

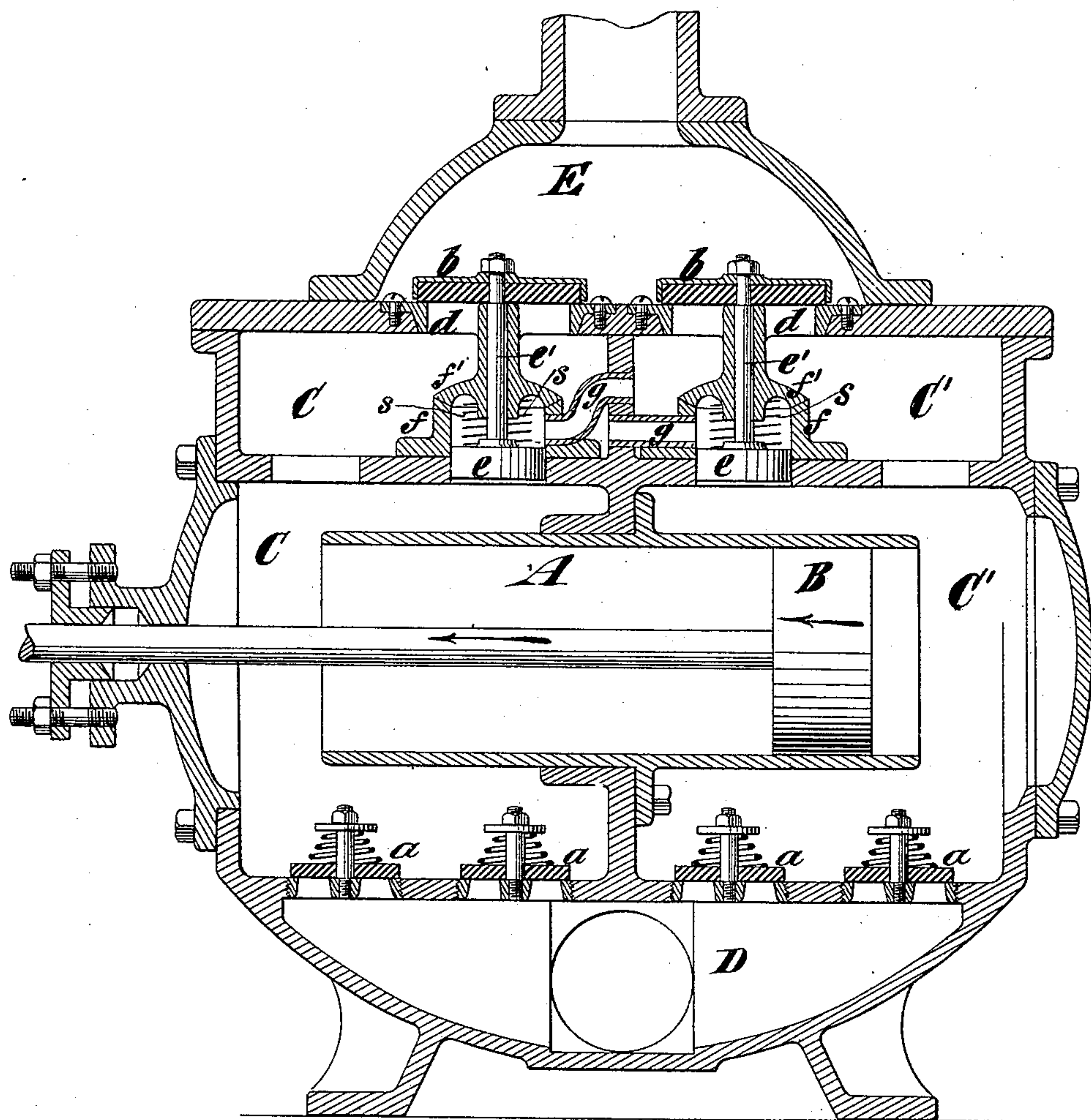
(No Model.)

J. H. PENDLETON.

MEANS FOR RELIEVING DISCHARGE VALVES OF DOUBLE ACTING PUMPS.

No. 373,478.

Patented Nov. 22, 1887.



Witnesses:

Ol. Sundgren  
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Inventor:

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By his atty  
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# UNITED STATES PATENT OFFICE.

JOHN H. PENDLETON, OF BROOKLYN, ASSIGNOR TO HIMSELF, AND CORNELIUS TIERS AND ALEXANDER H. TIERS, BOTH OF NEW YORK, N. Y.

MEANS FOR RELIEVING DISCHARGE-VALVES OF DOUBLE-ACTING PUMPS.

SPECIFICATION forming part of Letters Patent No. 373,478, dated November 22, 1887.

Application filed December 15, 1885. Serial No. 185,695. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN H. PENDLETON, of Brooklyn, in the county of Kings and State of New York, have invented a new and useful  
5 Improvement in Means for Relieving Discharge-Valves of Double-Acting Pumps, of which the following is a specification.

My invention relates to the discharge-valves of pumps which severally have a larger area  
10 exposed to pressure on the back than on the face, and which have connected with them diaphragms or pistons fitting small cylinders or chambers, and exposed on one side to the full pressure of liquid in the pump, and upon  
15 the other side provided with vents, whereby they are relieved of pressure. In the operation of a pump provided with such a discharge-valve the liquid under pressure from the pump-piston acts upon both the face of the  
20 valve and upon the piston of diaphragm which is connected with the valve, and the combined pressure upon the face of the valve and upon the piston or diaphragm is amply sufficient to overcome the pressure of the water-column  
25 upon the back of the valve. In my application for United States Letters Patent, Serial No. 185,696, filed of even date herewith, I have shown and described a combination in which the vent-pipe leading from the piston or dia-  
30 phragm chamber communicates with the atmosphere, or, in other words, with a vessel which is open to atmospheric pressure, and from this vessel any water which may pass the piston or diaphragm as leakage is returned  
35 automatically to the suction-chest or supply of the pump to be again passed through the pump. When the discharge-valves of double-acting pumps have connected with them pis-  
40 tons or diaphragms for aiding their opening, as described, the vent-pipe from the piston or diaphragm chamber which is in one water-chamber of the pump may be connected directly with the other chamber of the pump, and then the reciprocating movements of the  
45 piston will serve not only to produce pressure alternately upon the pistons or diaphragms which are connected with the valves, but will also alternately produce a suction through the vent-pipes upon the opposite side of such pis-  
50 tons or diaphragms; and this combination of discharge-valves and motor pistons or dia-

phragms with the water-chambers of a double-acting pump wherein pressure is alternately produced by the reciprocating movements of the piston forms the subject-matter of my pres- 55 ent invention.

The accompanying drawing represents a longitudinal vertical section of the liquid cylinder, chambers, and valves of a double-acting pump embodying my invention. 60

A designates the cylinder, and B the piston, by the movement of which the liquid in the opposite chambers C C' is alternately put under pressure sufficiently to open the discharge-  
65 valves *b*, whereby the chambers C C' communicate with the discharge-chest E. The chambers C C' also communicate by valves *a* with a suction-chest, D. The suction-valves *a* may be of any suitable construction, and my invention in no way relates to them. 70

As here represented, the discharge-valves *b* are closed upon removable seats *d*, and, as usual in pump-valves of this class, the area exposed to pressure on the back or top of the valve is greater than that exposed to pressure on the  
75 face of the valve, by reason of the lapping which the valve necessarily has on its seat and around the openings therein. In order to balance the discharge-valves *b* and aid them in opening, I arrange in the two chambers 80 C C' motors, which are connected one with each valve, and are operated by the pressure of water alternately produced in the chambers C C'. As here represented, each motor consists of a movable diaphragm or piston, *e*, con- 85 nected by a stem, *e'*, with a valve, *b*, and working freely within a small cylinder or chamber, *f*. On the one side of the diaphragm or piston *e* the chamber *f* is entirely open, so that the diaphragm or piston on that side is ex- 90 posed to pressure which may be created in the chamber C or C', and on the opposite side of the diaphragm or piston a vent-pipe, *g*, leads from each chamber or cylinder *f* to the other water-chamber C or C'. The vent-pipe *g* from 95 the motor which is in the chamber C leads to the chamber C', and the vent-pipe *g* from the motor which is in the chamber C' leads to the chamber C.

The cylinder *f* on that side of the diaphragm 100 or piston which is vented, and which in this instance is the upper end, is closed by a cap



or bonnet, *f'*, which, as here represented, is formed integral with a valve-seat, *d*. The operation of these parts is very simple. Suppose, for example, that the piston B be moved  
 5 in the direction indicated by the arrow thereon. It will be obvious that it will produce pressure in the chamber C, and will produce a vacuum or remove any pressure which may be in the chamber C'. The pressure acting  
 10 upon the face of the diaphragm or piston *e* of the motor which is in the chamber C at the same time that its opposite side is relieved of pressure by the vent-pipe *g*, leading to the chamber C', will be sufficient to equal or  
 15 slightly exceed the difference in pressure exerted on the back and face of the valve *b*, and consequently the valve *b* will be opened by a pressure no greater than that necessary to force the liquid after the valve is opened.

20 I have shown springs *s* applied to the pistons *e* for quickening the closing of the valves *b*.

From the above description it will be understood that when the piston B is moving toward the left, as indicated by the arrows, not only  
 25 will the water in the chamber C exert a pressure upon the face of the piston *e* in that chamber to open the corresponding valve, *b*, but such pressure will be communicated from the chamber, through the vent-pipe *g*, to the back of  
 30 the piston *e*, which is in the chamber C', and will thereby tend to hold the valve *b* corresponding to that piston tightly to its seat. This same movement of the piston B will produce a suction in the chamber C', and such  
 35 suction will be communicated through the vent-pipe leading from the chamber C' to the piston-cylinder *f*, which is in the chamber C, and hence the piston *e*, which is in the chamber C, will not only be moved by the pressure  
 40 in the chamber C, but such movement will be aided by the suction in the chamber C', which is communicated through the vent-pipe *g*.

I do not claim herein the combination, with a pump-piston, a chamber wherein the fluid is put under pressure by the movement of the  
 45 piston, and a discharge-chest, of the valve *b* in the discharge-chest, for controlling the discharge from said chamber, and having a stem, *e'*, projecting inward through the valve-seat, a diaphragm, *e*, directly connected with the  
 50 inner end of the stem, the supplemental chamber *f*, containing the diaphragm, opening at one end directly into the chamber, wherein fluid is put under pressure by the movement  
 55 of the piston and at its opposite end closed and provided with a vent, and a sleeve extending inward from the valve-seat and connecting the closed end or top of the chamber  
 60 *f* with the valve-seat, as such a combination of parts is claimed in my pending application, Serial No. 185,696, filed December 15, 1885.

What I claim as my invention, and desire to secure by Letters Patent, is—

The combination, with the two water-chambers, of a double-acting pump wherein pressure  
 65 is alternately produced by the reciprocating movement of the piston, and with the discharge-valves leading therefrom, of diaphragms connected with the valves, supplemental chambers *f*, arranged in the two water-  
 70 chambers and containing the diaphragms, and receiving on one side of the diaphragms the full pressure of liquid, and a vent-pipe, whereby the supplemental chamber of the diaphragm in  
 75 each water-chamber is connected with the other water-chamber, substantially as herein described.

J. H. PENDLETON.

Witnesses:

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