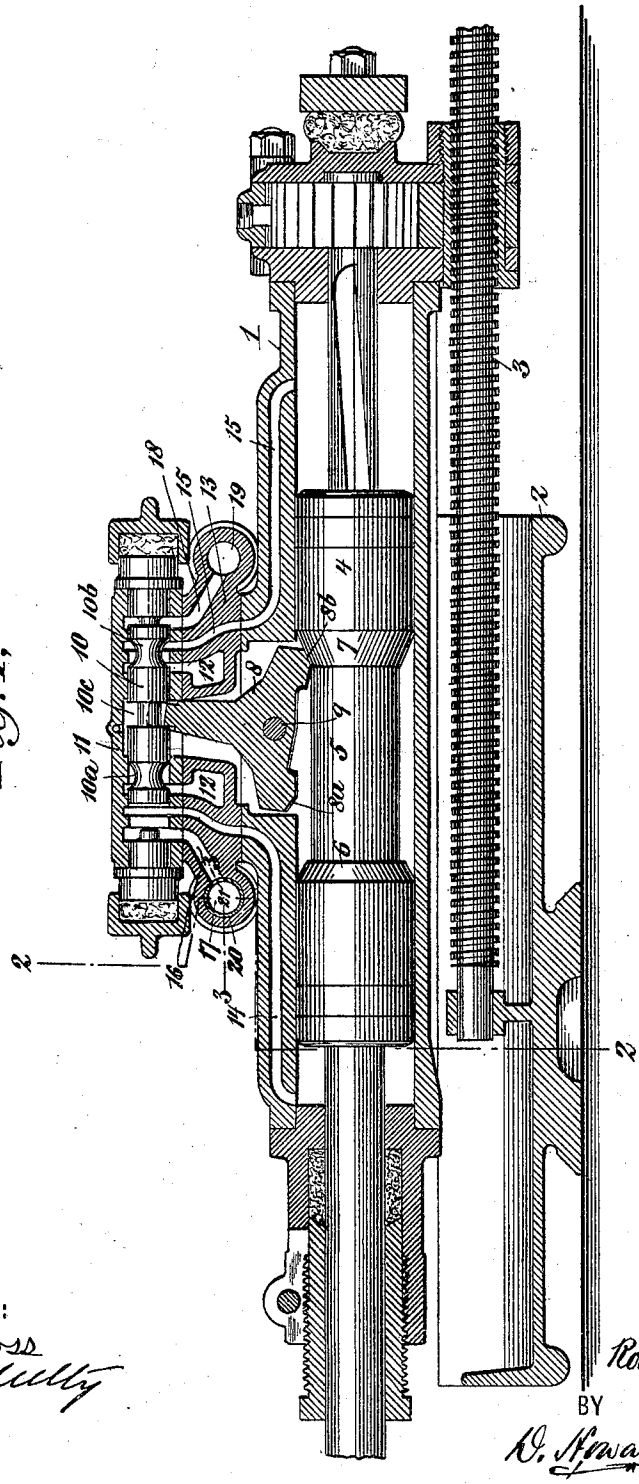
R. L. AMBROSE.

ENGINE FOR ROCK DRILLS.

(Application filed Feb. 16, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



WITNESSES:

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Fig. 3.

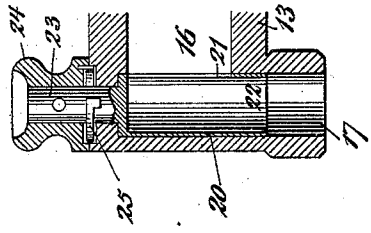


Fig. 5.

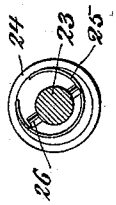


Fig. 6.

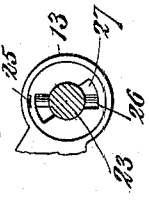


Fig. 4.

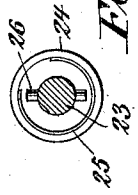
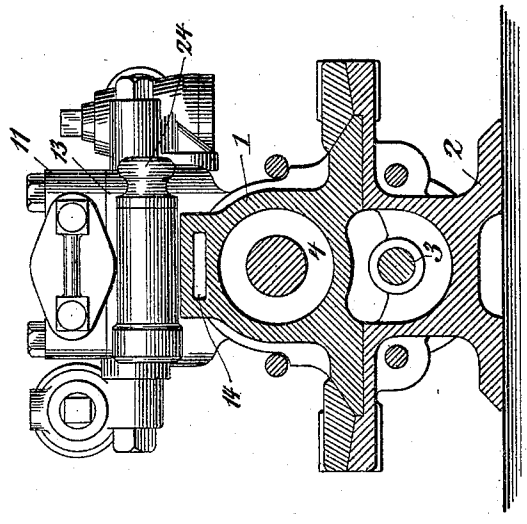


Fig. 2.



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ENGINE FOR ROCK-DRILLS.

SPECIFICATION forming part of Letters Patent No. 643,077, dated February 6, 1900.

Application filed February 16, 1899. Serial No. 705,620. (No model.)

To all whom it may concern:

Be it known that I, ROBERT L. AMBROSE, a citizen of the United States of America, and a resident of North Tarrytown, in the county of Westchester and State of New York, have invented a new and useful Improvement in Engines 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 the valve-operating mechanism for rock-drill engines; and it consists in the provision of means for operating the valve controlling the admission and exhaust of the motive fluid to and from the cylinder independent of the means employed normally or when a drill is running under normal conditions.

The object of my invention is to permit short strokes to be made by a reciprocating piston.

In rock-drilling the use of short strokes at certain times is of great advantage. In drilling a hole it is always better to start with a short stroke, no matter what the conditions. Should it be desired to drill a hole otherwise than perpendicular to the surface, the use of a short stroke would obviate the necessity of "pointing off." Again, should a drill become jammed a few short strokes might readily clear it.

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

Figure 1 is a central longitudinal section of a portion of a rock-drill embodying my invention. Fig. 2 is a transverse section of same, the plane of section being taken on the line 2 2 of Fig. 1. Fig. 3 is a detail view, in horizontal section, of the valve employed, the plane of section being taken on the line 3 3 of Fig. 1. Figs. 4 and 5 are details in transverse section of portions of the said valve, illustrating certain details of construction. Fig. 6 is a detail taken on the same line of section, but viewed from the opposite direction.

Similar reference characters designate corresponding parts in the several figures.

Reference-numeral 1 designates the cylinder of a rock-drill of the reciprocating type; 2, the shell upon which same is mounted; 3, the feed-screw, operated in the usual or any desired manner.

4 designates the reciprocating piston, having the usual contracted central portion 5 and the beveled shoulders 6 and 7 for operating the tappet or rocker which normally controls the valve.

8 designates the rocker or tappet, pivoted at 9 in an opening in the cylinder-casting.

10 designates a reciprocating valve, which is here shown of cylindrical form and which fits in the valve-chamber 11, in which it is arranged to reciprocate.

12 12 are the admission-ports for the motive fluid. The motive fluid commonly used with this type of drill is compressed air, and for convenience I will refer to the said motive fluid throughout the specification as "compressed air;" but I do not wish to be limited to the use of same, as I may use other motive fluids—such, for instance, as steam. The ports 12 12 unite in a common passage-way in the intermediate casting 13, and from there pass to an admission-valve 14, to which a compressed-air hose is attached. I have not shown this in detail in the drawings, as it forms no part of my invention.

14 is an inlet-port connecting with the front end of the cylinder and the valve-chamber, and 15 is an inlet-port connecting with the rear end of the cylinder and the valve-chamber.

16 is an exhaust-port discharging to the outer atmosphere at 17, and 18 is an exhaust-port discharging to the outer atmosphere at 19.

The reciprocating cylindrical valve 10 is provided with two annular grooves 10^a and 10^b, which alternately connect the ports 14 or 15 with their respective inlet-ports or exhaust-ports. The valve is further provided with a central annular groove 10^c, which is adapted to engage with one arm of the rocker or tappet 8. The rocker is further provided with two extending arms having beveled faces 8^a 8^b, which engage the aforementioned beveled shoulders 6 and 7 on the piston 4.

When the parts are in the position as shown

in Fig. 1, air is being admitted through the port 15 to the rear of the cylinder and the piston is moving forward. It has almost reached the completion of its stroke. The compressed air from the other end of the cylinder is being exhausted through the ports 14 16 to the atmosphere at 17. Upon the further movement of the piston the rocker, by reason of the contact of the beveled face 8^b with the beveled shoulder 7, will partially rotate upon its pivot 9. The valve 10 will be moved forward, closing the admission of air to the port 15 and opening said port to the exhaust 18. At the same time it will close the exhaust 16 and open the admission 12 to the port 14, allowing the compressed air to enter the front end of the cylinder. This will cause a return movement of the piston, and under normal conditions the piston will continue to return until the beveled shoulder 6 strikes the beveled face 8^a of the rocker or tappet 8. I, however, provide an independent short-stroke contrivance containing a cushioning device. The cushioning device is so arranged as to apply, when required, an elastic pressure to move the reciprocating valve intermediate of a full stroke of the piston. The cushioning action is preferably applied directly to the front of the reciprocating valve and may be applied in any manner desired and by any suitable mechanism. I have shown and will now describe an elastic-pressure controller comprising a valve by the manipulation of which pressure is caused to accumulate or to be released, according to which way the valve is turned. The position of the said valve hence controls the fluid-pressure, which when caused to accumulate by the operation of the valve or pressure-controller in one direction will move the reciprocating valve and when released by the operation of the valve or pressure-controller in the other direction will cause the reciprocating valve to be moved only by the action of the tappet or rocker.

20 is the elastic-pressure controller in the form of a hollow cylindrical valve mounted in the discharge end of the exhaust-port 16. This valve is provided with a port 21, normally in register with the exhaust-port 16 and is open at the end 22, so that the exhaust-air will pass freely through same. If now the said valve 20 be rotated so that the port 21 will be out of register with the port 16, the air in the front of the piston and that which is contained in the port 14, the front end of the valve-chamber, and the port 16 will be prevented from exhausting to the atmosphere. Now, therefore, if the said valve 20 be rotated at about the time the other parts are in position shown in Fig. 1 a further forward movement of the piston and the reciprocation of the valve 10 to the other end of the valve-casing consequent thereupon, as previously explained, will further compress the air, which is locked from escape, and an elastic pressure will be applied to the forward end of the valve 10, so that when the piston 4 shall begin its rearward movement and free the end of the tappet 8 the valve 10 will be forced rearwardly and the admission-port 15 again opened. The above series of operations will be repeated so long as the valve 20 remains closed, the piston 4 making a series of short and rapid strokes until upon the rotation of the valve 20, so as to bring the ports 21 16 again in register, the elastic pressure in front of the piston 10 is removed. The valve will then only be moved by the tappet which is operated by the piston at or near the end of a full stroke in either direction, and the piston will be permitted to make said full strokes.

I preferably provide the valve 20 with a stem 23, upon which is secured a head 24, which may be conveniently grasped by the fingers for causing the rotation of the said valve. I also provide a spring one end of which engages with the valve's stem or head and the other end of which engages the intermediate casting 13. The tension of the spring keeps the valve so that the ports 21 and 16 are in register. It is thus necessary to hold the valve in its closed position when it is desired to make short strokes. This is of course not an essential part of my invention, but it is a form of construction which I have found most suitable. I have also found thus far that enough air would leak past the valve to compensate for the slight additional amount of air taken in upon each short return stroke; but, if desirable, I may provide a suitable stop, so that the valve could not be entirely closed, thereby leaving whatever space might be necessary to exhaust the surplus air; but such opening would of course not be large enough to interfere with the necessary compression in order to apply the elastic pressure to the front of the reciprocating valve. Such limiting-stop is shown in the drawings as a pin 26, carried by the valve and which moves in a recess 27 in the casting 13. Said pin will limit the movement of the valve in either direction by striking the end walls of the recess 27. The throttle-valve 14 may conveniently be used when the short-stroke valve 20 is operated to modulate the force of the blow as well as the length of the stroke.

I do not wish to be limited to the precise form or combination of parts or the exact details of construction as herein shown and described, as they may obviously be varied within wide limits without departing from the spirit and scope of my invention.

What I claim is—

1. In a rock-drill, the combination with a cylinder, a piston, and a valve for controlling the admission and exhaust of the motive fluid thereto, of mechanism for reversing the position of the valve at or near the end of each stroke of the piston, and an independent short-stroke contrivance forming a cushioning device by means of which the position of the valve may be reversed at a point in the stroke

intermediate of the points at which reversal of the valve by the main-valve-operating means is produced, substantially as specified.

2. In a rock-drill, the combination with a cylinder, a piston, and a valve for controlling the admission and exhaust of the motive fluid thereto, of means operated by the piston to move the valve at or near the end of a full stroke of said piston, and an elastic-pressure controller, by the manipulation of which, pressure is applied to move the valve intermediate of the full stroke of the piston, substantially as specified.

3. In a rock-drill the combination with a cylinder, a piston, and a valve for controlling the admission and exhaust of the motive fluid thereto, of a rocker or tappet operated by the piston to move the valve at or near the end of a full stroke of the piston, and an elastic-pressure controller, by the manipulation of which, pressure may be applied to the valve to move same intermediate of a full stroke of the piston, substantially as specified.

4. In a rock-drill the combination with a cylinder, a piston and a valve for controlling the admission and exhaust of the motive fluid thereto, of a rocker or tappet operated by contact with the piston to move the valve at or near the end of a full stroke of the piston, and an elastic-pressure controller by the manipulation of which, pressure, applied by the movement of the piston, may be applied independently of the action of the said piston on the rocker to the valve to move same intermediate of the full stroke of the piston, substantially as specified.

5. In a rock-drill, the combination with a cylinder, a piston, and a valve for controlling the admission and exhaust of the motive fluid thereto, of means operated by the piston at the end of its stroke to move the valve in one direction, and means whereby an elastic pressure may be applied to move the valve in the opposite direction prior to its completion of a full stroke and immediately upon its release from the action of the piston-operated means, substantially as specified.

6. In a rock-drill, the combination with a cylinder, a piston, and a valve for controlling the admission and exhaust of the motive fluid thereto, of a rocker or tappet operated by the piston at the end of its stroke to move the valve in one direction, and means whereby an elastic pressure may be applied to move the valve in the opposite direction, prior to its completion of a full stroke and immediately upon its release from the action of the tappet, substantially as specified.

7. In a reciprocating engine the combination with a cylinder, a piston and a distributing-valve, of ports for the admission and exhaust of the motive fluid to and from the cylinder and means for closing the exhaust at one end of the cylinder independently of the distributing-valve, whereby the compression of the motive fluid will move the said distributing-valve, substantially as specified.

8. In a reciprocating engine the combination with a cylinder, a piston, and a reciprocating valve, of ports, for the admission and exhaust of the motive fluid to and from the cylinder, controlled by said valve and an independent valve arranged in the exhaust-port whereby the said exhaust-port may be closed independent of the reciprocating valve to shorten the stroke of the engine, substantially as specified.

9. In a reciprocating engine the combination with a cylinder and a piston of an inlet for the motive fluid, two admission-ports for admitting the motive fluid to the front or rear of the said piston in the cylinder as the said ports are alternately connected with the said inlet, two exhaust-ports for exhausting the said motive fluid as the said exhaust-ports are alternately connected with the respective admission-ports, a reciprocating valve for alternately connecting the said admission-ports with the inlet, and with the exhaust, and an independent valve provided in one of said exhaust-ports, whereby the compression of the motive fluid will move the said reciprocating valve substantially as specified.

10. In a reciprocating engine the combination with a cylinder, a piston and a reciprocating valve, of ports, for the admission and exhaust of the motive fluid to and from the cylinder controlled by said valve, an independent valve arranged in the exhaust-port, whereby the compression of the motive fluid will move the said reciprocating valve and stops for limiting the movement of the valve whereby sufficient opening is left when the valve is in closed position to permit the escape of superfluous motive fluid, substantially as specified.

11. In a reciprocating engine the combination with a cylinder, a piston, a valve-chamber having a cylindrical bore, a cylindrical piston-valve adapted to reciprocate therein and admission and exhaust ports, of an independent valve arranged in one of said exhaust-ports and a communication between the said exhaust-port and the valve-chamber in front of the cylindrical piston-valve whereby the compression of the motive fluid will move said cylindrical valve substantially as specified.

12. In a reciprocating engine the combination with a cylinder, a piston, a valve-chamber having a cylindrical bore, a cylindrical piston-valve adapted to reciprocate therein, and admission and exhaust ports, of a rocker operated by the said piston, to move the valve at or near the end of a full stroke of the piston, and an independent valve arranged in one of said exhaust-ports, whereby the compression of the motive fluid will move the said cylindrical piston-valve independently of said rocker, substantially as specified.

13. In a rock-drill the combination with a cylinder, a piston, a valve-chamber having a cylindrical bore, a cylindrical piston-valve adapted to reciprocate therein, and admission

and exhaust ports of a rocker operated by the said piston to move the valve at or near the end of a full stroke of the piston, and an independent valve, arranged in one of the exhaust-ports, said valve being spring-actuated in one direction whereby same is normally held open, but adapted to be closed against the tension of said spring when desired to close the said port independently of the said rocker substantially as specified.

14. In a rock-drill, the combination with a cylinder, a piston, and a valve for controlling the admission and exhaust of the motive fluid thereto, of means operated by the piston to move the valve at or near the end of a full stroke of said piston, an elastic-pressure controller, by the manipulation of which, pressure is applied to move the valve intermediate of the full stroke of the piston, and means for automatically returning the elastic-pressure controller to its normal "out-of-operation" position.

15. The combination in a rock-drill with a cylinder, a piston, a distributing-valve and valve-gear for same, of a short-stroke-controlling device having means for automatically throwing it to its "out-of-operation" position when released.

ROBERT L. AMBROSE.

Witnesses:
W. S. BARNUM,
FRED. M. HITCHCOCK.