(No Model.) 2 Sheets—Sheet 1.

J. L. BOGERT.

VACUUM PUMP.

No. 536,415. Patented Mar. 26, 1895.

Fig. 1.

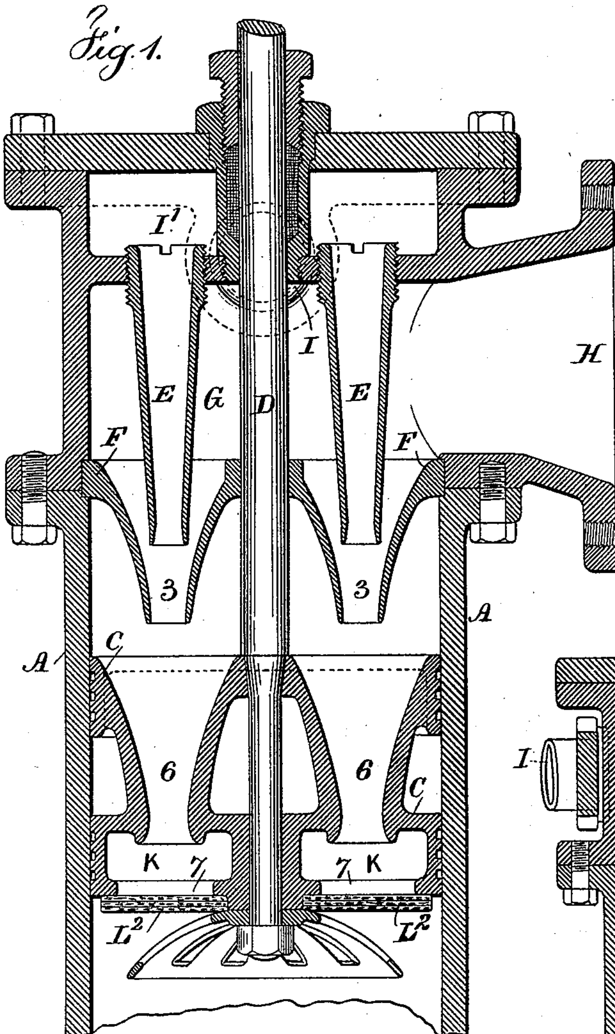


Fig. 6.

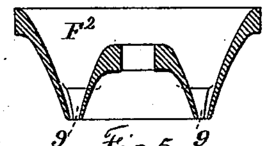


Fig. 5.

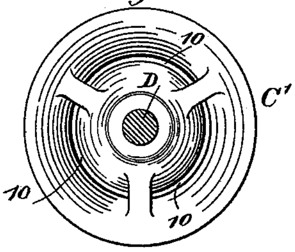


Fig. 3.

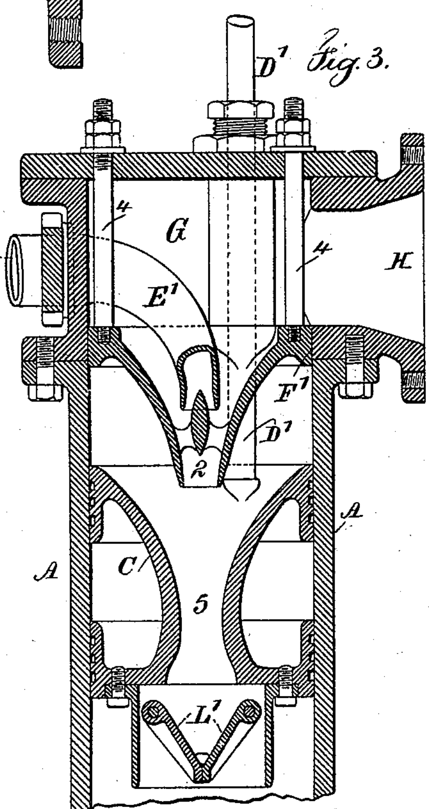
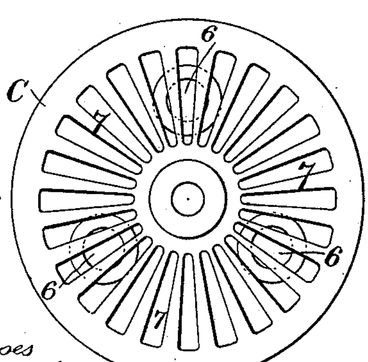


Fig. 2.



Witnesses
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Inventor
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Atty.

(No Model.)

2 Sheets—Sheet 2.

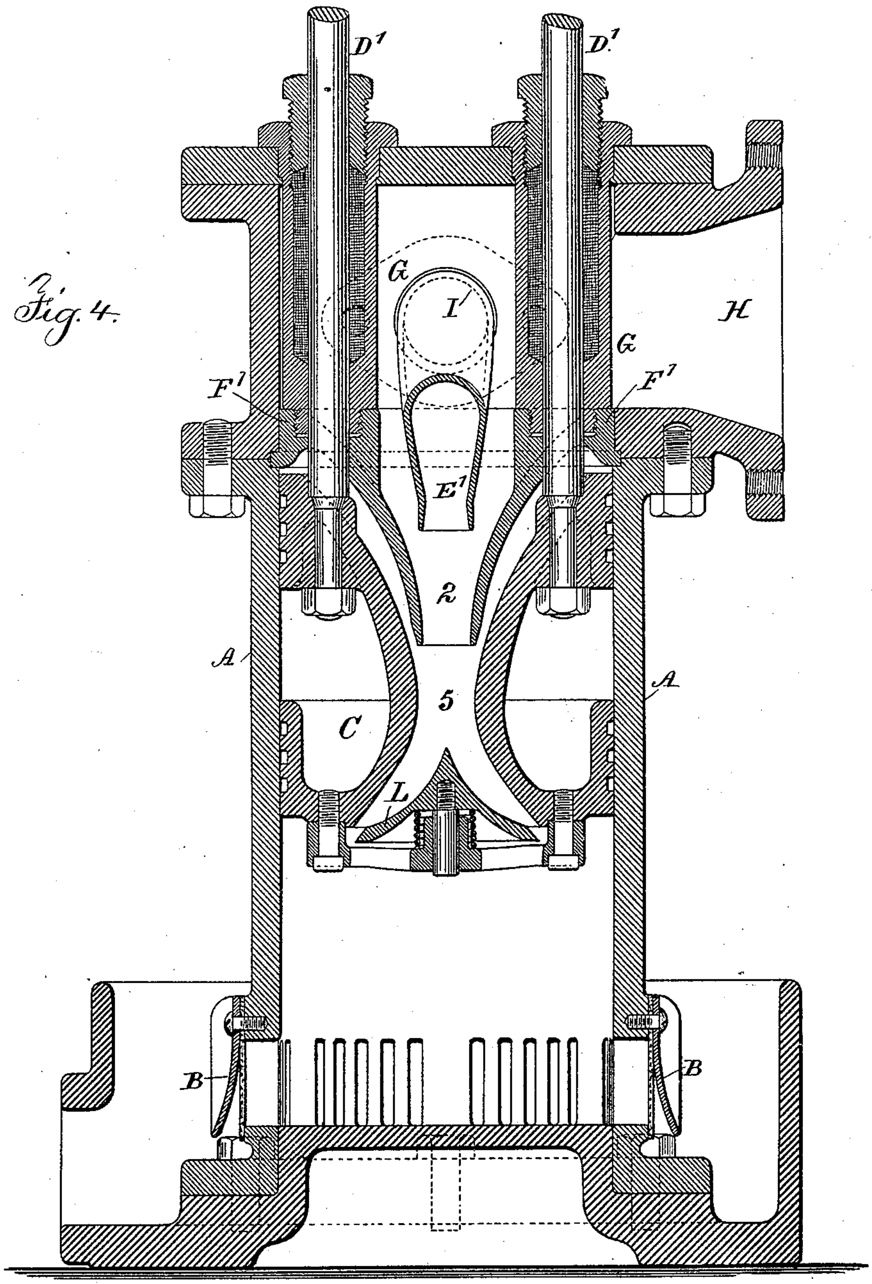
J. L. BOGERT.

VACUUM PUMP.

No. 536,415.

Patented Mar. 26, 1895.

Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN L. BOGERT, OF FLUSHING, NEW YORK.

VACUUM-PUMP.

SPECIFICATION forming part of Letters Patent No. 536,415, dated March 26, 1895.

Application filed July 21, 1894. Serial No. 518,165. (No model.)

To all whom it may concern:

Be it known that I, JOHN L. BOGERT, a citizen of the United States, residing at Flushing, in the county of Queens and State of New York, have invented an Improvement in Vacuum-Pumps, of which the following is a specification.

The steam which passes away from an engine has entered a tube or case having a column of water descending therein through a nozzle, and in some instances the water has been divided into numerous jets or sprays to condense the steam as it falls. The action of this condenser being entirely dependent upon gravity is sometimes inefficient, the water accumulating instead of passing away from the vertical pipe to the hot well. The vacuum pumps which have been made use of for taking away the water of condensation from a condenser are usually operated at a considerable loss in the power, because the flow of water is intermittent, the loss arising in the stopping and starting of the movement of the column of water.

My present invention is made with reference to economy and efficiency, and by this improvement the movement of the column of water is not stopped and it is checked but little by the operation of the pump, and the pump working in harmony with the movement of the column of water prevents the possibility of accumulation of water in the condensing column and insures the discharge of the water of condensation, the condensing water and any air or gases that may be present with rapidity and uniformity, and should any air or gases pass in with the condensing water, they are carried by the jet of water into the pump before they have opportunity to expand and interfere with the perfection of the vacuum.

In carrying out my invention I make use of one or more injector nozzles for the supply of the condensing water, and the jet or jets of water pass into the steam space and by their movement draw the steam into themselves and they pass through a tapering opening in a septum forming the top of the pump, and the bucket of the pump is provided with a tapering passage through it in line with the column of water and steam, and there is a valve or valves in the bucket at the bottom of this tapering opening, which valve or valves open in the direction of the movement of the column of water. Hence the bucket of the pump does not interfere with the continued movement of the column of water due to its inertia, and when the bucket is moving in the same direction as the column of water, the valve or valves close to insure the ejection from the pump cylinder of its contents, and when the bucket is moving in the opposite direction to the column of water, such column of water is not checked but passes by the valve of the bucket directly into the pump cylinder. By this arrangement the inertia of the moving column is not checked and its energy is availed of in aid of the action of the pump, so that the pump will be worked efficiently by the expenditure of less power than has heretofore been necessary, and the vacuum pump can be made much smaller than heretofore usual without lessening its efficiency.

In carrying out my invention I have employed and found it advantageous to use devices corresponding generally to those represented in the accompanying drawings, but I do not limit myself to the details in the construction of the respective parts.

In the drawings, Figure 1 is a vertical section representing the pump and the injector nozzles. Fig. 2 is an inverted plan view of the lower end of the pump bucket. Fig. 3 is a vertical section illustrating a modification in the valves employed in the bucket and in the shape of the injector nozzles. Fig. 4 is a modification of the water supplying device. Fig. 5 is a plan view of a modification of the bucket, and Fig. 6 is a section of a modification of the septum.

The pump cylinder A is of any desired size and preferably cylindrical and the eduction valves B may be of any desired character, and I prefer to place such valves around the lower end of the pump cylinder. The pump bucket C is actuated by any suitable power connected with the piston rod or rods. In Fig. 1 I have shown one piston rod D central to the bucket, and in Fig. 4 I have shown two piston rods, D′, the number and location of the rods varying according to the number of the induction nozzles and passages through the pump bucket that are in line with the induction nozzles.

Where two or more piston rods are made

use of, the tapering opening for the passage of the fluid through the valve may be central, as shown in Figs. 3 and 4. Where one piston rod D is made use of, two, three or more tapering openings may be provided in the bucket for the passage of the fluid. In all instances the tapering openings in the bucket are to be in line with the induction nozzle or nozzles E or E′, and at the upper end of the pump cylinder A there is a septum F with one or more tapering openings in it in line with the nozzles E and the tapering openings through the pump bucket.

The induction nozzles E or E′ pass across a chamber G, and it is to be understood that when the condensing water is supplied through the nozzles E the steam is admitted into the chamber G, but the action may be reversed, the water passing into the chamber G and the steam passing through the induction nozzles E or E′. I however prefer to have the condensing water pass through the nozzles E or E′ and the steam to pass into the chamber G. With this object in view I have represented a pipe or connection H for steam for leading the same into the chamber G, and I have represented pipes I for the supply of water to the nozzles E E′.

In Figs. 3 and 4 the water is supplied to the nozzle E′ by a pipe I, and the nozzle E′ is curved so that its lower end is centrally over the one opening 2 in the septum F′, but in Fig. 1, I have shown two nozzles E E centrally over the two openings 3 in the septum F, there being a water vessel I′ through the bottom of which the nozzles E open, and in this form it is advantageous to screw thread the upper ends of the nozzles E so that they may be screwed up or down to bring their lower ends nearer to or farther from the tapering opening through the septum and thus regulate the opening for the steam that is drawn into the tapering opening of the septum from the chamber G.

Where the nozzle E′ is a fixture, as in Fig. 3, the septum itself may be raised or lowered by screws 4 passing up from the same through the chamber G and through the head or plate at the upper end of such chamber, the object in both cases being to regulate the relative volume of steam and water by this adjustment.

The pump bucket C may be provided with any suitable packing within the pump cylinder A or there may be peripheral grooves around such bucket to act in place of packing rings, and there is through the bucket a central opening 5, Figs. 3 and 4, which opening is tapering and is in line with the opening 2 through the septum F′. In this form of bucket it is advantageous to make use of two piston rods D′, as seen in Fig. 4, but when the septum F is provided with two, three or more openings 3, the pump bucket being provided with openings 6 that are in line with the openings in the septum F and with the nozzles E, there may be a single bucket rod. In all instances such openings in the bucket are tapering in order that the column of fluid may pass through such openings with as little obstruction as possible and without its momentum being materially checked, and in the under side of the pump bucket any suitable valve or valves are provided.

In Fig. 4, I have shown a single valve L to the central opening through the pump bucket, such valve being in the form of a cone and provided with a spring beneath it that is sufficient to sustain the weight of the valve. Hence the valve will open and the conical upper surface of the valve will spread the column of fluid freely into the pump cylinder and below the bucket.

In Fig. 3, I have shown the opening through the pump bucket as provided with two swinging valves L′ which open downwardly and outwardly so as to leave the passage for the column of fluid unobstructed.

In Fig. 1, I have represented an annular chamber K in the pump bucket and below the lower ends of the tapering openings through such pump bucket and a grating 7 forming a seat for the valve L^2, which valve may be in one or more parts and close upwardly against the under surface of the pump bucket, and the chamber above the grating allows the column of fluid to spread with little or no obstruction so as to pass freely through the grating 7, the valve L^2 being open.

It will now be understood that the bucket can be reciprocated with greater or less speed according to the volume of fluid that is flowing through the pump, and it is only necessary that the speed of the pump shall be sufficient to deliver through the eduction valves the fluid that accumulates below the pump bucket each reciprocation, and the valve or valves of the pump bucket will only close when the pressure below the bucket exceeds the pressure above the valve due to the momentum of the descending column of fluid, and in consequence of the column remaining substantially unbroken, any air or gases that may pass in with the water are carried by the water directly through the pump bucket before they have opportunity to expand, and the column of water commingles with the steam to condense the same and form a minus pressure or vacuum in the steam chamber according to the speed of movement of the column of condensing water and the speed of movement of the pump bucket. It will also be apparent that when the pump bucket reaches the upper end of its stroke, the fluid which there is in the pump cylinder will be forced and drawn through the tapering opening or openings in the pump bucket by the double action of the vacuum below the pump bucket and the impact of the column of water above the pump bucket and in line with the opening or openings through such bucket. Thereby the pump will work with great efficiency and with as small an expenditure of power as compatible with the work performed.

I do not limit myself to any particular shape of nozzles or of openings through the bucket or through the septum. I however find it advantageous to employ concentric openings in order that the condensing water may commingle with the steam to the best advantage and condense the same and the fluid pass on directly through the tapering opening in the air pump bucket; neither do I limit myself to any particular character of valve or valves made use of in the vacuum pump. It will also be understood that where two vacuum pumps are made use of, it is advantageous to operate the same by right-angled cranks or similar devices as well known in pumps of this character, in order that the piston of one may be in full operation when the piston of the other is at or near the end of the stroke.

In cases where it is desired to use the condensing water in thin sheets, the openings 9 through the septum F^2 and the openings 10 through the bucket C′ may be substantially annular, there being connecting bridges between the respective parts, as seen in Figs. 5 and 6 and the openings in the lower ends of the water nozzles are curved and sufficiently long and narrow to be of substantially the same shape as the openings in the septum, there being sufficient space between the tubes or connections for the steam to pass freely to the inside of the nearly annular descending column of water.

This improvement although specially adapted to use as a condenser and vacuum pump, may be used with any fluid that may pass as a column through the moving bucket.

I claim as my invention—

1. The combination with an injector condenser, of a pump having a reciprocating bucket with an opening through the same and tapering in both directions from the smallest part and in line with the column of fluid passing from the condenser, substantially as set forth.

2. The combination with a vacuum pump having a bucket with a tapering opening through the same, of a nozzle for supplying the condensing water, a septum with a tapering opening through the same for the passage of the steam and the condensing water, such opening being in line or nearly so with the opening through the pump bucket, there being a valve to the pump bucket opening in the direction of the movement of the column of fluid, substantially as set forth.

3. The combination in a condenser and vacuum pump, of a water supply, a nozzle through which the water is discharged, a chamber for the steam, a septum with a tapering opening for the passage of the condensing water and the steam, the pump having a bucket and an opening in the same in line with the nozzle and the opening in the septum, and a valve below the bucket closing upwardly, substantially as set forth.

4. The combination in a condenser and vacuum pump, of a water supply, an adjustable nozzle through which the water is discharged, a chamber for the steam, a septum with a tapering opening for the passage of the condensing water and the steam, the pump having a bucket and an opening in the same in line with the nozzle and the opening in the septum, and a valve below the bucket closing upwardly, substantially as set forth.

5. The combination in a condenser and vacuum pump, of a water supply, a nozzle through which the water is discharged, a chamber for the steam, a septum with a tapering opening for the passage of the condensing water and the steam, the pump having a bucket and an opening in the same in line with the nozzle and the opening in the septum, a valve below the bucket closing upwardly, and a rod connected with the bucket and passing through the septum and through the steam chamber, substantially as set forth.

6. The combination with the water supply and nozzles, of a chamber surrounding the nozzles, a septum with tapering openings in line with the nozzles, a pump cylinder and bucket having tapering openings through the bucket in line with the openings through the septum, a rod connected with the bucket and passing through the septum and provided with a packing, and valves opening downwardly below the bucket, substantially as set forth.

7. The combination in a combined condenser and vacuum pump, of a nozzle for supplying the condensing water, a chamber for the steam, a septum having a tapering opening in line with the nozzle for the passage of the condensing water and steam, a pump cylinder and bucket, such bucket having a tapering opening through the same in line or nearly so with the opening through the septum, a valve opening in the direction of the flow of the fluid, and means for adjusting the relative positions of the septum and nozzle for regulating the flow of water in proportion to the steam, substantially as set forth.

8. The combination in a pump of an open nozzle for an unobstructed supply of fluid and a reciprocating bucket having an opening in line with the nozzle and tapering in both directions from the smallest part, and a valve opening in the direction of the movement of the fluid, substantially as specified.

9. The combination in a pump, of a nozzle for supplying a fluid and a reciprocating bucket having a passage in line with the nozzle and tapering in both directions from the narrowest part, and a valve opening in the direction of the movement of the fluid, and a chamber between the valve and the lower end of the passage, substantially as specified.

Signed by me this 18th day of July, 1894.

JOHN L. BOGERT.

Witnesses:
GEO. T. PINCKNEY,
A. M. OLIVER.