C. H. HALL.

Improvement in Steam Vacuum-Pumps.

No. 131,532. Patented Sep. 24, 1872.

Fig: 1.

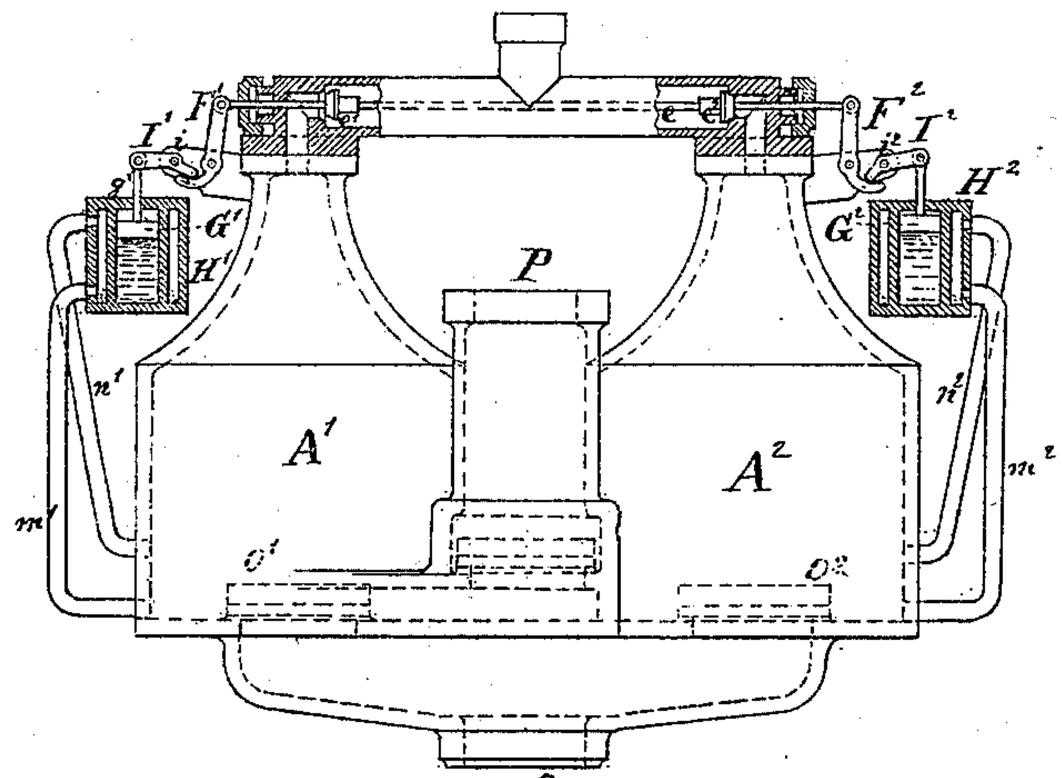
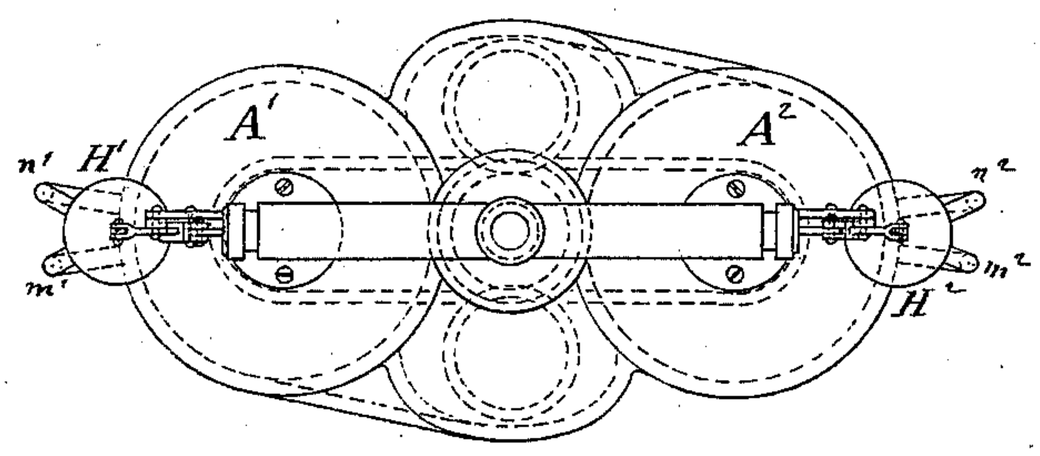


Fig: 2.



Witnesses;

Arnold Hörmann.

Wm. C. Dey

Inventor;

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by his attorneys F. L. Stetson

UNITED STATES PATENT OFFICE.

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

IMPROVEMENT IN STEAM VACUUM-PUMPS.

Specification forming part of Letters Patent No. **131,532**, dated September 24, 1872.

CASE R.

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.

Figures 1 and 2 represent this form, in which the change of condition in the valves is induced by the expansion of mercury or other suitable fluid, surrounded by a space into which cold water and steam are admitted alternately, according as the water-level rises and sinks in the connected chamber. Fig. 1 is a side elevation, partly in section; and Fig. 2 is a plan view.

The steam-valves e^1 e^2 are fixed on a stem, *e*, which extends out through a stuffing-box at each end of the valve-chest, and is connected to a lever. The lever F^1 is mounted at one end, and the lever F^2 at the other. The apparatus being the same at each end, a description of one alone will suffice. The piston G^1 plays vertically in a cylinder, H^1, with a quantity of confined air or other suitable fluid susceptible of expansion from heat confined below it, and with a chamber or jacket extending around it, as represented. If the fluid under the piston G^1 be mercury, the piece G^1 need not fit tightly, but may be simply a mass of iron floating on the denser fluid. In either case the piece G^1, which I will call a piston, is connected, by the rod g', to an intermediate lever, I^1, turning on a fixed center, i', and acting on the lever F^1, as represented. The short arm of the lever I^1 acts on the curved surface on the lever F^1; but the curvature is not struck on the axis of the lever I^1 as a center. The arrangement causes the lever F^1 to move a little as the lever I^1 is moved. The pipes m' n^1 communicate with the jacket around the cylinder H^1, the pipe m' connecting the bottom of the jacket with the extreme base of the chamber A^1, and the pipe n^1 connecting the top of the jacket with a higher point in the chamber A^1. The steam-valve e^1 is open, and the steam thereby admitted into the chamber A^1 drives out the water, while the chamber A^2 becomes promptly filled. The water is expelled in the chamber A^1 until the water-level therein sinks below the connection with the pipe n^1, immediately on which the steam rising through the pipe n^1 into the jacket surrounding the cylinder H^1 expels the water therefrom, allowing it to descend by gravity through the pipe m' into the chamber A^1 to be driven out. The elevation at which the pipe n^1 is connected to the chamber A^1 is such that before the last of the water is expelled from the chamber A^1 the steam has taken possession of the jacket around the cylinder H^1, and has raised the temperature of the expansible fluid therein, and thereby raised the piston G^1. This movement, by the action of the lever I^1 upon the lever F^1, pulls the rod *e* to the left, thereby promptly closing the steam-valve e^1 and opening the steam-valve e^2. The effect on the chambers A^1 A^2 due to this change of condition is as heretofore explained. The water commences to be expelled from the chamber A^2, and the

condensation of the steam in the chamber A^1 rapidly creates a vacuum, which draws water from the pipe O past the valve o' to fill the chamber A^1. The only peculiarity worthy of remark is the effect on the piston G^1 and the fluid under it. So soon as the cold water has risen above the connection of the pipe n^1 it condenses the steam in the jacket and its connections, and the cold water flows upward through both the pipes m' and n^1, and promptly fills the jacket, thereby commencing to cool the fluid, and rapidly induce a sinking of the piston G^1. The operations are timed so that the piston G^1 sinks to its original position before the water is all expelled from the chamber A^2, so that when the piston G^2 rises by the admission of steam through the pipe n^2 to the jacket surrounding the cylinder H^2, the piston G^1 is in its lowest position, and the lever I^1 is turned so as to offer no obstruction to the movement of the rod e and its connections to the right. This latter movement closes the steam-valve e^2 and opens the steam-valve e^1, which brings the parts again into the condition in which they are represented in the figures.

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.

What I claim as my invention is as follows:

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 jacketed fluid-vessels H^1 H^2, receiving steam and water alternately with the movable pieces G^1 G^2 and connections I^1 F^1 I^2 F^2, for operating the steam valve or valves, according as steam or water is admitted, all arranged for joint operation, substantially 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.