C. H. HALL.

Improvement in Steam Vacuum-Pumps.

No. 131,520. Patented Sep. 24, 1872.

Fig: 1.

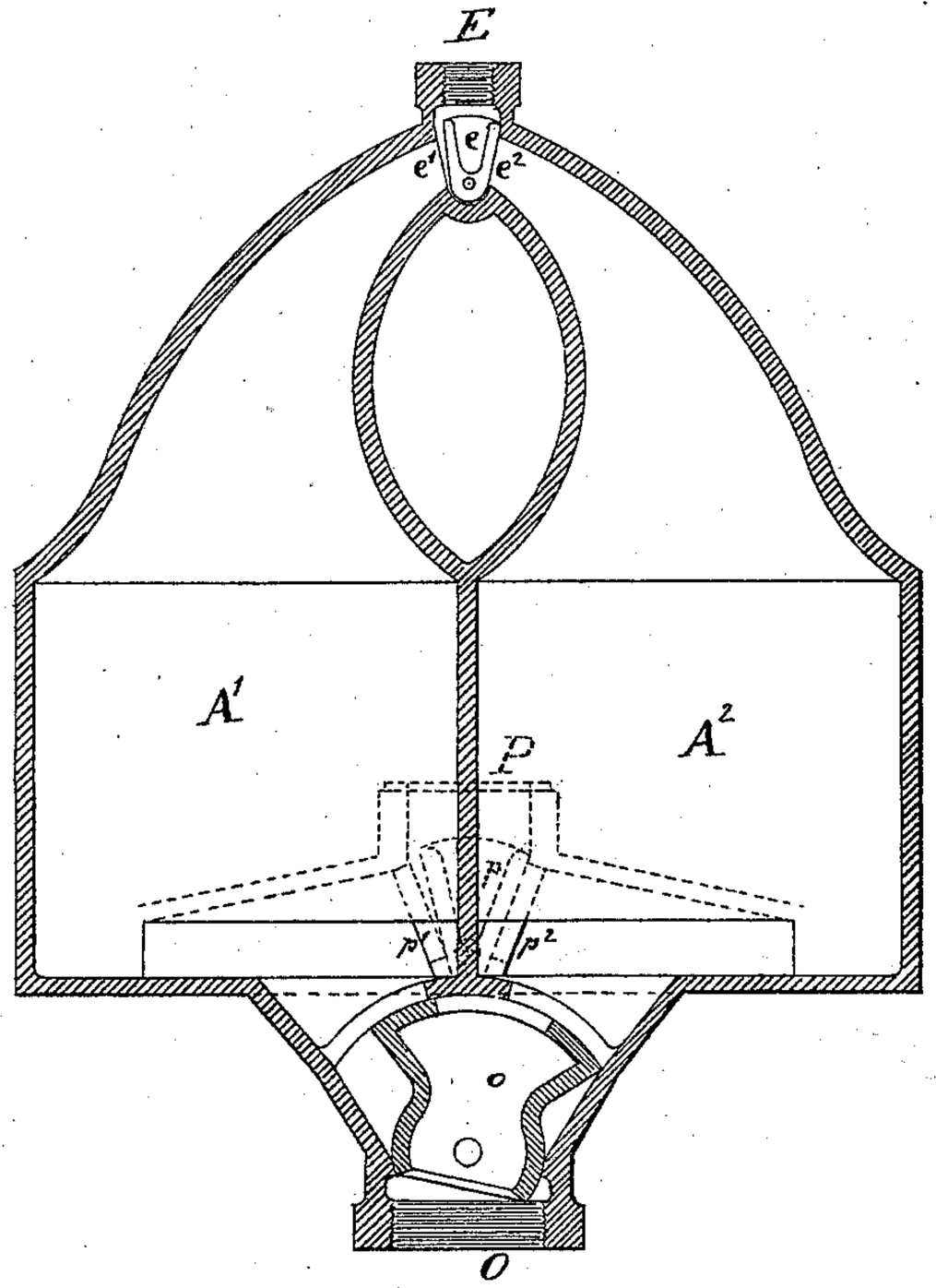
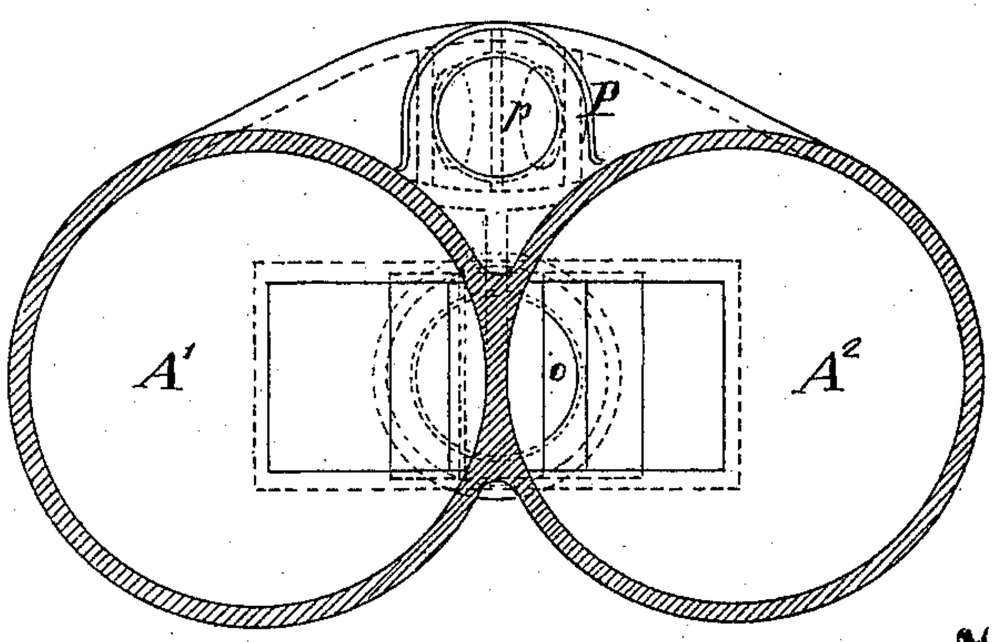


Fig: 2.



Witnesses:

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Inventor:

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UNITED STATES PATENT OFFICE.

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

IMPROVEMENT IN STEAM VACUUM-PUMPS.

Specification forming part of Letters Patent No. **131,520**, dated September 24, 1872.

CASE F.

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 F, and I will also designate it by the brief title "Hollow Wedge."

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 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 efficacy 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 vertical section, and Fig. 2 is a horizontal section.

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

A^1 A^2 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 and discharge it at a higher point or wherever it is desired to force the water. The chambers A^1 and A^2 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 chamber is soon again filled with water. While one chamber is being filled with water the other is expelling its water. The steam-valve *e* turns upon an axis below. When it lies in the position represented it bears against the seat e^2 and prevents the flow of steam into the chamber A^2, in which meantime, a vacuum obtains and causes it to fill with water through provisions which will be presently described. Under these conditions the steam flows freely into the opposite chamber A^1 and drives out the water which has previously filled the latter. It drives it outward past the valve-seat p' into the delivery-passage P. When the surface of the water in the vessel A^1 has sunk sufficiently low it passes below the upper edge of the discharge-orifice O. At this juncture the steam itself commences to be discharged into the discharging-orifice and induces a violent agitation of the water-surface. This induces a rapid increase in the rate of condensation of the steam, the condensation having been before almost inappreciable. There is, in consequence, a momentary violent flow of steam through the valve-seat e^1 at the top, but the current has no sooner commenced than it is arrested again by its having induced the valve *e* to change its position. It leaves the seat e^2, where it has been previously resting, and tilts over and bears against the seat e^1. Under these new conditions the condensation of the steam in the chamber A^1 rapidly continues, and the pressure is soon below that of the external atmosphere. Meanwhile the steam is admitted freely from the pipe E into the chamber A^2, and acts therein to discharge therefrom until the water-surface is so depressed as to induce in this chamber the same change of conditions which has been described for the other.

The provisions for receiving and discharging water are peculiar. There is a hollow movable piece, *o*, hung and capable of oscillating freely on trunnions which form in effect an axis. The exterior surface at each side is cylindrical and fits tight and easy against the adjacent casing. As this piece *o* rolls and oscillates under the influence to which it is subjected it forms al-

ways a tight or nearly tight contact with the adjacent walls of the passage. The upper face of the rolling piece *o* is also curved and adapted to move tight and easy within a correspondingly-concave portion of the casing above. When the piece *o* stands in the position shown in Fig. 1 the water from the induction-pipe O, entering freely at the lower end of this movable piece, issues at the upper end into the chamber A^2. This condition continues until the chamber A^2 is filled with water. Meantime the water has been forced out from the chamber A^1, and when the vacuum is formed in the chamber A^1 and the steam-valve *e* rocks and prevents the further introduction of steam into the chamber A^1, the vacuum thereon ensuing in the chamber A^1 by its suction on the movable piece *o* induces it also to change its position and move to the left, so that the communication between the suction-pipe O and the chamber A^2, is, in this new condition of affairs, tightly closed, and the water is inducted rapidly into the chamber A^1. The alternate changes of condition in each chamber, forming first plus pressure of steam and then a vacuum, induces the movable piece *o* as well as the valves *e* and *p*, to rock on their respective centers at nearly simultaneous periods and the water is drawn upward from the pipe O and discharged through the pipe P, so as to be practically continuous.

I have conceived this form of the valves and of the adjacent parts as the result of laborious and expensive experiment. I have endeavored to construct a form which will be durable and reliably effective. The seats for the valves *e* and *p* may be plane, and may be faced with soft metal, rubber, or any other suitable material. The valves are cheaply made and easily mounted and adjusted. The hollow piece *o* and its adjacent surfaces are easily finished. This construction of the apparatus reduces the number of moving parts to three. The valves *e* and *p* may serve successfully without any pin or axis at their lower angles. They may be simply wedge-shaped pieces, rocking on their lower angles.

I claim as my invention—

1. The hollow rocking valve *o*, arranged and operating relatively to the water-induction pipe O, and to the chambers A^1 A^2, as specified.

2. The combination of the rocking valves *e p* and hollow valve *o*, arranged and operating relatively to the chambers A^1 A^2, and suitable pipes or connections, as 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.