A. F. HALL.

Double-Acting Steam-Pump.

No. 199,288. Patented Jan. 15, 1878.

Fig. 1.

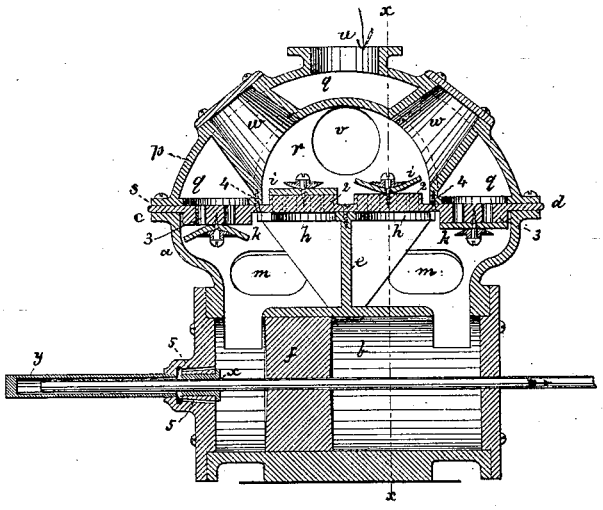


Fig. 2.

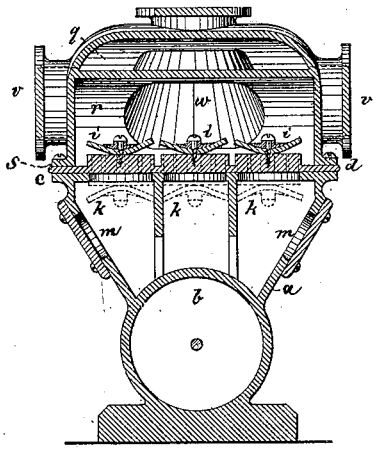


Fig. 3.

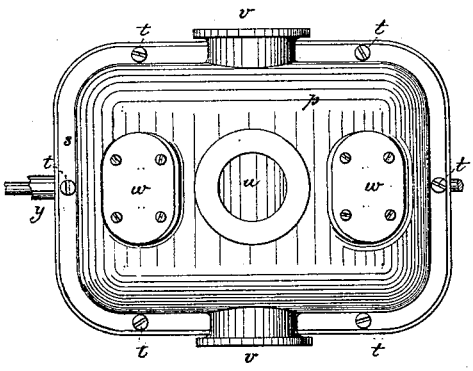
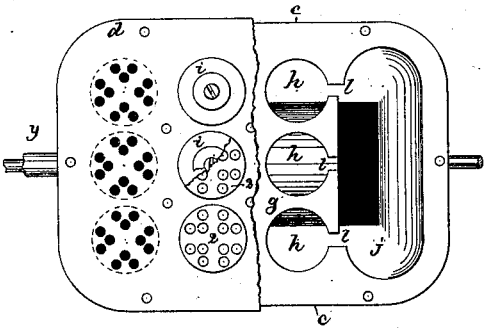


Fig. 4.



Witnesses

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UNITED STATES PATENT OFFICE.

ALBERT F. HALL, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO GEORGE F. BLAKE MANUFACTURING COMPANY, OF SAME PLACE.

IMPROVEMENT IN DOUBLE-ACTING STEAM-PUMPS.

Specification forming part of Letters Patent No. **199,288**, dated January 15, 1878; application filed November 13, 1877.

To all whom it may concern:

Be it known that I, ALBERT F. HALL, of Boston, in the county of Suffolk and State of Massachusetts, have invented an Improvement in Double-Acting Steam-Pumps, of which the following is a specification:

This invention relates to improvements in steam-pumps to be employed either for compressing or exhausting air or gases accompanied or not with fluids.

In this invention the inlet and discharge chambers are in a top formed as a single casting, preferably dome-shaped and flanged, to be placed upon a metallic valve-plate sustained by the flanged portions of a casting, which I denominate the "fluid-chamber," such casting containing the pump-cylinder. This valve-plate has a series of seats for the inlet and discharge valves, the faces of these seats being on opposite sides, so that the valves open in opposite directions therefrom.

The upper and lower flanged castings, forming the main portion of the pump, are held together by bolts passing through the flanges and the edge of the valve-plate.

Figure 1 of the accompanying drawings shows in vertical longitudinal section a pump provided with my improvements; Fig. 2, a section on the line *x x;* Fig. 3, a top view; and Fig. 4 shows at the right the upper portion of the fluid-chamber casting, and at the left a portion of the valve-plate resting thereon.

The fluid-chamber *a*, rising above and containing within it the pump-cylinder *b*, both preferably in one casting, has about its top a flange, *c*, to sustain the valve-plate *d*. This fluid-chamber *a* is divided by a partition, *e*, into two parts, each of which is capable of containing a quantity of fluid equal to or greater than the volume of the fluid displaced from the pump-cylinder *b* at each stroke of the piston *f*. The top *g* of the fluid-chamber is provided with openings *h h*, communicating with the discharge-valves *i*, and with an opening, *j*, communicating with the inlet-valve *k*. These openings *h* and *j* are connected by channel-ways *l*, which act to prevent the accumulation or retention in the opening *j* of the material being pumped, such material escaping through the channels *l* into the openings *h* when the fluid in the fluid-chamber rises.

It will be seen by this construction that every particle of the air or other material being pumped is expelled at each rise of the fluid in the fluid-chamber.

Each compartment of this fluid-chamber has an opening, *m*, covered by a plate, by which access may be had to the inlet-valves *k*. The valve-plate *d* has on its upper side a series of seats, 2, for the discharge-valves, and on its lower side a series of seats, 3, for the inlet-valves. These valves are and may be of any usual construction. The outer edge of this valve-plate rests upon the upper portion of the fluid-chamber, and its edges extend over the flange *c*.

By this construction it is obvious that all the valves may be simultaneously placed in position with reference to the fluid-chamber, and that the valve mechanism is simplified and cheapened more than would be the case were the valves on separate plates and upon different levels, as now common. This valve-plate will be bolted to the partition *e* and to the lower portions 4 of the top *p*. This top sustains a chamber, *q*, communicating with the inlet-valves, and a chamber, *r*, communicating with the discharge-valves, and at its lower end is provided with a flange, *s*, to receive bolts *t* through it, and the valve-plate and the flange *c*, by which such parts are firmly bolted together, suitable packing being used between them.

The top has an inlet-opening, *u*, surrounded by a flange to connect with the inlet-pipe and discharge-openings *v*, surrounded by a flange, either or both of which may be connected with discharge-pipes, and it has also one or more hand-holes, *w*, by which to gain access to the discharge-valves.

To support the piston and prevent it from wearing away the lower portion of the pump-cylinder, the rear end of the piston-rod is sustained in a bushing, *x*, which may be turned as its wears.

The extreme end of the piston-rod passes into a cylinder, *y*, which communicates by holes 5 with the interior of cylinder *b*, such holes receiving water to fill the cylinder *y* when the piston-rod is withdrawn.

In operation the piston at each reciprocation is followed by the fluid in the fluid-chamber, but the fluid never descends low enough to

leave the face of the piston unimmersed, so when the piston makes its return stroke the fluid moved before it ascends in the chamber up to and touches the bottom of the discharge-valves, displacing all the air or gas within the fluid-chamber.

In this invention the steam and pump pistons are directly connected, as in Patent No. 60,852, thereby constituting a so-called "direct-acting pump," all cranks and gears for moving the piston being dispensed with.

The inlet-valves are arranged, it will be noticed, to open downward, so as to operate with the greatest ease and with the least resistance. This is of much importance, especially when pumping gases and vapors from condensers and exhausting the vacuum-pans used in the manufacture of sugar.

The valve-plate *d* may be omitted, and either inlet or discharge valve seats, or both, may be made in, or secured in, a cover or plate formed in the upper portion *g* of the fluid-chamber, or in a portion, like *g*, attached to the lower portion of the top, though the construction here shown is preferred.

I claim—

1. The combination, with the flanged top, provided with inlet and discharge openings, and the flanged fluid-chamber, of the valve-plate interposed between the top and chamber, and provided with the inlet and discharge valves, the parts being all bolted together, substantially as described.

2. The fluid-chamber provided with openings *h j* and channels *l*, in combination with inlet and discharge valves, to operate all substantially as described.

3. In a direct-acting pump, the top provided with the inlet and discharge openings, and the fluid-chamber connected with and containing the pump-cylinder, in combination with inlet-valves opening downward into such chamber, and discharge-valves opening upward from such chamber, all substantially as described.

4. The combination, with the cylinder-head and an adjustable bushing, *x*, of a cylinder, *y*, communicating with the main cylinder by means of openings 5, and containing the end of the piston-rod, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALBERT F. HALL.

Witnesses:

G. W. GREGORY,

S. B. KIDDER.