C. H. HALL.

Improvement in Steam Vacuum-Pumps.

No. 131,527. Patented Sep. 24, 1872.

Fig: 1,

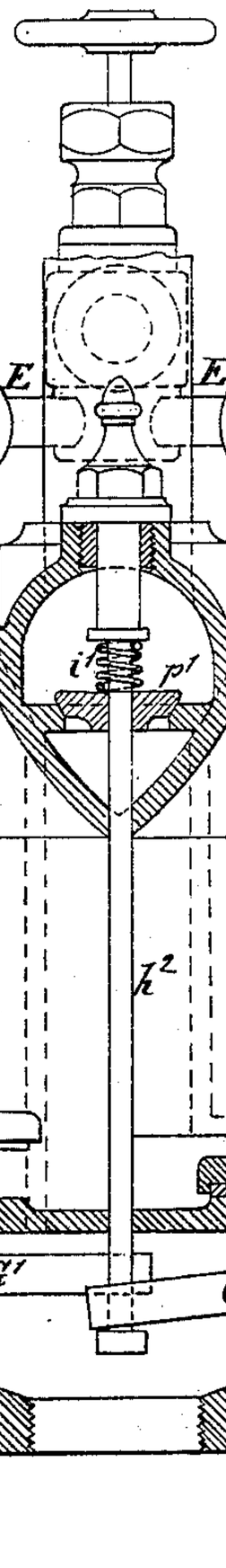
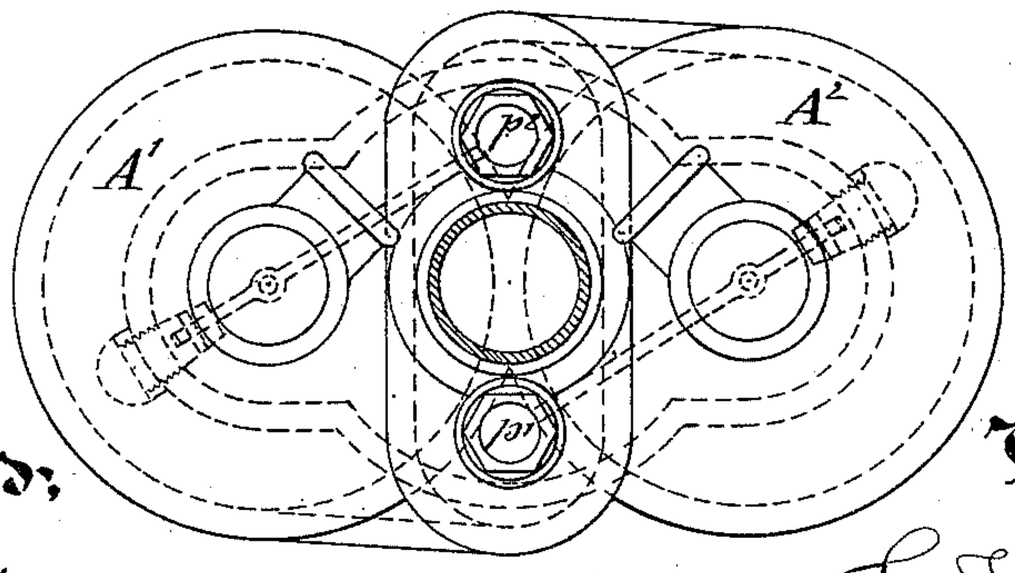


Fig: 2,



Witnesses;

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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. **131,527**, dated September 24, 1872.

CASE M.

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 this the change of condition in the apparatus is induced by the action of the delivery-valves. Fig. 1 is a vertical section through the axes of the two chambers A^1 A^2 and one of the delivery-valves, and Fig. 2 is a plan view.

The steam-pipe E branches and conducts the steam to the respective chambers past the steam-valves e^1 e^2, which are fixed on vertical rods F^1 F^2, which descend through the water-induction valves o^1 o^2 and rest on levers G^1 G^2 mounted in the subchamber and turning on fixed pivots, marked, respectively, g^1 g^2. The lever G^1 is connected by a vertical rod, h^1, to the delivery-valve p^2, which serves as the delivery for the opposite chamber A^2. This valve p^2 is mounted at a higher level, and pressed down by the spring i^2. The lever G^2 is connected by a similar rod, h^2, to the opposite delivery-valve p^1, which is held down by its spiral spring i^1. The steam-valve e^2 is represented as open. The steam enters past this valve, and expels the water from the chamber A^2 until the water-level has descended to a little below the upper edge of the discharge-orifice, when the escape of steam and the agitation of the water causes a sudden increase in the condensation. The partial vacuum thus produced in the chamber A^2 causes the delivery-valve p^2 to close, which thus lowers the connected rod h^1, lever G^1, and vertical sliding rod F^1, and opens the steam-valve e^1 to admit steam into the opposite chamber A^2. Immediately on this partial change of conditions the water commences to be delivered from the chamber A^1, thus lifting its delivery-valve p^1. The lifting of this valve, which follows in an inappreciable interval of time after the preceding operation, completes the change of apparatus by pulling upward on the rod h^2, and thus lifting the lever G^2 and rod F^2, and closing the steam-valve e^2, and excluding the steam from the chamber A^2; thenceforward the operation proceeds as before, the condensation in the chamber A^2 drawing up the water past the water-induction valve o^2 and filling the chamber. At some short interval after this chamber A^2 is filled, the influx of steam into the chamber A^1 has driven out the water therefrom, and the partial vacuum resulting from the discharge and agitation therein at the close, induces the closing of the delivery-valve p^1, immediately on which the same round of operations is repeated as before.

The connections in this case, although very effective in practice, are difficult to describe briefly with absolute clearness. I will detail the round of operations which occur on the entering of this second chamber from the completion of the discharge of water from the chamber A^1. The water-induction valve o^1 has been all along closed. On the formation of the partial vacuum in the chamber A^1 the water-in-

duction valve o^1 will open, and, in practice, the lifting of the water-induction valve and its striking against the collar *f*, represented on the rod F^1, aids in closing the valve e^1, and the same, of course, at the proper time in the opposite chamber; but I do not rely upon this action mainly to close the steam-valve, and certainly do not rely upon it to hold the steam-valve closed for the proper period. In short, the movement of the several water-induction valves o^1 o^2 aids to close the respective steam-valves e^1 e^2 at the proper time, but would not hold them closed for the proper period. The other means which I have provided aid to close them and exert a constant force to hold them closed for the proper time.

Now, with reference to these other means, the partial vacuum obtaining in the chamber A^1, induces a prompt closing of its delivery-valve p^1, and a corresponding prompt sinking of the rod h^2, lever G^2, and rod F^2, which necessarily, by the opening of the connected steam-valve e^2 and the admission of steam into the chamber A^2, inaugurates a delivery of water from the chamber A^2, which immediately lifts the delivery-valve p^2, and thus, by lifting the connected rod h^1, lever G^1, and rod F^1, promptly closes the steam-valve e^1, and allows the vacuum in the chamber A^1 to become perfect, and the chamber to fill promptly with water for another round of operations. The train of connections between the delivery-valve p^1 and its connected steam-valve e^2, as also between the delivery-valve p^2 and its connected steam-valve e^1, are so adjusted that a very slight rise of the delivery-valve induces a tight closing of the connected steam-valve. This allows the apparatus to work successfully under conditions where it works very slowly; but when the apparatus is working more rapidly it is important to provide for a possible wider opening of the respective delivery-valves p^1 p^2—that is to say, I wish to allow the delivery-valves to open further than is necessary to close the connected steam-valve. I allow this by the yielding of the respective springs i^1 i^2. These springs must be stiff enough to afford a sufficient force to hold the connected steam-valves tightly closed, but they should have range enough and not be too stiff to allow the delivery-valves to rise to a sufficient height to deliver rapidly.

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 two chambers A^1 A^2 suitable water induction and eduction means and provisions for receiving steam intermittently into each, I claim the levers G^1 G^2 connected to pieces h^1 p^2 h^2 p^1 mounted in the discharge-passage, as represented, so as to open and close the steam-valves e^1 e^2 by the action of the water delivered, 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.