C. H. HALL.

Improvement in Steam Vacuum-Pumps.

No. 131,531. Patented Sep. 24, 1872.

Fig: 1.

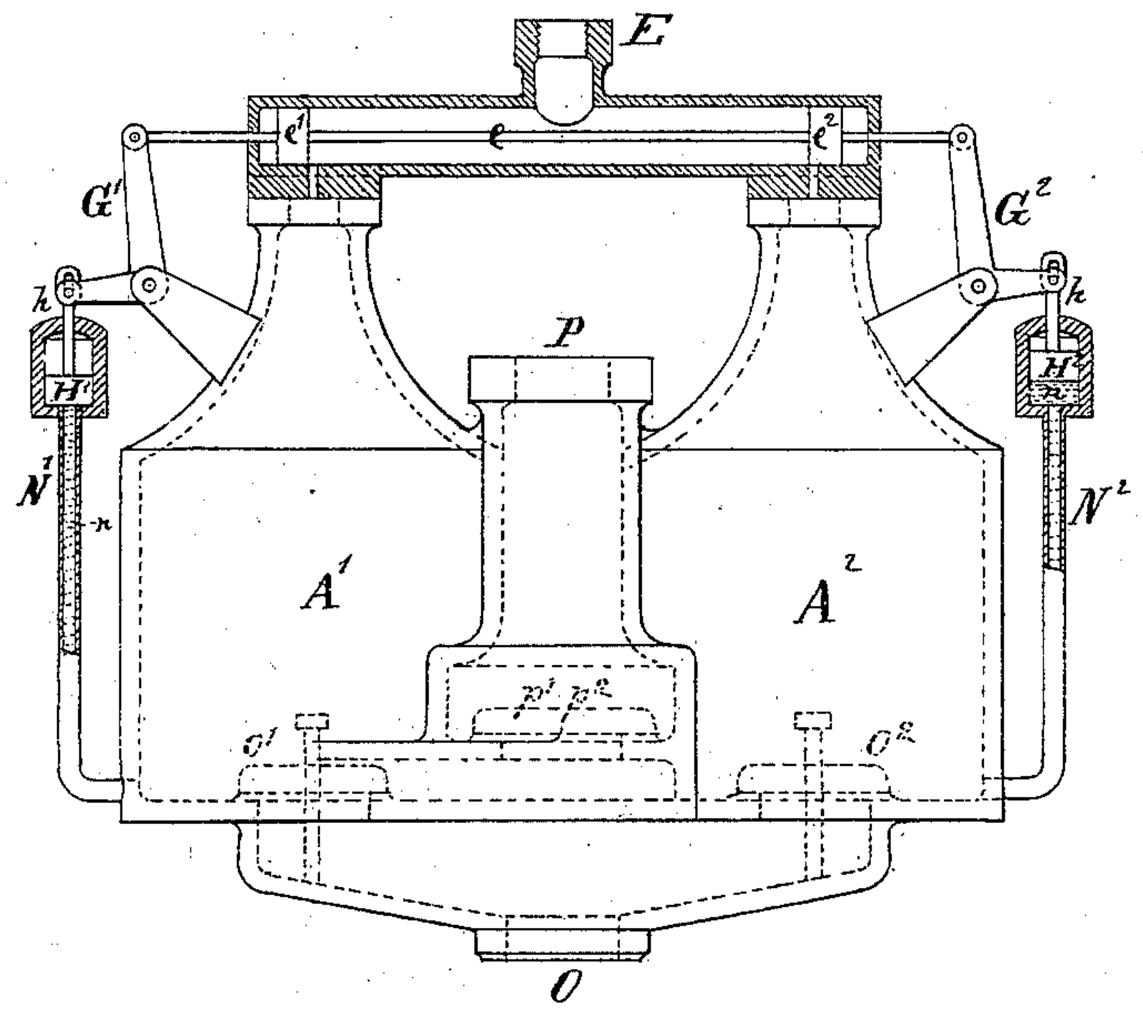
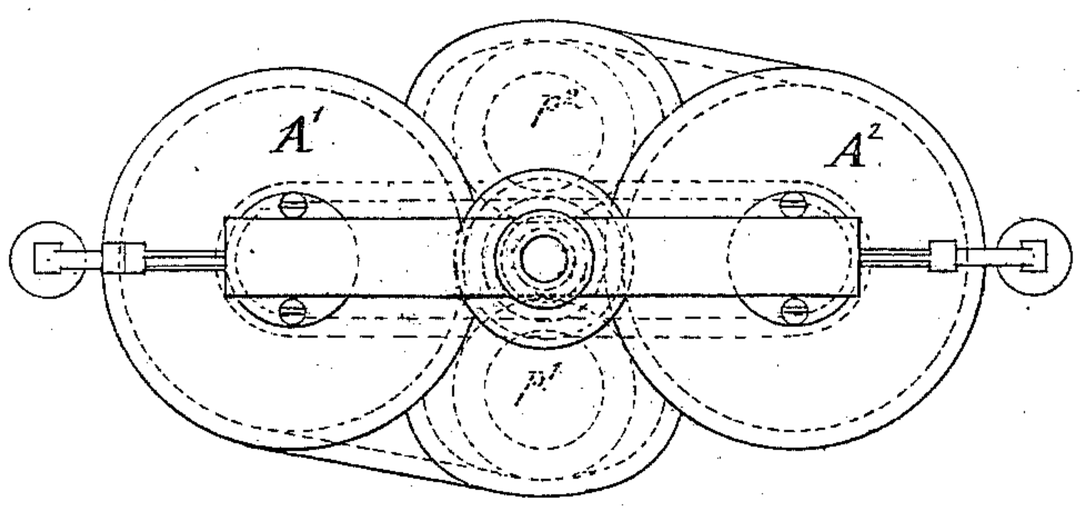


Fig: 2.



Witnesses:

Arnold Howland.

W. E. Dey

Inventor:

C. H. Hall.

by his attorney 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. **131,531**, dated September 24, 1872.

CASE Q.

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.

This form is represented in Figures 1 and 2, where Fig. 1 is a side elevation partly in section, and Fig. 2 is a plan view.

The steam-valves e^1 e^2 are, in effect, slide-valves. They are represented as cylindrical in form, but this is not material. They fit tightly on their lower faces, where they slide across the small parts, and are connected by the rod *e* passing out through a stuffing-box at each end of what may be termed the steam-chest. The valves are moved by mechanism operated by a change of temperature. G^1 G^2 are bell-crank levers, one arm of each connected to the rod *e*, and the other arm of each connected to a rod, *h*, which is attached to the piston H, subjected to the pressure of a fluid which is sensitive to changes of temperature. I will describe this fluid as mercury, and describe it as inclosed within a cast-iron pipe; but other fluids may be substituted for mercury, and copper may, with advantage, be substituted for iron, particularly at the lower part, on account of its greater conductibility of heat. The fluid *n*, inclosed within the casing N, is exposed within the chambers to the temperature of the surrounding fluid—that is to say, each chamber A^1 and A^2 has a pipe, N, led through its walls, and adapted at its outer end to allow its contained fluid to act on the piston H. Its inner end may be expanded in any suitable manner to expose a large surface to the influence of the temperature. There may be a cylindrical pipe of iron, copper, or other suitable metal, wound in a volute form, or it may be otherwise variously convoluted to afford the steam at one period and the cold water at another an opportunity to rapidly affect the temperature of the contained fluid.

Assuming the steam-valves e^1 e^2 to be in the position represented in Fig. 1, the steam entering the chamber A^1 drives out the water, the cold water meanwhile flowing up rapidly into the other chamber A^2 and filling it. When the steam has driven out the water from the chamber A^1, until the level of the water has sunk, so as to expose the pipe N, the access of the hot water at the surface, and immediately afterward of the steam, rapidly heats the contained fluid *n* and causes the connected piston H to ascend. This turns the bell-crank lever G^1, and induces an active movement of the rod *e* so as to close the steam-valve e^1 and open the steam-valve e^2, after which the same round of operations occurs in the other chamber A^2. There is a slot in each rod, *h*, which makes a loose connection with the bell-crank lever. When the cooling effect of the influx of the water has induced a contraction of the fluid *n*, the piston H, with the rod *h*, may sink as far as it pleases without inducing any movement of the connected lever; otherwise there might be a premature movement of the steam-valves.

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:

1. In combination with two chambers, A^1 A^2, suitable water induction and eduction means, and provisions for receiving steam intermittently, I claim the within-described method of operating the steam-valves e^1 e^2, by allowing the steam in the respective chambers A^1 A^2 to raise the temperature and thus expand masses, which expansion induces the motion of the valves, substantially as herein specified.

2. Also, the within-described combination and arrangement of the two chambers A^1 A^2 with the means o^1 o^2 p^1 p^2 for the admission and discharge of water, steam-controlling device e e^1 e^2, bell-crank levers G^1 G^2, pistons or floats H^1 H^2, and vessels N^1 N^2, presenting a fluid in the interior of the respective chambers A^1 A^2 to act on the pistons by the expansion of the fluids by heat, as 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.