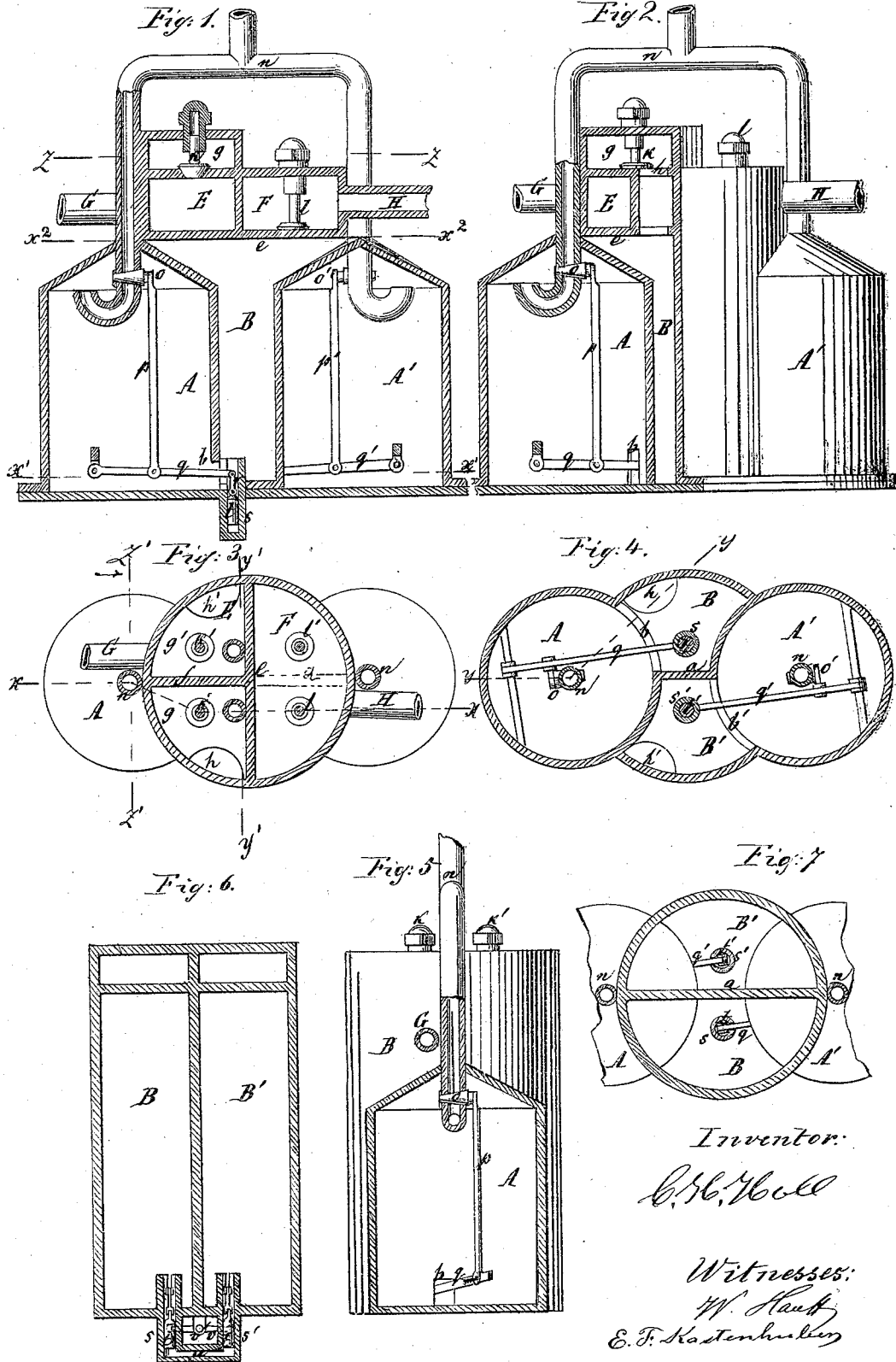


C. H. HALL.

Improvement in Steam Vacuum-Pumps.

No. 131,518.

Patented Sep. 24, 1872.



Inventor:

C. H. Hall

Witnesses:

W. H. Hall
E. F. Kastenhuber

UNITED STATES PATENT OFFICE.

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

IMPROVEMENT IN STEAM VACUUM-PUMPS.

Specification forming part of Letters Patent No. 131,518, dated September 24, 1872.

CASE D.

To all whom it may concern:

Be it known that I, CHARLES H. HALL, of the city, county, and State of New York, have invented a new and useful Improvement in Vacuum-Pumps; and I do hereby declare the following to be a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawing forming part of this specification, in which drawing—

Figure 1 represents a longitudinal vertical section of this invention in the plane xx , Fig. 3. Fig. 2 is a similar section of the same in the plane yy , Fig. 4. Fig. 3 is a horizontal section of the same in the plane zz , Fig. 1. Fig. 4 is a similar section of the same in the plane x^1x^1 , Fig. 1, looking in the direction of the arrow opposite to that line. Fig. 5 is a transverse vertical section in the plane $z'z'$, Fig. 3. Fig. 6 is a similar section in the plane $y'y'$, Fig. 3; and Fig. 7 is a horizontal section of the apparatus in the plane x^2x^2 , Fig. 1.

Similar letters indicate corresponding parts.

This invention relates to certain improvements on that class of vacuum-pumps which I have described in an application for a patent filed in the Patent Office on or about the 31st day of August, 1871. These improvements consist in combining the pistons, which insure the alternating action of the two groups of chambers, with the plugs of stop-cocks or faucets, controlling the admission of steam to the working-chambers in such a manner that the time when said cocks open or close is governed entirely by the positive motion of the alternating pistons; also, in the combination of a balance-lever with the alternating pistons in such a manner that if one piston rises the other must descend, and vice versa, and by these means the alternating action of the said pistons, and consequently that of the two groups of chambers, is insured without fail.

In the drawing, the letters $A A'$ designate two working-chambers in which the pulsations of steam and water or other liquid takes place, said chambers filling and discharging alternately, as will be hereinafter explained. They are made by preference in the form of cylinders with conical tops, cast in one piece, and

standing on their flat bottoms; but they may be constructed in any other desirable form or shape and cast in one or more pieces. Between the working-chambers $A A'$ are situated two intermediate chambers, $B B'$, which are separated from each other by a partition, a , (see Figs. 4 and 7,) and which communicate with the working-chambers $A A'$, respectively, through apertures $b b'$. (See Figs. 1, 4, and 5.) Over the top of the chambers $B B'$ extends a horizontal partition, e , which separates the same from the receiving-chamber E and from the discharge-chamber F . The receiving-chamber communicates with the supply-pipe G and with a chamber above, which latter is divided by a transverse partition, f , in two receiving-valve chambers, $g g'$, (see Fig. 3,) which communicate through apertures $h h'$ with the intermediate chambers $B B'$. The discharge-chamber F communicates with the discharge-pipe H , and it is provided with two valves, $l l'$, which are separated from each other by the partition a between the chambers $B B'$, as indicated in Figs. 3 and 7. Each of the receiving-valve chambers $g g'$ is provided with a valve, $k k'$, so arranged that the liquid admitted through the supply-pipe can open said valves and pass into the chamber $B B'$, but the liquid flowing out of said chambers will close the valves $k k'$ so that it cannot return to the supply-pipe. The valves $l l'$ of the discharge-chamber F are so arranged that they allow the liquid to pass from the chambers $B B'$ to the discharge-pipe, but prevent its return from the discharge-pipe to said chambers. The working-chambers are supplied with steam through a common steam-pipe, n , which branches off so as to connect with said working-chambers, as shown in Figs. 1 and 2, said branches extending down into the working-chambers far enough to make room for stop-cocks $o o'$, which govern the supply of steam, the ends of the pipe being curved up so as to cause the steam discharging from the same to impinge against the tops of the chambers, and not directly against the surface of the liquid. The plugs of the stop-cocks $o o'$ connect, by rods $p p'$, with levers $q q'$, (best seen in Figs. 1 and 4.) These levers are situated in the bottom parts of the working-chambers, and they

extend out through the apertures bb' , leading into the intermediate chambers $B B'$. The outer ends of the levers $q q'$ connect, by links $r r'$, with pistons tt' , working in cylinders $s s'$, extending down below the bed-plate of the apparatus. These cylinders connect, near their bottom ends, by a passage, u , (see Fig. 6,) which forms the sole connection between the two groups of chambers. The pistons tt' are connected by a balance-lever, v , which has its fulcrum on a pivot, v' , Fig. 6, and which compels one piston to rise when the other descends, and vice versa.

The operation is as follows: First, I place the apparatus in a suitable position with reference to the liquid to be pumped, taking care to keep the same within the elevation perpendicularly to which said liquid would be raised by the atmospheric pressure. I then connect the suction-pipe or supply-pipe G with the tank, well, or reservoir containing the liquid, and provide said pipe with a suitable foot-valve, (not represented,) and the delivery-pipe $H I$ connect with or lead over so as to discharge into the receptacle into which the liquid is to be pumped. The steam-pipe n I connect with a suitable steam-generator, and then I fill the apparatus with the liquid to be pumped, which may be done by pouring it into the valve-openings $g g'$, and after securing the valves again in their places and screwing their caps in tight the apparatus is ready to be started. Before admitting steam through the pipe n , however, care must be taken that one of the stop-cocks o , for instance, shall be open. The steam, on passing into the top of the chamber A , forces the liquid contained in said chamber out through the aperture b into the intermediate chamber, and thence out through the discharge-valve chamber F and the delivery-pipe H . As soon as the liquid in the work-

ing-chamber A has descended low enough to allow the steam to pass through the aperture b into the intermediate chamber, said steam, being now compelled to mix with the liquid, condenses immediately, and by the suction of the vacuum thus produced in the working-chamber A the piston t is caused to rise, thereby depressing the piston t' , and the stop-cock o is closed, while the stop-cock o' is opened. By the suction of the vacuum a fresh supply of liquid is drawn into the chambers $A B$, while at the same time the steam passing into the chamber A' through the open cock o' causes this last-named chamber to discharge.

By the peculiar arrangement of the stop-cocks $o o'$ and of their connections the cock o will remain closed as long as the cock o' remains open, and vice versa, and the chamber A will not commence to discharge until the chamber A' has been emptied, and by the condensation of the steam in the chamber the cock o' is closed and the cock o opened. The alternate action of the two groups of chambers is secured without fail, and a steady stream of liquid discharges through the delivery-pipe H .

What I claim as new, and desire to secure by Letters Patent, is—

1. The stop-cocks $o o'$, having their plugs connected to levers $q q'$, in combination with the alternating pistons tt' and with the chambers $A B A' B'$, substantially in the manner herein shown and described.

2. The lever U , in combination with the alternating pistons tt' , cylinders ss' , and connecting-passage u , and with the working-chambers $A A'$, substantially as set forth.

C. H. HALL.

Witnesses:

W. HAUFF,

E. F. KASTENHUBER.