

C. H. HALL.
 Improvement in Steam Vacuum-Pumps.
 No. 131,536. *Fig. 1.* Patented Sep. 24, 1872.

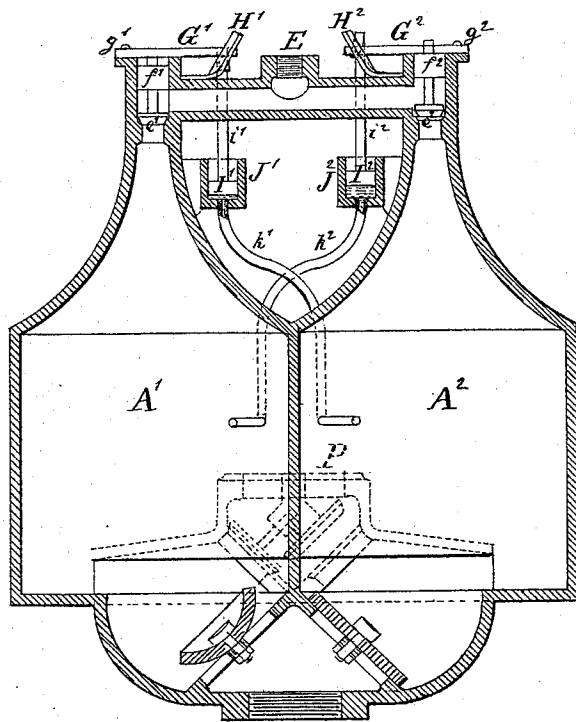
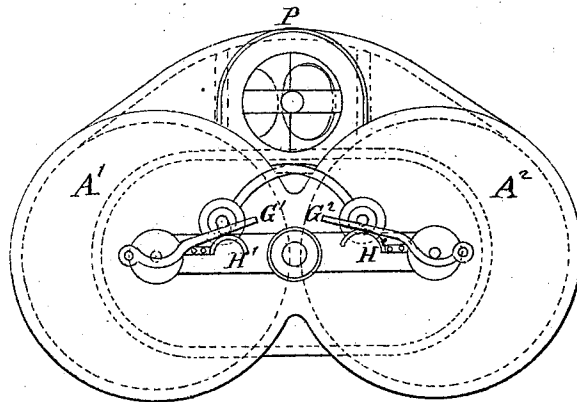


Fig. 2.



Witnesses;

Amold Hornum.
W. C. Dey

Inventor;

C. H. Hall
 by his attorney *T. S. Peterson*

UNITED STATES PATENT OFFICE.

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

IMPROVEMENT IN STEAM VACUUM-PUMPS.

Specification forming part of Letters Patent No. 131,536, dated September 24, 1872.

CASE V.

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:

The invention relates to that class of pumping apparatus in which the steam is admitted into the same chamber or chambers with the water, and presses upon the surface thereof. The working parts are small relatively to the capacity for pumping, and the apparatus constitutes an efficient pumping means, operating rapidly and reliably. I employ strong chambers provided with valves for admitting water and holding it against its return, and also with valves for allowing it to be expelled through another pipe to be conducted to an elevated reservoir, or to such other point as may be desired, and the operations of being filled with water and being discharged succeed each other by reason of a change of position of the steam valve or valves, governing the admission of steam from a boiler or steam-generator, which may be situated at a distance. There are two equal chambers in each set of the apparatus, the two filling and emptying alternately. The chamber which is filling with water should complete its filling before its mate is emptied, and the change of the steam-valves is effected automatically on the completion of the emptying of the discharging-chamber.

The following is a full and exact description of what I consider the best means of carrying into effect one form of the invention. The accompanying drawing forms a part of this specification.

Figs. 1 and 2 represent this form of the apparatus. In this two vessels are employed, and the steam-valves are balanced by pistons subject to the pressure of the steam. A device analogous to a latch is employed in connection with each valve and piston to hold it in the shut position, when that has been attained, until the opposite vessel has been emptied to a certain point. Figure 1 is a vertical section, and Fig. 2 is a plan view.

The steam from the pipe E is conducted in the horizontal branch or chest represented to the two valves e^1 e^2 , which control its admission to the respective chambers A^1 A^2 . To the

valve e^1 is attached the piston f' , the pressure against which tends to pull the valve open, while the direct pressure on the valve tends to close it and hold it closed. The description of one side of the apparatus may answer for both. I make the area of the piston f' a little greater than that of the valve e^1 . Under ordinary conditions there is a tendency of the valve to open and remain open; but when there is a vacuum below the valve the effective pressure of the steam downward on the valve is correspondingly increased, and the violent current of steam rushing past the valve e^1 brings the valve down to its seat. It will be understood that the action in the respective chambers—the receiving and expelling the water and the forming of the vacuum—is induced at the proper period in each chamber by the escape of a quantity of steam into the discharge-orifice. So soon as the valve e^1 has reached its seat the swinging lever or latch G' , turning on the pivot g' and actuated by the spring H' , moves over the upper end of the valve-stem, and locks or latches the valve down until the proper period arrives for its release. I' is a piston, playing in a cylinder, J' , and having a rod, i' , with a wedge-shaped top.

When the piston is down, as represented, it has no effect; but when it is forced upward its inclined or wedge-like upper end acts on the lever or latch G' , and turns it, swings it around against the force of the spring H' , and liberates the valve, which then rises by the superior pressure on the piston f' . I raise the piston I' at the proper time, by the force of mercury, air, or other expansible fluid, under the influence of the heat of the steam in the opposite chamber A^2 . The pipe k' leads downward from the piston J' , and leads into and exposes a considerable surface in the interior of the chamber A^2 . The level at which this exposure in the chamber A^2 is made is important. It should be at such height that when, by the lowering of the water-surface in the chamber A^2 in the expulsion of the water, the steam obtains access to this pipe k' , it will have sufficient time to heat its contents, induce an expansion, and raise the piston I' a little before the water is entirely expelled from the chamber A^2 .

The advantage of thus raising the piston I'

and liberating the corresponding latch, and allowing the steam-valve e^1 to open to commence the work of expelling the water from the chamber A^1 a little before the water has ceased to be expelled from the chamber A^2 , is very obvious. By its means I induce a steady stream to be delivered through the discharge-pipe P.

Any means which will liberate the confining device which holds the steam-valve e^1 shut a little before the chamber A^2 is emptied will induce a continuous stream, and thus realize an important end of this part of the invention. Several of the modifications described in other forms may suffice for this purpose, the initiating process being commenced when the steam has forced only a half or two-thirds of the water from the chamber.

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 con-

nections of lead, to pump acids, or of glass or other material for any special uses requiring such.

What I claim as my invention is as follows:

1. In combination with the chambers $A^1 A^2$, suitable water induction and eduction means, and provisions for receiving steam intermittently into each, I claim the steam-valves $e^1 e^2$ with means for moving each independently to one extreme of its motion, and the holding and liberating means arranged to liberate each valve automatically and allow it to move at the proper period, substantially as herein specified.

2. Also, the specific arrangement of the valve e^1 , piston f' , latch G' , spring H' , liberating piece I' , pipe k' , and chambers $A^1 A^2$ and their connections, 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.