(No Model.)

L. M. HOSEA.

HYDRAULIC VALVE.

No. 423,255. Patented Mar. 11, 1890.

Fig. 1.

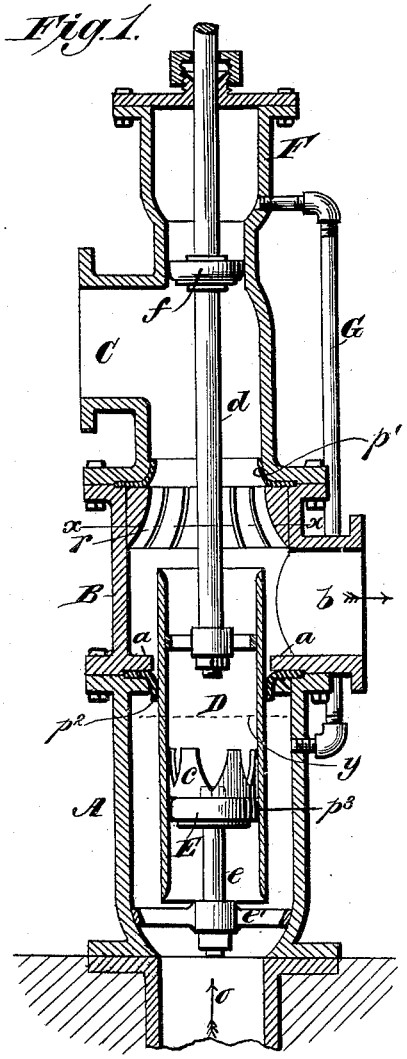


Fig. 2.

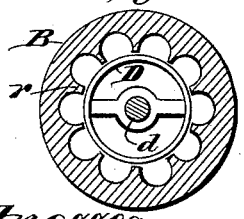


Fig. 3.

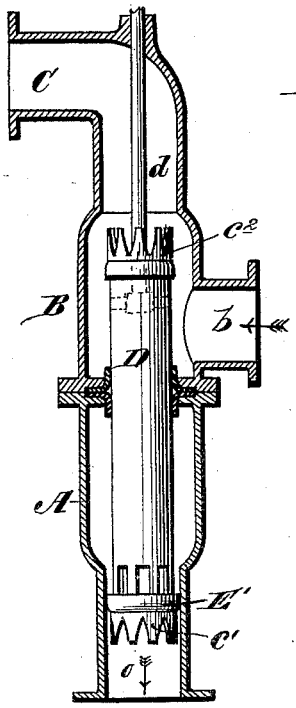
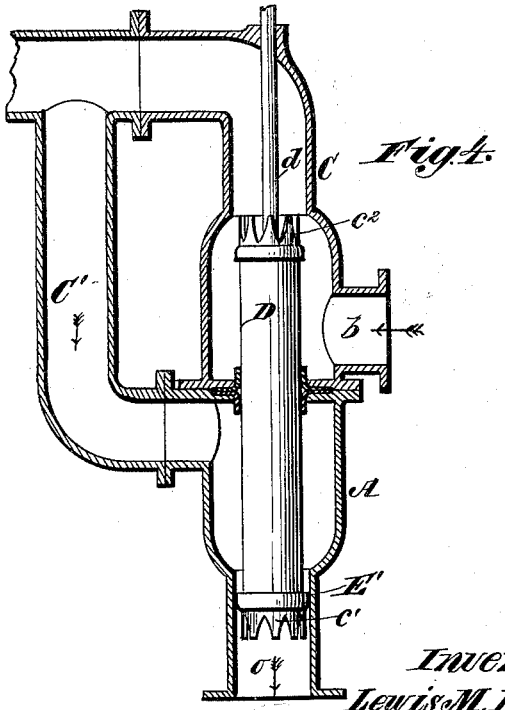


Fig. 4.



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UNITED STATES PATENT OFFICE.

LEWIS M. HOSEA, OF CINCINNATI, OHIO.

HYDRAULIC VALVE.

SPECIFICATION forming part of Letters Patent No. 423,255, dated March 11, 1890.

Application filed April 11, 1889. Serial No. 306,841. (No model.)

To all whom it may concern:

Be it known that I, LEWIS M. HOSEA, a citizen of the United States, residing at Cincinnati, Ohio, have invented new and useful Improvements in Hydraulic Valves, of which the following is a specification.

My invention relates to controlling-valves for hydraulic engines, more particularly for those used to operate hydraulic lifts or elevators, its object being to produce a compact and effective valve mechanism for controlling the movement of the elevator, adapted to be operated from the cab or platform and with due reference to proper graduation, so as to avoid sudden shocks of movement or water-ram in the pipes and connections.

To this end my invention embodies as one of its leading constructive principles a valve-casing separated into receiving and discharge chambers by an intervening partition or diaphragm, through which reciprocates a piston or piston-valve governing at alternate reciprocations the communication of the service-pipe with the inlet and discharge conduits, respectively. The preferred specific form in which I have applied this general principle of construction also embodies as a further constructive feature a tubular piston-valve operating through the diaphragm, and serving the double purpose of a valve and a conduit from one of the casing-chambers through the other into the service-passage, whereby the construction is simplified and economized both in cost and space.

Mechanism embodying my invention is illustrated in the accompanying drawings, in which—

Figure 1 is a vertical axial section of the valve mechanism complete in its preferred form embodying a tubular piston-valve; Fig. 2, a cross-section on the plane x of Fig. 1; Fig. 3, a vertical axial section of a slightly-modified construction embodying the same principles, and Fig. 4 a similar section of a construction embodying a solid piston.

Referring now more particularly to the drawings, and to the form of the device exhibited in Fig. 1, A and B designate, respectively, receiving and discharge chambers, provided with inlet and outlet orifices o b, and arranged in the same axial line to constitute a valve-casing and separated medially by an annular diaphragm or partition. C designates the service-passage to the elevator-engine, arranged as an axial prolongation of the discharge-chamber B. For convenience of construction and to facilitate access, it is desirable to cast these parts as three distinct elements joined in planes transverse to the axis, as shown, the chambers A and B being slightly enlarged beyond the diameter of the service prolongation. At the junction of the service-passage with the discharge-chamber B is placed an annular flexible cup-packing p', opening upward, and at the diaphragm a a similar annular cup-packing p^2, opening downward. Within the casing, and passing through the central perforation and packing of the diaphragm, is placed a tubular piston-valve D, open at both ends and adapted at its upward reciprocation to enter the service-passage C within the packing p', and form a water-tight sliding joint therewith.

Within the chamber A, I arrange a circular valve-seat E, mounted upon a stem e as a pedestal, secured upon a cross-bar e', or otherwise, as may be convenient. The valve-seat is provided with a circular cup-packing p^3, flaring downward, and the tubular valve D in its downward reciprocation "telescopes" over the valve-seat E, the interior surface of the tube forming a sliding joint with the packing p^3. The tubular valve D operates always within the packed orifice of the diaphragm, and is of sufficient length to seat in the packing p' in its upward reciprocation before quitting the packing p^3 below, and is provided with as much additional lap as required to insure the desired period of complete closure at both the upper and lower seats before opening in either direction at the usual rate of motion.

The tubular valve D is suspended by a stem d, by which it is reciprocated—as, for example, by a rack-and-pinion device operated by the elevator-ropes, or otherwise, as desired.

In order to graduate the flow of water in the seating and the unseating of the tubular valve, I provide as follows: I cast the upper part of the chamber B with a series of ribs r at its inner surface immediately beneath the packing p', flaring downward, as indicated in the sections, Figs. 1 and 2, and provide the valve-seat E with a crown c, projecting

upwardly. The function of these graduation devices is the usual one, and will appear in connection with the description of the operation, which is as follows:

In Fig. 1 the valve is represented at its lowest position. On being elevated the upper edge of the tubular valve D passes within the series of encircling ribs *r*, by which the discharge which is then passing downward through the service-passage C through the chamber B into the outlet *b* is gradually checked, and as the upper end of the tube passes into the packing *p'* the discharge is completely shut off, as the lower end of the tube has not yet left the packing p^3. In this intermediate position both the inlet and discharge openings remain closed, and the elevator is held in the position it then occupies. Upon continuing the elevation of the valve D it uncovers at its lower edge the valve E, and leaves the packing p^3, and the water from the receiving-chamber A then passes upward through the tubular valve D into the service-passage C. The crown *c* upon the pedestal-valve serves to graduate this flow at the moment of uncovering, and the full capacity of flow is not permitted until the bottom of the tubular valve D reaches the dotted line *y* and completely uncovers the crown *c*. In reversing the movement of the valve its lower edge passes downward over the crown *c*, gradually throttles the flow of water until the tube seats upon the packing p^3, when the flow is completely shut off, and similarly as the valve continues its descent and its upper edge leaves the packing *p'* the discharge is graduated by the gradually-widening space between the ribs *r*, before mentioned.

I have shown the valve-casing in Fig. 1 provided with an upper cylindrical extension F, in which is a balancing-piston *f*, attached to the rod *d*. This is not, however, in all cases necessary, inasmuch as the pressure of the water in the chamber tends to lift the valve when in its lowest position. This excess of pressure is, however, relatively small, as it is limited to an area equal to the annular cross-section of the tubular valve. In practice the tubular valve is a section of seamless brass or iron tubing, such as commonly found in the market, and as the shell is quite thin the unbalanced pressure upon the valve is easily counterbalanced by the weight of the valve and rod. Where a balancing-piston is used, its cylinder F is constructed a chamber of differential diameters, in which the balancing-piston *f* in rising leaves the contracted or engaging portion of its casing and passes into the enlargement coincidently with the unseating of the tubular valve D from its pedestal-valve E, for the reason that when the tubular valve D unseats from the pedestal-valve E and the water passes through into the service-passage the pressure on the tubular valve D is equalized at top and bottom, and therefore no balancing is required. An external tube G connects the upper part of the casing F with the inlet-chamber A to carry water to the balancing-piston.

In the modification shown in Fig. 3 I make the lower chamber A the discharge-chamber, and the orifice *o* is formed as an axial prolongation of this chamber. At the lower end of the tubular valve D is a piston-head E', closing the tube and carrying a cup-packing flaring upward and a crown *c'*, projecting downward. The tube is perforated radially above the lower closing-head. At the upper end of the tubular valve is placed a packing flaring downward and a crown c^3, projecting upward, and annular packings at the central diaphragm at each side and facing in opposite directions. The operation in this case differs slightly, owing to the reversed positions of the receiving and discharge chambers. The water enters the orifice *b* into the upper chamber B, and by the depression of the valve D is admitted to the service-passage (when it presses upward against a balancing-valve, if such is used) and passes on to the operating-cylinder. It also passes down through the tubular valve into the lower chamber A, being shut off from the discharge-orifice *o* by the lower or discharge valve E'. By the elevation of the valve into the service-passage C the inflow of water is shut off, and by the continued elevation of the valve the valve E' is lifted clear of the discharge-outlet *o* into the chamber A, and the water is then discharged from the service-passage C through the tubular valve D outward through its lower apertures into the lower chamber A and into the outlet *o*.

In the modification shown in Fig. 4 the same form of casing is used, and the packings are arranged at the upper and lower extremities of the plunger and at the central diaphragm around the plunger in the same manner as in the case last described. The only differences are that a solid (or closed) piston or a piston-rod with terminal heads is used instead of the open tubular valve, and an outside connection C' is made between the service-passage and the discharge-chamber. The operation is the same as in the last case, excepting that the discharge passes downward through the extra connection C into the discharge-chamber instead of through the tubular valve.

I claim as my invention and desire to secure by Letters Patent of the United States—

1. In hydraulic-valve mechanism, the combination, with a valve-casing having inlet and discharge orifices, of a perforated partition or diaphragm dividing said casing between said orifices, and an elongated piston-valve reciprocating through said partition and seated at all times within the same, substantially as set forth.

2. In combination with two-part casing having inlet and discharge chambers in the same axial line, one of which is prolonged into a service-passage, a perforated diaphragm separating said chambers, and a piston-valve op-

erating in the axis of the chambers through the intervening diaphragm, being seated at all times within the same and adapted at one limit of reciprocation to close communication between the service-passage and adjacent chamber and establish communication with the remote chamber, and act oppositely at the other limit of its reciprocation, substantially as set forth.

3. The combination of a two-part valve-casing prolonged into a service-passage and provided with inlet and discharge orifices, a perforated diaphragm or partition dividing the casing between said orifices, and a tubular piston-valve reciprocating in and through the perforated diaphragm, adapted to pass into the service-passage at one reciprocation with the treble function of closing communication between said service-passage and the adjacent chamber, establishing communication between said service-passage and the remote chamber, and itself constituting the conduit for such communication, substantially as set forth.

4. In hydraulic-valve mechanism, the combination of a two-chambered casing provided with inlet and discharge openings, a service-passage axially prolonging the casing at one end, a pedestal-valve seat axially arranged within the opposite chamber of the casing, an axially-perforated diaphragm dividing the chambers of the casing between the inlet and discharge openings, and a tubular valve reciprocating through the perforated diaphragm and seating alternately at one end in the service-passage and at the other end upon and around the pedestal-valve seat, substantially as set forth.

5. The combination and arrangement of the divided valve-casing having the inlet-chamber at one end, the service-passage at the other, and the discharge-chamber between, with the annular packing at the junction of the discharge-chamber and service-passage, the annular packing in the central diaphragm, the pedestal-valve seat provided with a circular packing, and the tubular valve reciprocating constantly in the packing of the central diaphragm and alternately engaging the other packings, substantially as set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

LEWIS M. HOSEA.

Witnesses:
DAVID DAVIS,
ELLA HOSEA.