J. SLORACH.

VALVE DEVICE.

APPLICATION FILED OCT. 19, 1908.

961,173.

Patented June 14, 1910.

Fig I

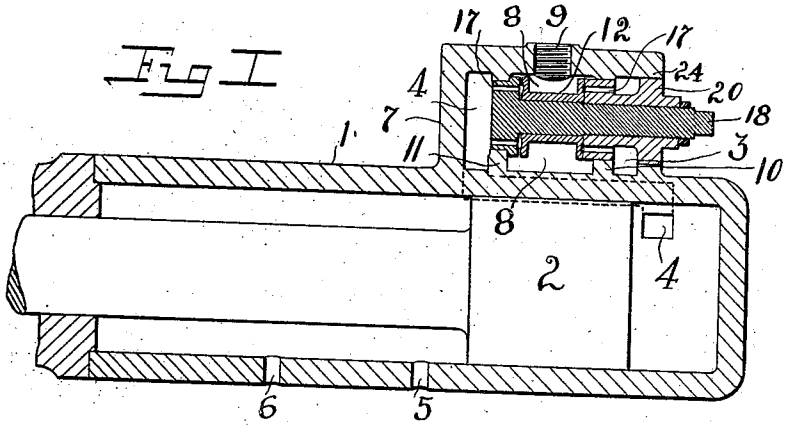
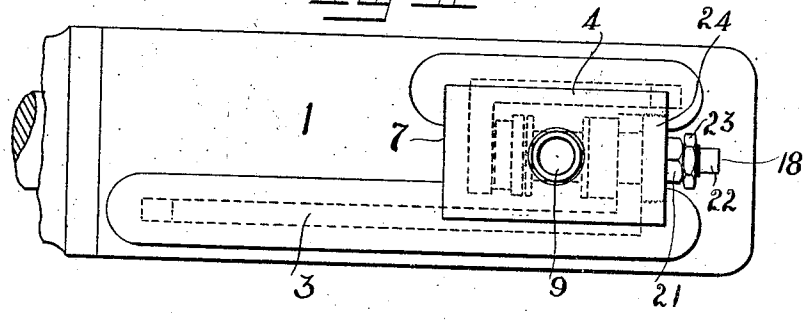


Fig II



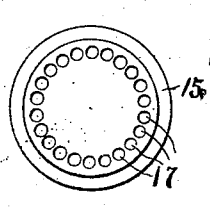


Fig IV

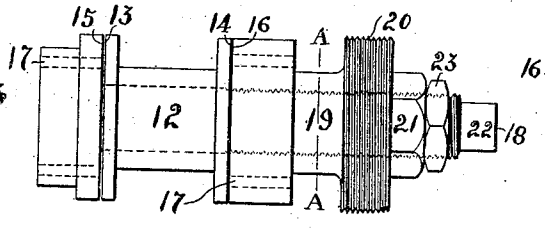


Fig III

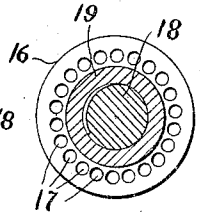


Fig V

Witnesses
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UNITED STATES PATENT OFFICE.

JOHN SLORACH, OF CLEVELAND, JOHANNESBURG, TRANSVAAL.

VALVE DEVICE.

961,173. Specification of Letters Patent. Patented June 14, 1910.

Application filed October 19, 1908. Serial No. 458,424.

To all whom it may concern:

Be it known that I, JOHN SLORACH, engineer, a subject of the King of Great Britain, residing at Geldenhuis Estate and Gold Mining Company, Cleveland, Johannesburg, Colony of the Transvaal, have invented certain new and useful Improvements in Valve Devices for Direct-Acting Engines, of which the following is a specification.

Direct acting engines for rock drilling and other purposes are known in which the piston, on approaching either end of its stroke, first closes an exhaust port in the cylinder wall and then compresses the remaining working fluid (hereinafter referred to as air) between itself and the cylinder cover. Such compressed air is forced up the induction port for the cylinder end in question, and forces a distributing valve from off the mouth of said port and causes it to close the mouth of the similar induction port provided for the other end of the cylinder, such last named end having already been exhausted through a cylinder wall port. Live air thus passes through the open induction port and drives the piston on its return stroke; upon completion of which the distribution of air is reversed by a similar operation to that described.

It is the purpose of the present invention to provide, for an engine of the type specified, a novel form of valve device in which the valve is so constructed as to provide a large area available both for moving the valve and passing air to the cylinder, so that the travel of the valve may be very short, and the efficiency of the machine thereby increased; in which the valve travel may be varied as may be necessary for the reasons hereafter stated; and by which the starting of the machine in any position is assured.

A rock drilling engine embodying the improved valve is shown in the accompanying drawings, in which—

Figure I is a longitudinal section of the engine, Fig. II a plan thereof, Fig. III is an enlarged elevation of the valve detached, and Fig. IV is a view of the left hand end thereof, and Fig. V is a section on the plane A—A Fig. III looking toward the left.

1 represents the cylinder with the piston 2 working therein.

3 and 4 are the induction ports to the front and rear ends respectively of the cylinder.

5, 6, are exhaust ports leading from the cylinder bore directly to the atmosphere.

Positioned longitudinally upon the cylinder is the valve chest 7 which includes the chamber 8 to which live air is supplied through inlet 9, and the terminals of the induction ports 3 and 4 which are separated from chamber 8 by the walls 10 and 11. The induction port 3 from the front of the cylinder is carried to the rear of the valve chest, and the induction port 4 to the front thereof.

The valve 12 is of the sliding type, formed with flat or substantially flat end faces 13 and 14 coöperating with corresponding faces on the seats 15 and 16, so as to provide a large opening in proportion to the travel. Said seats are apertured for the passage of air through them; being in the example shown, perforated by annular series of holes 17.

In the present case the valve is bored axially and slides upon a spindle 18 projecting from the valve seat 15. The second seat 16 is formed with an extension piece 19 upon which is formed a collar 20 somewhat larger in diameter than the seat proper. Internally the seat is threaded to screw upon the spindle 18; and the collar 20 has cut upon it an external thread equal in pitch to the spindle thread. Beyond the collar the extension is shaped to form a grip 21 for a wrench, as is also the end 22 of the spindle 18.

23 is a lock nut working upon the spindle 18.

The valve having been placed upon the spindle 18 and the seat 16 screwed up thereon to the requisite distance, the lock nut 23 is screwed home, thus securing the two seats against relative movement. The structure is then inserted through a tapped hole in wall 24 of the valve chest, into which the collar 20 is engaged. Seat 15 is formed with a reduced end which when the seat is in position passes into a circular orifice in wall 11, while the shoulder formed by such reduced end abuts against said wall. Seat 16 enters and fills the orifice in wall 10.

In operation, the parts being positioned as seen in Fig. I, live air passes from chamber 8 to the back of the cylinder and drives the piston forward. The air in front of the piston is at first exhausted through ports 5 and 6, but after the latter is covered, the remaining air is compressed, forced up port

3, and throws the valve over. Live air is thus admitted to the front of the piston and the air behind it having already been exhausted through port 5, the piston returns; and by compressing the air in the rear of the cylinder, again reverses the valve.

The exhaust ports 5 and 6 are placed nearer to the front than to the rear end of the cylinder, in order to afford a comparatively free working stroke and substantial cushioning upon the return stroke. By arranging the valve and induction ports in the manner described, the valve will always assume the correct position for starting the machine should the latter be inclined longitudinally for drilling up or down holes, lateral tilting of the machine having no effect.

A short and rapid valve stroke is essential to the fullest efficiency of an engine of the class in question. The throw over should in fact be as nearly as possible instantaneous, since so long as the valve is in motion both induction ports are taking air. With a comparatively slowly moving valve, such as the ball valves hitherto used in engines of this class, air continues to pass to an undue extent to the advancing side of the piston and is unable to escape before closure of the exhaust port, so that the piston is choked. In fact an apparently slight reduction of the speed of the valve may cause the motion of the piston to degenerate into a mere oscillation over the exhaust ports. The travel of the valve is therefore in practice reduced to the smallest limit consistent with the avoidance of substantial wire drawing of the air, and to obtain the best efficiency with any particular machine the valve travel should be adjusted in accordance with the pressure of the air. Thus upon the pressure being substantially altered at any time, or the valve and seats having become worn, the distance between the seats would be adjusted accordingly, a less valve opening being required as the pressure is raised, and vice versa. Such adjustment may readily be made with the device described, by slacking the lock nut 23, holding spindle 18 by means of a spanner applied to its polygonal end 22, screwing seat 16 in or out as the case may be by means of a second spanner applied to its polygonal part 21, and finally re-locking the parts by means of nut 23.

The improved valve device described, when properly set, will enable very high piston speeds to be attained; while of course the small momentum attained by the valve minimizes wear. It may also be noted that the absence of a separate air supply for operating the valve permits a material economy of compressed air to be effected.

What I claim, and desire to secure by Letters Patent is:—

1. In an engine of the class specified, in combination the cylinder 1, piston 2, induction ports 3 and 4 to the cylinder ends, the valve chest 7 comprising the central feed chamber 8 and the terminals of the induction ports, the valve 12 having flat end faces 13 and 14, and the detachable valve seating comprising the perforated seat 15 carrying a threaded spindle 18 upon which the valve is loosely mounted, and the seat 16, said valve seating being held in the walls of the valve chest by means of a threaded collar 20 upon the seating 16, substantially as described.

2. The combination with a working cylinder having admission and exhaust ports, of a valve chest having a centrally arranged supply chamber for the motive fluid, a guiding spindle arranged parallel with the axis of the cylinder and extending through the supply chamber, a valve mounted to slide thereon having flat end faces surrounding the spindle, and valve seats surrounding the spindle having flat faces corresponding with the faces of the valve and apertured to permit the passage of the motive fluid from the supply chamber to the admission ports.

3. The combination of a cylinder provided with exhaust ports, a valve chest having a centrally arranged supply chamber for the motive fluid, ports connecting the respective ends of the cylinder with the valve chest and terminating in the valve seats, a valve in the valve chest adapted to be moved by compression of the fluid in the cylinder ends alternately to cover said valve seats, and means for varying the travel of the valve to accommodate variations of pressure.

4. The combination with a working cylinder having admission and exhaust ports, of a valve chest having a centrally arranged supply chamber for the motive fluid, a spindle arranged parallel with the axis of the cylinder extending through the supply chamber, an apertured valve seat surrounding the spindle at one end of the supply chamber, a sleeve adjustable on the spindle and provided with an apertured valve seat on the opposite side of the valve chamber, means for adjusting the sleeve on the spindle to move one valve seat toward and from the other to alter the travel of the valve, and a valve mounted to slide on the spindle between the valve seats.

5. The combination with a working cylinder and its working piston, of a valve chest having a centrally arranged supply chamber for the motive fluid, a passage for motive fluid leading from the rear end of the valve chamber to the front portion of the cylinder, a passage for conveying the motive fluid leading from the front end of the valve chest to the rear portion of the working cylinder, a valve moving parallel with the piston in the supply chamber admitting the motive fluid alternately to the supply passages at

opposite ends of the valve chamber, and a piston reciprocating in the working cylinder which during its forward stroke compresses the motive fluid through the admission passage to the rear end of the valve chest and thus moves the valve to admit the motive fluid to the front portion of the cylinder and which on the rear stroke compresses the motive fluid through the admission passage leading to the front portion of the valve chest and again shifts the controlling valve.

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

JOHN SLORACH.

Witnesses:
J. WARREN DENNING,
WESLEY E. JOHN.