

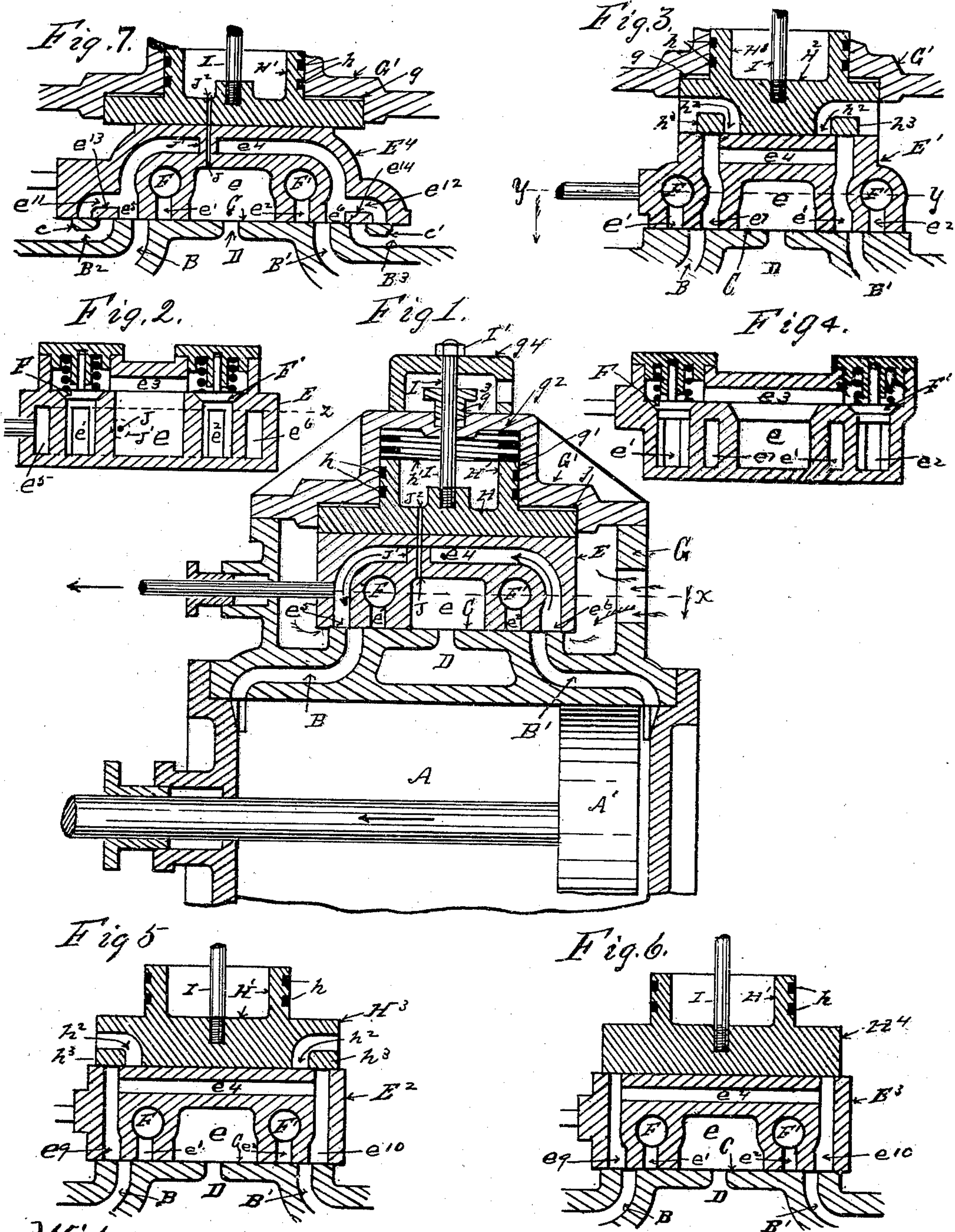
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H. E. LUDWIG.
VALVE MECHANISM.

(Application filed Jan. 3, 1898.)

(No Model.)



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VALVE MECHANISM.

SPECIFICATION forming part of Letters Patent No. 612,951, dated October 25, 1898.

Application filed January 3, 1898. Serial No. 665,430. (No model.)

To all whom it may concern:

Be it known that I, HENRY E. LUDWIG, a citizen of Switzerland, residing at the city of Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Valve Mechanism; and I do hereby 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, forming part of this specification.

This invention relates to valve mechanism for pumps for moving or compressing gaseous bodies; and it consists, substantially, in so constructing the ports in the pump or compressor cylinder and the valve operating thereon that the gas to be moved or compressed enters the valve-chest and surrounds the valve at its normal suction-pressure, while the gas pumped or compressed is discharged through the inside of the valve and out through a central exhaust or discharge port on the cylinder, and also mechanism for regulating the pressure on the back of the valve, adapted to be regulated to such pressure as may be desired.

One of the objects of this construction is to overcome the tendency to leakage of gases under high pressure, and thereby decreasing the losses entailed thereby, as well as the danger therefrom to life and property, when the gas being pumped or compressed is of a poisonous, inflammable, or explosive nature.

Another object of this construction is that it provides means for equalizing the pressure on both sides of the piston in the cylinder at the beginning of each traverse thereof and also for a single, double, or multiple opening of the suction-ports of the pump or compressor.

These and other features of this invention are hereinafter fully set forth and described, and illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal section of a pump or compressor cylinder, valve-chest, pressure-plate, and valve embodying my invention. Fig. 2 is a longitudinal vertical section of the valve shown in Fig. 1, on the line *x* therein.

Fig. 3 is a longitudinal section of a portion of a cylinder and steam-chest with a modified form of pressure-plate and valve embodying my invention. Fig. 4 is a longitudinal vertical section of the valve shown in Fig. 3, on the line *y y* therein. Figs. 5, 6, and 7 are longitudinal sections of portions of the cylinder, steam-chest, pressure-plate, and valve, showing modified constructions embodying my invention.

In the several constructions of my invention thus illustrated in Figs. 1, 3, 5, and 6 the cylinder A, the piston A', the valve-seat C, the outside ports B and B', and the central port D are of the usual construction.

In Fig. 7 I show a modified construction of the valve-seat D' and the port-openings therein, which will hereinafter be more fully referred to and described.

In Figs. 1 and 2 the valve E is constructed with a central chamber *e*, which covers the central port D. At each end of the central chamber *e* are ports *e'* and *e''*. In each of these ports *e'* *e''* are spring-actuated check-valves F F', and from above these check-valves a passage *e'''* leads to the central chamber *e*, (see Fig. 2,) so that as the gas or air is forced out of the chamber A through the ports B and B' and up through the ports *e'* and *e''* in the valve the check-valves F and F' are raised thereby, so as to allow the compressed gas or air to pass on through the passage *e'''* into the central chamber *e* of the valve, and thence out through the central port D. In the valve E, outside of the chamber *e* and the ports *e'* *e''*, there is another passage *e''''*, which operates to equalize the pressure in the ends of the cylinder just as the backward stroke of the piston commences and also operates as the open ends thereof pass off of the ends of the valve-face C to operate as the suction-ports in the valve for the cylinder-ports B and B'. In Fig. 1 it will be observed that as the valve is shown with the piston just starting on its return stroke the ports B and B' are both slightly communicating with the open ends of the passage *e''''* in the valve; but as the piston and valve travel onward in the direction of the arrow the open end *e''''* of the passage *e''''* moves off of the end of the valve-seat C, while the other end *e''''* of the passage *e''''* opens into the port B', so that

the air or gas passes from the valve-chest G, through the passage e^4 , to and into the port B', and thence into the cylinder, and at the reverse movement of the piston A' and valve E a like result takes place, the air or gas compressed into that end of the cylinder passing out through the port e^2 and check-valve F', through the passage e^3 , to the central chamber e of the valve, and vice versa on the return stroke of the piston and valve. In the valve-chest cover G' there is a rectangular recess g , and from the central port of this recess there is a cylindrical chamber g' , having a closed top g^2 , and in the rectangular recess g there is a pressure-plate H, operating on the back of the valve E, and on the back of this pressure-plate H there is a cylindrical shell H', which passes up into the cylindrical chamber g' and is provided with packing-rings h , so as to make it gas or air tight therein, and between the upper end of the cylindrical shell H' and the closed top g^2 of the chamber g' there is a spring h' , which operates to press the plate H down upon the back of the valve E and through a stuffing-box g^3 and a yoke g^4 on the top g^2 of the chamber g' . A rod I passes down into the top of the plate H, which is provided with a screw-threaded nut I', operating on the top of the yoke g^4 , whereby the pressure of the plate H on the back of the valve E can be adjusted as desired, the pressure in the chamber H² above the plate H and the pressure in the chamber e in the valve E being equalized by means of a small passage J, which passes up from the chamber e in the valve E, through a cylindrical bridge J', through the passage e^4 in the valve, and up through the top of the valve, which passage communicates with a like passage J² through the plate H at each traverse of the valve E.

In Figs. 3 and 4 the mechanism shown is identical with that shown in Figs. 1 and 2, except that the valve E' has its inlet-ports e^7 and e^8 next to the central chamber e of the valve, and these ports pass up through the valve, where they communicate with inlet-ports h^2 in the ends of the pressure-plate H², separated by bridges h^3 , so as to form double inlet-ports for the valve inlet-ports e^7 and e^8 . The outlet-ports e' and e^2 in this case are located outside of the inlet-ports e^7 and e^8 and communicate with the central outlet-chamber e of the valve by a longitudinal passage e^3 from above the check-valves F and F' therein, as is clearly shown in Figs. 3 and 4. In all other respects and in its operation the valve mechanism is the same in construction and operation as the valve mechanism shown in Figs. 1 and 2 and hereinbefore described.

The valve mechanism shown in Fig. 5 is the same in its general features and operation as that shown in Figs. 3 and 4, the modification in this case being that the valve E² has inlet-ports e^9 and e^{10} at the ends of the valve, which take their suction through inlet-ports h^3 in the ends of the pressure-plate H³ and at the

ends of the valve-seat C. In all other respects the construction and operation of the valve mechanism shown in Fig. 5 are the same as hereinbefore described.

In Fig. 6 the construction of the valve E is the same as that shown in Fig. 5. In this construction, however, the pressure-plate H⁴ is made the same length as the valve-face C, so that the inlet-ports e^9 and e^{10} take their suction both at the ends of the valve-seat C and at the ends of the pressure-plate H⁴. In all other respects the construction and operation of this valve mechanism are the same as those hereinbefore described.

In Fig. 7 the construction shown embodies a modified form of the valve-seat C shown in all of the other figures in that the valve-seat C' in this case is provided at its ends with ports B² and B³, separated by bridges c and c' , and the ends of the ports e^5 and e^6 of the valve E⁴ are provided with additional branch ports e^{11} and e^{12} , separated by bridges e^{13} and e^{14} , so that three inlet-openings are opened at each movement of the valve E⁴. In all other respects the construction and operation of this valve mechanism are the same as hereinbefore described.

It will be observed that in operation the compressed air or gas is in all cases discharged into the central chamber e of the valve and thence through the discharge-port D, so that the matter of leakage under high pressures from bad joints is thereby minimized.

Having thus shown and described convenient types of my invention, so as to enable others to utilize it, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination in a valve mechanism, of a cylinder, a piston, a valve-chest, a valve-seat therein having end ports communicating with the ends of the cylinder, and a central discharge-port, with a slide-valve having a central chamber therein communicating with the central port in the valve-seat, and two port-openings at each side of said central chamber, adapted to communicate with the end ports in the valve-seat, one of which communicates with the corresponding port-opening in the valve at the opposite side of the central chamber, and check-valves in each of the other port-openings in the valve through which said ports communication is had with said central chamber, substantially as and for the purpose set forth.

2. The combination in a valve mechanism, of a cylinder, a piston, a valve-chest, a valve-seat therein, having end ports communicating with the ends of the cylinder, and a central discharge-port, with a slide-valve having a central chamber therein communicating with the central port in the valve-seat, and two port-openings at each side of said central chamber adapted to communicate with the end ports in the valve-seat, one of which communicates with the corresponding port-opening in the valve at the opposite side of the

central chamber therein, check-valves in each of the other ports in the valve at the sides of said chamber through which said ports communication is had with said central chamber, and a pressure-plate operating on the back of the valve, substantially as and for the purpose set forth.

3. The combination in a valve mechanism, of a cylinder, a piston, a valve-chest, a valve-seat therein having end ports communicating with the ends of the cylinder, and a central discharge-port, with a slide-valve having a central chamber therein communicating with the central port in the valve-seat, and two port-openings at each side of said central chamber adapted to communicate with the end ports in the valve-seat, one of which communicates with the corresponding port-open-

ing in the valve at the opposite side of the central chamber therein, check-valves in each of the other ports in the valve at the sides of said chamber, through which said ports communicate with said central chamber, a pressure-plate operating on the back of said valve, and an adjustable bolt and spring connected with said pressure-plate for adjusting and regulating the pressure of the plate upon the valve, substantially as and for the purpose set forth.

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

HENRY E. LUDWIG.

Witnesses:

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C. A. GAITHER.