

C. H. HALL.
 Improvement in Steam Vacuum-Pumps.
 No. 131,534. *Fig. 1.* Patented Sep. 24, 1872.

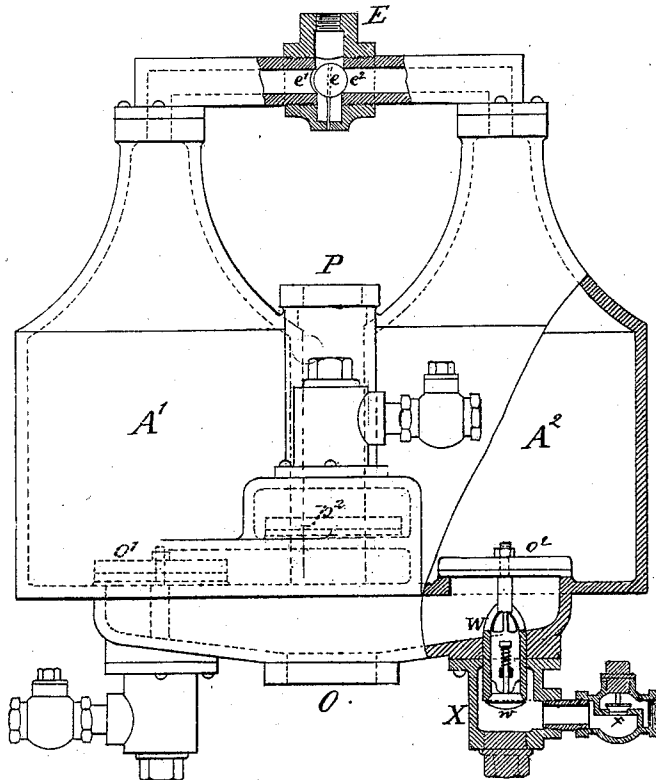
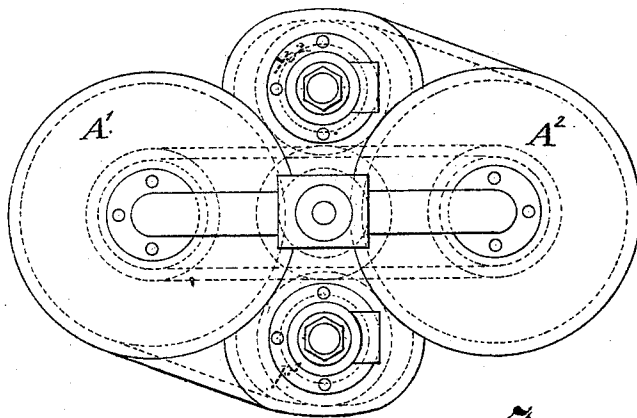


Fig. 2.



Witnesses:

Arnold Hornum.
W. C. Day

Inventor:

C. H. Hall
 by his attorney, *J. D. [Signature]*

UNITED STATES PATENT OFFICE.

CHARLES H. HALL, OF NEW YORK, N. Y.

IMPROVEMENT IN STEAM VACUUM-PUMPS.

Specification forming part of Letters Patent No. 131,534, dated September 24, 1872.

CASE T.

To all whom it may concern:

Be it known that I, CHARLES H. HALL, of New York city, in the State of New York, have invented a certain Improvement in Steam Pumping Apparatus, of which the following is a specification:

To distinguish this from other inventions of my own which are somewhat analogous, I will designate this particular invention by the letter T.

The apparatus belongs to that class of steam-pumps in which the solid working parts are small, relatively, to the capacity of the apparatus, and there is a marked gain by the reduction of rubbing-surfaces and the great efficiency and small cost of the apparatus.

The following is a description of what I consider the best means of carrying out the invention. The accompanying drawing forms a part of this specification.

Figure 1 is a side elevation, partly in section, and Fig. 2 is a plan view.

Similar letters of reference indicate like parts in all the figures.

A¹ A² are vessels of equal size, formed of cast-iron, in one piece, and adapted to resist a strong internal pressure, as also to resist the external pressure of the atmosphere when a vacuum is formed therein. E is a steam-pipe which communicates with a boiler not represented. The steam-pipe E is of small internal diameter, or there must be at some point in the steam connection a narrow passage through which the steam cannot flow readily, except in a very contracted current. O is a pipe, of sufficient size, communicating with the tank or well from which the water is to be taken; and P is a delivery-pipe adapted to convey away the water under pressure.

The chambers A¹ and A² are filled alternately with steam and water. The action is self-controlling. When the steam is excluded from a chamber the water is received from the pipe O and fills it. Meantime the opposite chamber is being emptied of its water by the steam entering at its top and pressing downward on the surface with such force as to discharge the water outward through the discharge-pipe. When the water is thus expelled the reception of steam is cut off and the cham-

ber is soon again filled with water. While one chamber is being filled with water the other is expelling its water. The steam received through the steam-pipe E is excluded from one chamber by the moving of the ball-valve *e* to one side, and the action is alternating or intermittent by the moving of this valve *e* to one side or the other at intervals. When the steam is excluded from the chamber A² the cold water rushes through the water-supply pipe O to fill the vacuum which obtains within it, and the water is thus inducted with sufficient force to act very strongly on the large disk-valve *o*², arranged as represented. It may not be necessary to explain the combination of causes which induce a movement of the ball-valve *e*. In brief, it is drawn away from the seat *e*² over to the seat *e*¹ at the right moment, by virtue of a partial vacuum which obtains in the other chamber A¹ at the moment when it is nearly emptied of its water. By this time the chamber A², having been entirely filled with water, either has its water induction-valve closed by gravity or is standing with the said valve a little open, ready to be closed the moment there is a back action of the water attempting to escape downward past this valve. When, by the movement of the valve *e*, the steam is admitted into the chamber A² to act on the surface of the water, the water then presses backward strongly against the valve *o*², and the force with which it is pressed downward is ample for overcoming a considerable resistance. I have utilized the force with which this large valve *o*² rises and sinks by attaching thereto a hollow plunger, W, provided with a valve, *w*, opening downward, and acting through a tight-fitting space, to serve as a pump-plunger. The movement of the valve *o*² upward lifts this plunger and allows the apparatus below, which I term the auxiliary pump, to fill with water derived from the suction-pipe O. The movement of the valve *o*² downward depresses this plunger, and, in case of a considerable resistance to the action of the auxiliary pump, a great force is available to insure its prompt movement. It is actuated by the whole pressure of the water in the vessel A² on the large area of the valve *o*². The body of the auxiliary pump is marked

X, and the delivery-valve thereof is marked *x*. I can use the water pumped by the auxiliary pump to supply the boiler of the apparatus, or for any other purpose for which water may be required at a higher pressure than that pumped by the main portion of the apparatus.

I have represented a similar auxiliary pump as attached on the other side of the apparatus. This duplication of the auxiliary apparatus may not be necessary in most cases.

I have not esteemed it necessary to provide a special stuffing-box to tighten the fit of the auxiliary pump-plunger W in the hole through which it works. A slight leak around the plunger is of trifling importance. The sinking of the valve *o*², and the consequent depression of the plunger W, with its connected valve, will be sufficiently prompt under most conditions to insure an adequate supply of water from the auxiliary pump without such

application; but a stuffing-box may obviously be employed, if such be desired.

I claim as my invention—

A reciprocating pump attached to and operated by the water induction-valve *o*², in combination with a steam and water chamber, A², with a valve, *e*, for alternately admitting and excluding steam, and valves *o*² *p*² for discharging the water, substantially as and for the purposes herein set forth.

In testimony whereof I have hereunto set my hand this 18th day of May, 1872, in the presence of two subscribing witnesses.

C. H. HALL.

Witnesses:

ARNOLD HÖRMANN,
W. C. DEY.