N. CLUTE.

Double-Acting Suction and Force Pump.

No. 202,633. Patented April 23, 1878.

*Fig. 1.*

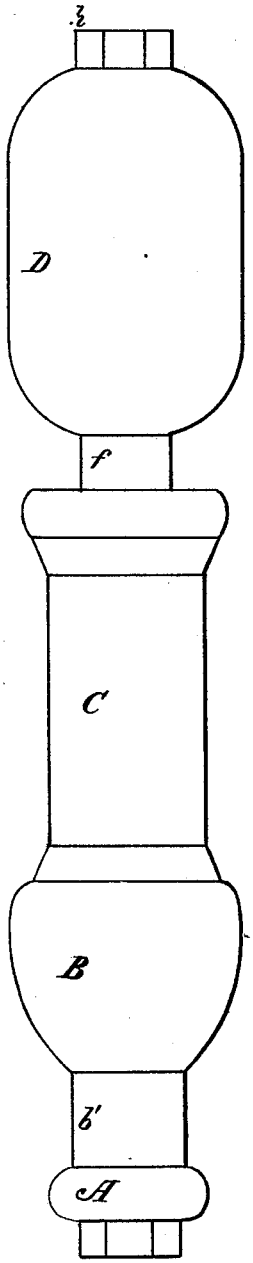



*Fig. 2.*

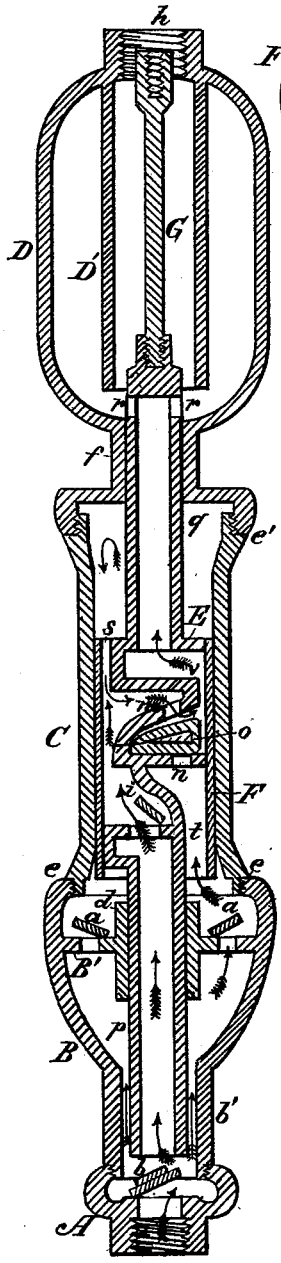



*Fig. 5.*

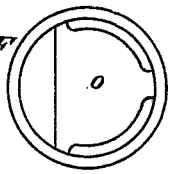



*Fig. 6.*

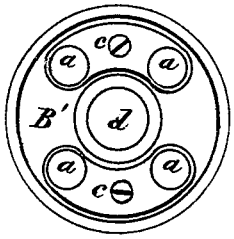



*Fig. 3.*

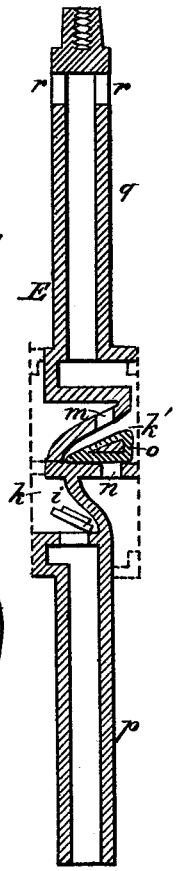



*Fig. 4.*

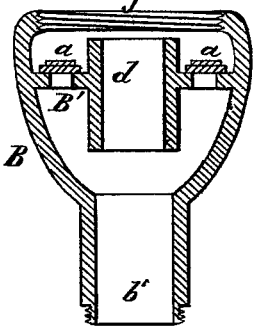



*Fig. 7.*

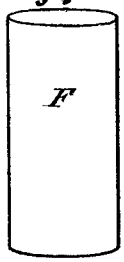



*Fig. 8.*

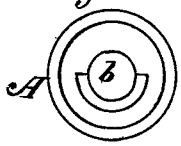
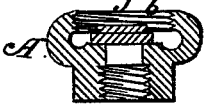



*Fig. 9.*




Witnesses

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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN DOUBLE-ACTING SUCTION AND FORCE PUMPS.

Specification forming part of Letters Patent No. **202,633**, dated April 23, 1878; application filed February 15, 1878.

*To all whom it may concern:*

Be it known that I, NICHOLAS CLUTE, of Schenectady, in the county of Schenectady and State of New York, have invented certain new and useful Improvements in Double-Acting Suction and Force Pumps; and I do hereby declare that the following is a full, clear, and exact description thereof, which 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 letters of reference marked thereon, which form a part of this specification.

This invention relates to that class of lifting and force pumps denominated "double-acting," in which two or more sets of valves and valve-chambers are used in addition to the valves located in the piston or plunger, the object being to produce a steady and uniform flow of water, and to avoid the friction caused by the use of metal, rubber, or other solid packing of the piston, which so greatly increases the power required to work the pump, by substituting water therefor; and, further, to cheapen the construction by substituting, in all places where two or more parts are connected, for the flanged and bolted joints, by which the different parts are commonly secured to each other, screw-threaded joints, which make water-tight and strong connections without the intervention of any packing whatever; and the invention consists in the construction, combination, and arrangement of the different parts, as will be hereinafter fully set forth, and then specifically pointed out in the claims.

In the drawings, Figure 1 is a side view of the pump complete. Fig. 2 is a vertical longitudinal section through the pump-casing valve-chamber and hollow plunger, showing the relative position of the different parts. Fig. 3 is a vertical longitudinal section through the pump-plunger and its valves. Fig. 4 presents a vertical section through the lower valve-chamber. Fig. 5 is a plan of one of the valves and its seat. Fig. 6 is a plan of the diaphragm and valves in the lower valve-chamber. Fig. 7 shows the tubular casing which surrounds the plunger, indicated by dotted lines in Fig. 3. Figs. 8 and 9 are a plan and section of the lower or inlet valve and its seat.

The outer casing of the pump is formed of four separate pieces, the lower one of which, A, forms the seat for the inlet-valve *b*, and is provided at both ends with female screws, by which it is connected at the bottom to an extension pipe or strainer, the upper screw serving to connect it to the valve-chamber B. Traversing this chamber is a diaphragm, B′, provided with the upwardly-opening valves *a a*, which may be secured to the diaphragm in pairs by the screws *c*. A circular tubular orifice, *d*, through the middle of the diaphragm, forms the lower guide for the pump-plunger E reciprocating in the working-barrel C. This barrel is connected to the valve-chamber B by a screw-thread at *e*, and to the air-chamber D by a similar joining at *e′*. The lower part of the air-chamber is contracted at *f*, and forms a guide for the upper end of the tubular plunger E. An internal tube, D′, placed concentrically within the air-chamber, and preferably cast with it, passes down from its top to near its bottom, leaving only an annular space, *g*, through which water passes back and forth in keeping up an equal pressure upon the column of water within the tube, which forms the exit for all water passing through the pump. The top of this air-chamber D is pierced by the screw-threaded orifice *h*, which forms a point of attachment for the extension-pipe, which carries the water from the pump to the desired locality.

The tubular plunger E is formed of cast metal, and provided with two valve-chambers, *k* and *k′*, situated one above the other, the lower chamber *k* being furnished with a valve, *i*, of ordinary construction, which opens for the passage of water in an upward direction and closes to prevent its return. The upper chamber *k′* is differently constructed, being of triangular shape, and provided with inlet and outlet orifices *m* and *n*, which are alternately opened and closed by the wedge-shaped valve *o*. An outer casing, F, incloses the valve-chambers, and forms the part of the plunger corresponding to the ordinary pump-piston.

It will be observed that this casing occupies a great portion of the length of the working-barrel, and is so fitted as to fit closely to the inner surface of the latter, but not so closely as to create friction between them, the small

quantity of water entering serving the purposes of packing and lubrication. The lower tubular extension *p* of the plunger passes through the guide *d* in the lower valve-chamber and down into the contracted neck *b'* of the same, but does not fill it so completely as to prevent a part of the water entering through the valve *b* to pass upward through the annular space around it into the chamber B, while the remainder goes directly upward through the plunger and its valve-chambers to the air-chamber D. The upper extension *q* of the plunger passes through the guide *f* into the tube D' within the air-chamber, where it is connected to the pump-rod G by a screw-joint. Apertures *r*, at opposite sides of the extension *q*, serve for the exit of the water from the interior of the plunger, after which it passes upward and out of the pump through the tube D' and any extension-pipe which may be attached to it.

The operation of this pump is as follows: When the plunger is raised water flows upward through the valve *b* into the valve-chamber B. When it is depressed a portion of the water in the chamber passes upward through the extension of the plunger into its lower valve-chamber *k*. As the plunger continues its reciprocations a part of this water finds its way through the passage *s* into the space within the working-barrel above the plunger, but at the ensuing reciprocation passes back through the orifice *m* and passage *v* to the upper extension *q* of the plunger to the air-chamber, as indicated by the arrows in Fig. 2 of the drawing. That portion of the water entering the valve-chamber around the lower extension of the plunger passes upward through the valves *a* in the diaphragm B', and through the passage *t* and valve-opening *n* into the chamber *k'*, and thence by the passage *v* into the extension *q* and air-chamber, as heretofore described.

It will thus be seen that a part of the water entering the pump during the upward stroke of the plunger is expelled therefrom at both the upward and downward stroke of the same, thus equalizing the strain upon the pump-gear and causing a steady and uniform flow of water from the exit-pipe.

Having thus described my invention, I claim as new, and desire to secure by Letters Patent, the following:

1. A pump-case composed of the lower section A, provided with the inlet-valve *b*, section B, having a valved diaphragm, B', forming a guide for the lower end of the plunger E, and forming a water-way around the same, the working-barrel C, and the air-chamber D, provided with the contracted neck *f*, forming a guide for the upper end of the plunger, all constructed, arranged, and attached together in the manner and for the purpose specified.

2. The combination of the inlet-valve and its case with the divided valve-chamber above the inlet-valve, as described, the working-barrel, the air-chamber, and reciprocating tubular plunger, forming a water-way, as and for the purpose set forth.

In testimony that I claim the foregoing as my own I hereunto affix my signature in presence of two witnesses.

NICHOLAS CLUTE.

Witnesses:

FRED. E. TASKER,

J. W. HAMILTON JOHNSON.