

C. H. HALL.
 Improvement in Steam Vacuum-Pumps.
 No. 131,535. *Fig. 1.* Patented Sep. 24, 1872.

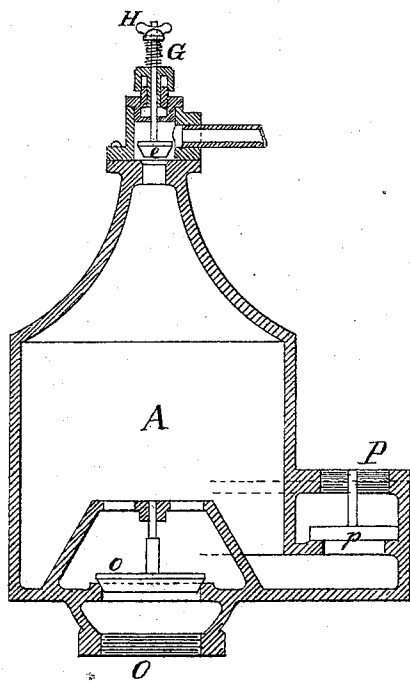
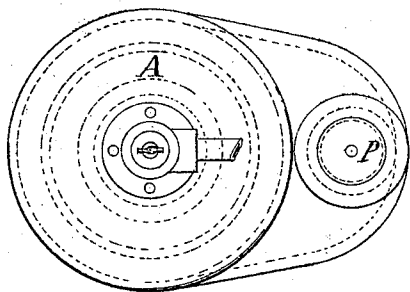


Fig. 2.



Witnesses:

Arnold Horwath
M. C. Day

Inventor:

C. H. Hall
 by his attorney, *J. L. Sullivan*

UNITED STATES PATENT OFFICE.

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

IMPROVEMENT IN STEAM VACUUM-PUMPS.

Specification forming part of Letters Patent No. 131,535, dated September 24, 1872.

CASE U.

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 U.

The apparatus belongs to a class of steam-pumps in which the solid working-parts are small relatively to the capacity of the apparatus, and the steam is caused to act by direct pressure upon the water. There is a marked gain by the reduction of rubbing-surfaces, and the great efficiency and small cost of the apparatus, which is self-acting and of very simple construction.

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 vertical section, and Fig. 2 a plan view.

Similar letters of reference indicate like parts in both figures.

The operation of the single steam-valve *e* depends in part or mainly on the spring *G*, the force of which is adjusted by an adjustable stop, represented as a simple thumb-nut, *H*, but which may be a nut and jam-nut, or any analogous device. The spring *G* should be sufficiently long to afford a nearly uniform tension in all positions. The force should be sufficient to open the steam-valve *e* and hold it open, except when a vacuum obtains in the chamber below—in other words it can resist the steam-pressure and open the valve when the pressure below it is at or near the pressure of the atmosphere; but when there is a vacuum below it the force of the vacuum, in addition to the pressure of the steam, is sufficient to close it and keep it closed.

The action is very simple, and the changes of condition may, I think, be made very reliable. Any percussive force due to the sudden influx of the water acting as a water-ram against the under side of the valve at the moment when the chamber is completely filled with water, instead of disturbing the effect,

would in fact make it more reliable. It would make it more certain to open the valve at this period, which is just the time when it is desired to open it; but I think the apparatus will work successfully without relying upon such percussive action.

It will be readily seen that the provisions for adjusting the tension of the spring *G* allow the ready adaptation of the apparatus to different pressures of steam.

The valve *e* is represented as open. Under these conditions the steam enters and expels the water, driving it up past the valve *p* into the pipe *P*. When the water-level has been lowered to a little below the upper edge of the discharge-orifice, which may be, and properly is, wide and exactly horizontal, so that the change in conditions at that moment is very marked, a quantity of steam is delivered into the discharge-orifice, and a large portion of the water-surface is agitated, so as to present cold water to the steam. The sudden condensation thereon ensuing induces such a vacuum that the steam-valve *e* is instantly drawn down to its seat against the tension of the spring *G*, and it remains thus seated so long as the vacuum obtains below. The vacuum draws the water from the pipe *O* past the water-induction valve *o* until the chamber *A* is filled, on which, there being no longer a vacuum therein, but rather, under ordinary conditions, a slight plus pressure due to the momentum of the water in its flow through the pipe *O*, the steam-valve *e* opens in obedience to the tension of the spring *G*, and the round of operations is repeated.

I have found by experiment that the loss of steam is slight when worked in this manner in uncoated vessels of metal; but I propose in ordinary practice to coat the interior of each chamber with japan varnish, or with red lead and oil, or with a solution of rubber or the like, to serve as a durable non-conductor of heat. I can make the chambers and the several connections of lead, to pump acids, or of glass or other material for any special uses requiring such.

I am aware that it has before been proposed to arrange, in connection with a steam and water chamber for water elevating, a valve held open by the force of an adjustable spring in

such position that the current of steam will tend to close it; but in such cases, so far as I have learned, a float or the like was always employed to open and close the valve. By my invention, on the contrary, I employ simply the changeable force of the steam to induce the action.

What I claim as my invention is as follows:

In combination with the chamber A, suitable water-induction means, and a discharge-orifice and water-delivery passage, arranged as

shown, I claim the self-acting valve e, spring G, and adjusting means H, adapted to control the action, as herein specified.

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.