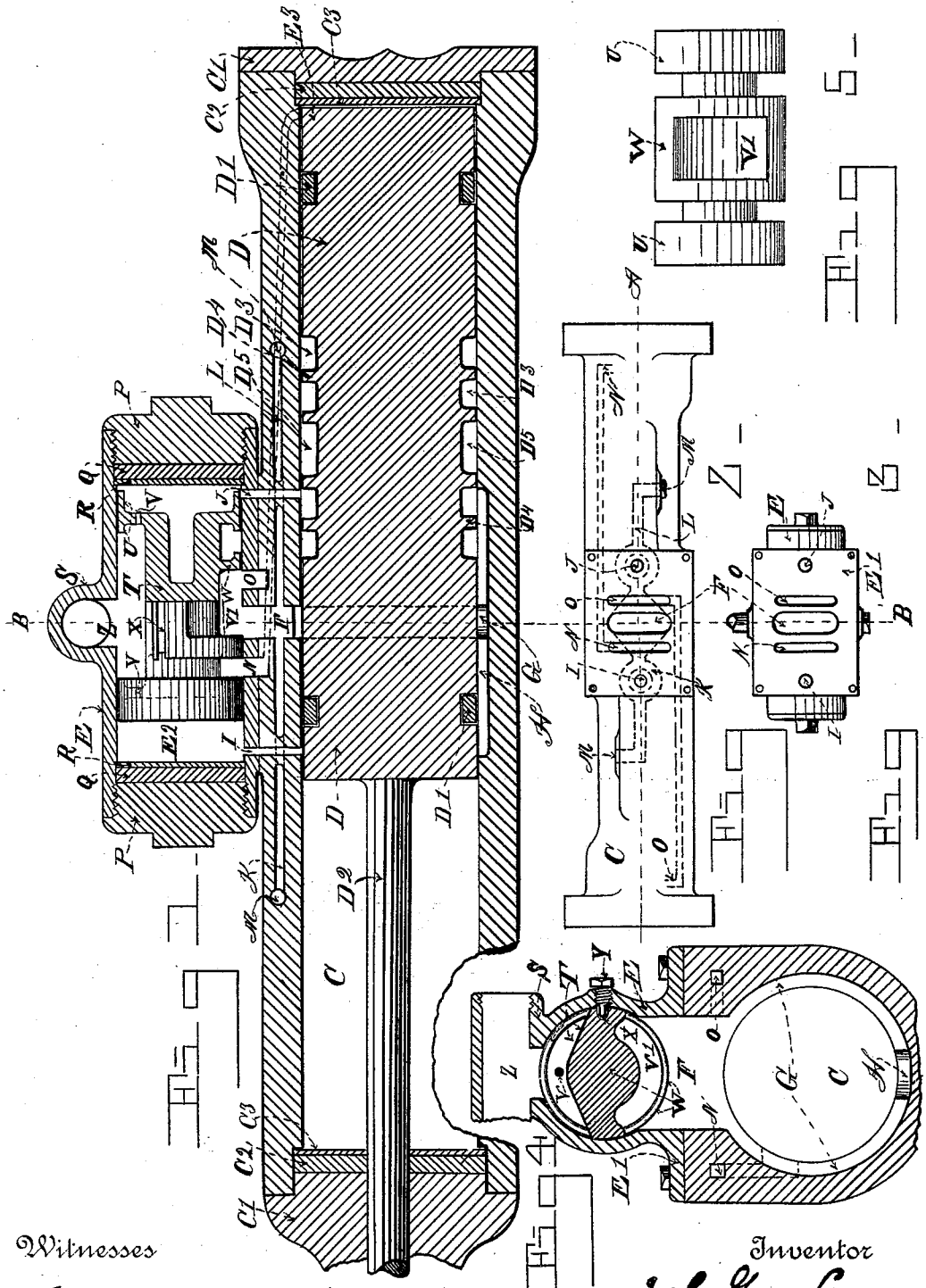
(No Model.)

J. G. LEYNER.

DIRECT ACTING ENGINE.

No. 508,430. Patented Nov. 14, 1893.



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DIRECT-ACTING ENGINE.

SPECIFICATION forming part of Letters Patent No. 508,430, dated November 14, 1893.

Application filed December 19, 1892. Serial No. 455,676. (No model.)

To all whom it may concern:

Be it known that I, JOHN GEORGE LEYNER, a citizen of the United States of America, residing at Denver, in the county of Arapahoe and State of Colorado, have invented certain new and useful Improvements in Direct-Acting Engines; and I do 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, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in direct acting engines generally, and particularly to rock drills in which the valve is operated by pressure applied and relieved alternately to its ends, the opposite ends of the valve cylinder being connected directly or indirectly with the atmosphere by the reciprocating action of the piston.

The objects of my invention are, first, to provide a balanced valve; second, to provide a valve that will automatically cushion the piston on the back stroke; third, to provide a valve that will assure positive action of the piston in all positions. I attain these objects by the mechanism illustrated and described in the accompanying drawings and specification, in which—

Figure 1 represents a longitudinal vertical section through the center of a cylinder, valve chest, and a piston head and rod, showing my improved valve partially in section and partially in elevation, the section being taken through the center of Fig. 2 on line A. Fig. 2 represents a plan of same with valve chest removed to show the direction of the ports. Fig. 3 represents a bottom view of the valve chest. Fig. 4 represents a transverse vertical section through Figs. 1, 2 and 3 on line B. Fig. 5 represents a bottom view of the valve.

Similar letters refer to similar parts throughout the several views.

Referring to Fig. 1, C designates a cylinder which is provided with heads C′, rubber buffers C^2, and washers C^3, these being part of the usual equipment of a rock drill cylinder. The cylinder is fitted with a piston D, which is provided with the usual packing rings D′, and a piston rod D^2, which usually forms a part of the piston, and which extends through the front head and is adapted to receive the drill. On the body of the piston D, I form a number of circumferential grooves D^3, five being preferably shown, the central one, D^5, being wider than the others. The said grooves naturally form a number of collars D^4, which operate in conjunction with the valve and ports in a manner which will be hereinafter fully described.

E, designates a cylindrical valve chest formed with a bottom flange E′ which is secured by bolts to a raised flat surface in the center of the cylinder C. The exhaust port F, is located centrally in the bottom of the valve chest and extends directly through into the cylinder, and into a circumferential recess G formed in the bore of the same. In the bottom of said cylinder this recess is intersected by a recess H, crossing it and extending along the bottom of the cylinder to a point even with the valve cylinder exhaust ports I and J, which like the exhaust port F, extend from the chest directly into the cylinder. Two passages, K and L, lead from the exhaust port to the atmosphere. They pass around the holes I and J to the openings M, either one of which may be used, and the other closed, as shown in Fig. 2.

N, and O, designate the induction ports. The induction port N, which is in the front end E^2, of the valve chest, passes around the exhaust port F, see Fig. 2, to the rear end E^3, of the cylinder, while the induction port O, which is the rear port of the valve chest, leads to the front end of the cylinder. This arrangement of the ports enables me to secure quick and positive action on the rear end of the piston before the valve starts, which is of great value, especially when drilling up holes. It also operates to cushion the piston as the port N, is opened a trifle before the piston completes its back stroke. The valve chest E, is bored completely through from end to end. The ends are slightly counterbored and threaded to receive the threaded chest heads P, which are provided with a hub adapted to receive a wrench to turn the said heads into place. A rubber buffer Q, and a metal plate R, are secured to the inner end of each head.

They operate to cushion the valve at each end of its stroke. At the top of the valve chest an inlet hub S, is arranged transversely to the axis of the chest and opens into the top of the valve cylinder. The valve T has cylindrical flanged ends U, fitting closely the valve chest. Through the web of each end is drilled a small hole V, forming direct communication between the steam space of the valve and the ends of the valve chest. The central portion of the valve, W, is in the form of a semicircle which coincides with the ports of the chest, it being provided centrally in the bottom with an exhaust recess V'. Between this central portion and the ends U, recesses or ports are formed with flanged edges through which steam or air passes to the induction ports N, and O with which they alternately coincide. It will be noticed that the form of the central portion of the valve gives a large steam space between its ends. A slot X is formed in one side of the semicircular portion W, parallel with the axis of the valve. In this slot extends the end of a screw or pin Y, which is secured centrally in the side of the valve chest. It operates to keep the valve in alignment with the ports as it reciprocates in the valve chest.

The operation is as follows: The elastic fluid enters the steam chest through the opening Z into the central portion of the valve which it surrounds. It then enters the cylinder through the ports N, and O, and leaves the cylinder by the way of one of these ports into the exhaust port V', of the valve, and through the exhaust port F, to the atmosphere, the operation so far being similar to all common engines. The most important feature however, of my valve is the fact that it always occupies the same end of the chest as the piston does of the cylinder, as shown in Fig. 1, which is accomplished by the novel arrangement of ports herein illustrated.

By reference to Fig. 1 it will be noticed that the valve is at the extreme end of its back stroke and also that the piston is in the same position. The induction port N, which is the front port in the chest and which leads to the rear end of the cylinder is wide open, which allows the fluid to act immediately on the piston, forcing it forward. Meanwhile the said fluid is passing through the little holes V of the valve into both ends of the valve chest, and as it cannot escape owing to both exhaust ports I and J being closed, one by the valve itself and the other by the piston, the valve is balanced, and consequently stationary, and remains so until the piston moves forward and the circumferential recesses D^3, and collars D^4, of the piston quickly uncover and close the exhaust port J, as they pass it, which operates to relieve that end of the valve of pressure gradually, until it reaches the central recess D^5, which being larger, completes the exhaust, and gives a quick but easy stroke to the valve, which is now forced by pressure on its opposite end to make its stroke. The expansive fluid which flows through the port I, into the said recesses D^3, of the said piston, enters the longitudinal recess H, formed in the bottom of the cylinder bore, and flows from it through the circumferential recess G to the exhaust port F, and thence to the atmosphere. It is obvious that the valve always occupies the same end of the valve chest as the piston does that of the cylinder, and that the piston moves before the valve, and controls the action of the valve, which is balanced. This insures positive action of the piston in all positions, and prevents any possibility of the piston failing to act, either in an up or down hole, which is a great fault in the rock drills and sinking pumps at present in use.

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

1. A valve having cylindrical flanged ends fitting closely a cylindrical valve chest and a semicircular flanged central portion adapted to coincide with the ports of said chest, and provided with an exhaust recess having semicircular recesses or ports formed between the said central portion and the said ends, arranged to coincide alternately with said ports and having through the web of said flanged ends a hole or holes adapted to make fluid connection between the center of the valve and ends of chest, and having a slot formed in the side of the central portion of the valve and a pin or screw extending through the side of said chest freely into said slot to preserve its alignment, as herein specified.

2. The combination in a cylindrical valve chest provided with threaded heads adapted to screw into each end, and buffers operating as cushion for the valve, and ports leading to the cylinder and atmosphere, a valve chest exhaust ports, with a valve having cylindrical flanged ends fitting closely the said chest and reciprocating therein on a screw or pin attached to the said chest and extending into a slot formed in the side of said valve operating to preserve its alignment in the chest; having a hole through each end of the valve communicating with the ends of said chest, and a semicircular flanged body and recesses adapted to coincide with the port of said chest, as herein specified.

3. A cylinder having a circumferential recess in its bore connecting with the exhaust port, and a longitudinal recess in the bottom intersecting the said circumferential recess, as specified.

4. The combination with a cylinder having a circumferential recess in its bore connecting with the exhaust port, and a longitudinal recess in the bottom intersecting the said circumferential recess, a piston having a number of circumferential grooves and a number of collars between said grooves, and exhaust ports communicating with the said cylinder and the ends of the valve chest, and a valve

arranged to move by pressure acting on its end, as herein specified.

5. The combination with a cylinder and valve chest, a circumferential recess in the bore of the cylinder connecting with the exhaust port, and a longitudinal recess in the cylinder intersecting the same, and extending even with exhaust ports connecting the cylinder with the valve chest; of induction ports having the front port of the valve chest lead to the rear end of the cylinder and the rear port of said chest lead to the front end of the cylinder, of a piston having a number of circumferential grooves and collars, of a valve having cylindrical flanged ends fitting closely a cylindrical valve chest and holes through the webs of said ends, and a semi-circular central portion adapted to coincide with said ports, and a screw projecting through the chest into a slot in the side of said valve, all arranged as, and for the purpose specified.

6. The combination and arrangement of the induction ports N, and O, the main exhaust port F, and cylinder recesses G, and H, the valve chest exhaust ports I and J and the circumferential grooves D^3 and collars D^4, of the piston D and the valve T, and the chest E, the combination operating to positively start the piston while the valve is stationary, to balance the valve, to operate the valve automatically, and to cushion the piston, as herein specified.

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

JOHN GEORGE LEYNER.

Witnesses:

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