(No Model.)

H. C. SERGEANT.

VALVE FOR DIRECT ACTION ENGINES.

No. 545,738. Patented Sept. 3, 1895.

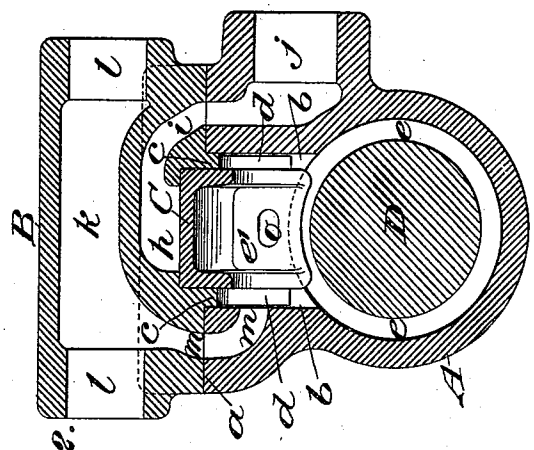

Fig. 2.

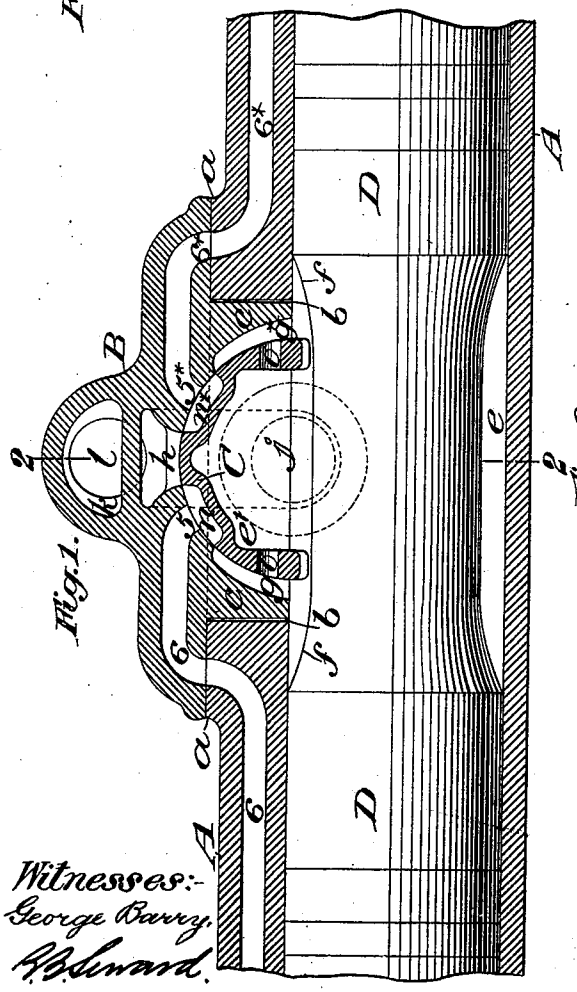

Fig. 1.

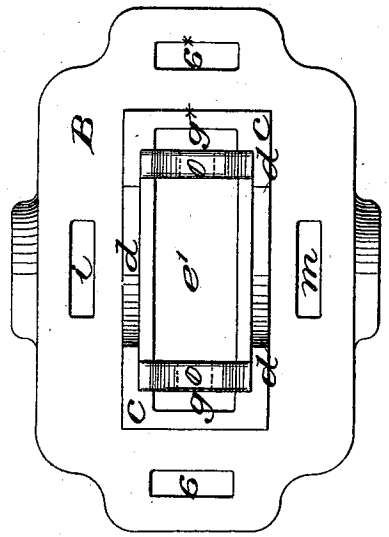

Fig. 3.

Witnesses:-
George Barry.
G. B. Seward.

Inventor:-
Henry C. Sergeant
by attorneys
Brown & Seward

UNITED STATES PATENT OFFICE.

HENRY C. SERGEANT, OF WESTFIELD, NEW JERSEY ASSIGNOR TO THE INGERSOLL-SERGEANT DRILL COMPANY, OF NEW YORK, N. Y.

VALVE FOR DIRECT-ACTION ENGINES.

SPECIFICATION forming part of Letters Patent No. 545,738, dated September 3, 1895.

Application filed October 4, 1894. Serial No. 524,871. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. SERGEANT, of Westfield, in the county of Union and State of New Jersey, have invented a new and useful Improvement in Valves for Direct-Action Engines, of which the following is a specification.

This invention relates to valves, particularly applicable to rock-drilling engines, which are moved in the arcs of circles by means of inclines which are provided upon the pistons of such engines. Such a valve is the subject of Letters Patent No. 212,598, dated February 25, 1879.

One object of this improvement is to reduce the wear of such a valve.

Another object is to retain the valve in its seat in a proper working line, and a further object is to provide a more direct passage for the supply of steam or other motive fluid to the ports in the valve-seat.

I will proceed first to describe my invention in detail, and will afterward point out its novelty in claims.

Figure 1 represents a longitudinal sectional view of portions of the cylinder and piston of a rock-drilling machine, said section being taken through the center of the valve-chest valve, and ports. Fig. 2 represents a transverse section in the line 2 2 of Fig. 1. Fig. 3 represents an inside view of the valve-chest and a back view of the valve therein.

Similar letters and numerals of reference designate corresponding parts in all the figures.

A is the cylinder, having on one side of its exterior a flat face *a*, from which there is an opening *b* directly into the bore.

B is the valve-chest faced to fit the face *a* of the cylinder, but having a projecting portion *c*, which enters the opening *b*. In the inner face of this chest there is a cavity, the inner face of which is of arc form, as shown in Fig. 1, to constitute the seat for the valve C, the face of which is cylindric and has an arc of about and preferably somewhat more than one hundred and eighty degrees, as shown in Fig. 1, the said arc having its center approximately at the surface of the bore of the cylinder.

D is the piston, having the central portion of its length of so reduced a diameter that an annular space *e* is formed between it and the bore of the cylinder to constitute a steam-chest, and that inclined shoulders *f f* are formed to act upon the ends of the valve for producing and controlling its movement. The back of the valve, which is always in communication with this space *e*, is hollowed out, as shown at *e'* in Figs. 1 and 2, to give more steam-room.

The portion *c* of the valve-chest B which enters the opening *b* of the cylinder is made with cheeks *d d*, as shown in Figs. 2 and 3, to constitute guides for the sides of the valve to guide the latter in planes parallel with the length of the cylinder. In the valve-seat there are ports 5 5*, communicating respectively with passages 6 6*, leading to opposite ends of the cylinder, and there are also recesses *g g** in the ends communicating with the annular steam-space *e*. Between the ports 5 5* is arranged the exhaust-port *h*, from which a passage *i* runs through the chest and the wall of the cylinder, as shown in Fig. 2, to the exhaust-pipe connection *j*. In the back of the valve-chest there is a steam-space *k*, at either side of which there is a steam-pipe connection *l*, and from which there is communication through a passage *m* in the chest and in the wall of the cylinder with the annular steam-space *e* in the cylinder and with the steam-space *e'* in the back of the valve.

The valve has in it two coves *n n**, arranged to bring either port 5 or 5* into communication through the corresponding cavity *g* or *g'* in the seat with the steam-space, while the other port 5* or 5 is in communication with the exhaust-port *h*, and between these coves and its ends there are provided through it two openings *o* to provide for a more direct and free supply of steam from the spaces *e* and *e'* to the ports 5 5*, the said openings never being closed. The exhaust-port *h* is made of such area in proportion to the ports 5 5* that the valve will be subject to a sufficient excess of pressure from the steam under it to hold it to its seat with sufficient pressure to prevent a reaction of the movement of the valve when its movement has been arrested suddenly by one end striking the piston.

By making the valve with a face having an

arc of about or rather more than one hundred and eighty degrees, the center of which is near the outside of the bore of the cylinder, those parts of its face near the ends are substantially or approximately normal or at right angles to the line of movement of the piston, and the consequence is that when the inclines *f f* act upon the ends of the valve to move it the direction of the pressure produced upon the valve is in the direction of the line of the arc of its face and consequently in the direction of least resistance, and the friction between the valve and seat resulting from such pressure and the wear of the valve, the valve-seat, and the piston is reduced to a minimum, whereas when such a valve is, as has always heretofore been the case, constructed with an arc of shorter radius and larger diameter, having its center near the center of the bore of the cylinder, the angle formed between the face of the valve and the line of movement of the piston is very acute, and the consequences are not only that the pressure produced on the valve by the piston for the purpose of moving it tends to press the valve forcibly against its seat and produce great friction between them, but that the valve is caused to act as a wedge between the valve-seat and the straight portion of the piston which fits the cylinder, and thereby to grind and cut away the latter. The valve which is the subject of the present invention stops against the piston at a right angle thereto, and therefore cannot operate as a wedge in relation to it.

I have throughout this specification referred to steam as the motive agent for an engine fitted with my improvement, but it is obvious that the improvement is just as applicable to an engine in which compressed air, gas, or other fluid under pressure is used for the motive power.

What I claim as my invention is—

1. In an engine, the combination with a cylinder fitted with a piston having inclines for operating a valve, and a valve-seat of arc form on said cylinder, of a valve of corresponding form fitted to said seat and having the end portions of its face normal or approximately at right angles to the line of motion of the piston whereby it is caused to stop against the piston approximately at a right angle thereto, substantially as and for the purpose herein set forth.

2. The combination with an engine cylinder having an opening in one side thereof, a valve-chest fitted to said cylinder and comprising an arc formed valve-seat and valve guiding cheeks projecting within said opening, and a valve fitted to said seat between said guiding cheeks, substantially as herein set forth.

3. The combination with the engine cylinder and a piston in which is a cavity forming a steam space between the cylinder and piston, of a valve-chest upon said cylinder containing an arc-formed valve-seat, and a hollow arc-formed valve having a cavity in its back in communication with said steam space and having provided through it near its ends openings *o o* forming free communication at all times between the aforesaid space and the valve-chest, substantially as herein set forth.

HENRY C. SERGEANT.

Witnesses:
FREDK. HAYNES,
LIDA M. EGBERT.