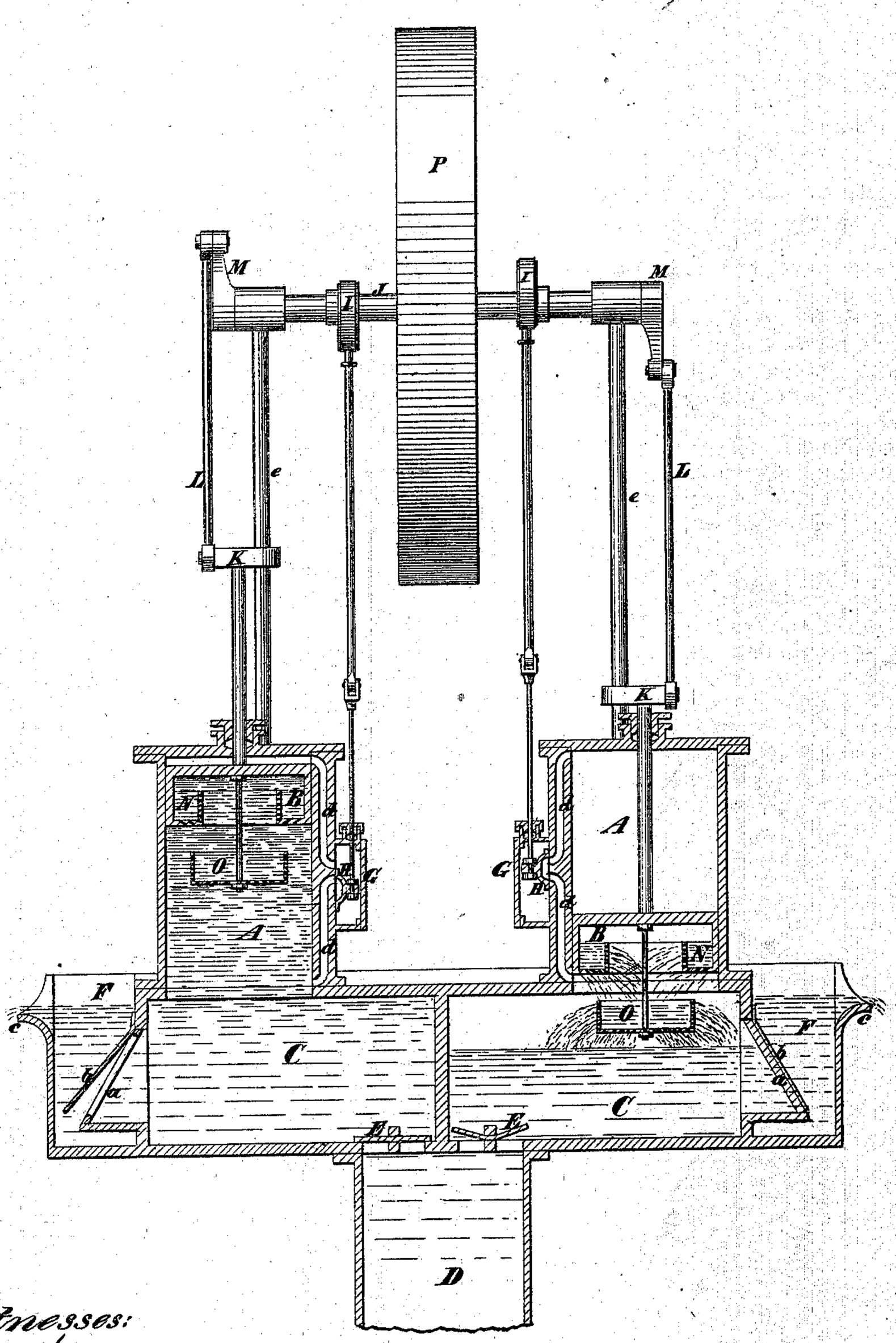
W. BURDON.

Steam Vacuum Pumps.

No. 139,235. Patented May 27, 1873.



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UNITED STATES PATENT OFFICE.

WILLIAM BURDON, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN STEAM VACUUM-PUMPS.

Specification forming part of Letters Patent No. **139,235**, dated May 27, 1873; application filed August 9, 1872.

To all whom it may concern:

Be it known that I, WILLIAM BURDON, of Brooklyn, in the county of Kings and State of New York, have invented new and useful Improvements in Apparatus for Raising and Forcing Water; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing forming part of this specification.

This invention relates to that class of apparatus in which a vacuum is formed alternately in two adjacent chambers or cylinders, and water raised into it by atmospheric pressure and afterward expelled by a piston operated by the pressure of steam, which is subsequently condensed to form a vacuum for the repetition of the operation.

The improvement consists in the combination with the two water cylinders or chambers, and with the pistons working therein, of valves so constructed, organized, and operated, that the steam is first admitted to each cylinder or chamber, above its piston, for the purpose of depressing the piston and expelling the water from below it, and afterward allowed to exhaust into the same cylinder below the piston, for the purpose of producing therein a vacuum into which water is raised by atmospheric pressure, the two pistons being so connected that while one is being depressed by the steam the other is raised by means of its connection. It further consists in the combination, with hollow pistons used in the water-chambers, of perforated cups or receptacles arranged therein, whereby, in the discharge of the chambers, water is retained, and afterward escapes in a spray or shower and condenses the steam to form vacuums. It also consists in the combination with the aforesaid pistons of attached perforated cups, arranged some distance below them, whereby also water is retained in the discharge of the chambers, and in the ascent of the pistons escapes and continues flowing after the flow from the cups before mentioned has ceased, and thereby perfects the condensation of the steam.

The accompanying drawing represents a central vertical section of an apparatus constructed according to my invention.

A A are two water-chambers or cylinders, which are furnished with hollow pistons B B, and are arranged at some distance apart, on a box partitioned centrally, to form two compartments C C, each of which communica tes with a suction-pipe, D, through a valve, E. The cylinders are open at the bottom, and consequently there is free communication between them and their respective compartments C C. These compartments are provided with salient grated openings *a a*, furnished with flap-valves *b b*. These openings communicate with an open-topped trough, F, which surrounds the compartments C C and discharges through lips *c c*. The chambers or cylinders A A have formed on their adjacent sides steam-chests G G, which communicate through ports *d d* with the extreme upper and lower portions of said cylinders. These steam-chests are furnished with slide-valves H H, which control the admission of steam to the cylinders, and are operated by eccentrics I I set reversely on a shaft, J, which is supported on rods or standards *e e* secured on the tops of the cylinders. The rods of the pistons B B are secured to cross-heads K K, which slide up and down on the rods *e e*, and thereby constitute the latter guides as well as supports. To these cross-heads are pivoted rods L L that connect the former with cranks M M set reversely on the aforesaid shaft J. A fly-wheel, P, is provided on the shaft just referred to. In each of the hollow pistons B B there is an annular perforated open-topped receptacle, N, and secured, at some distance below each piston, to a rod extending therefrom, is an open-topped perforated cup, O.

The apparatus operates as follows: The chambers A A are first filled with water by any convenient means. The shaft J is then turned to open one of the steam-valves H H, which, for convenience, I will suppose to be the left. Steam is admitted to the steam-chest within which this valve works, and thence enters the left cylinder A, and acting on the top of the piston B therein, causes it to descend and expel the water in the chamber through the valves *b b*. During the discharge of the chamber, the receptacle N and cup O fill, and when the piston has completed its stroke, and the water, by its impetus and weight, has receded below it and the cup O, both the latter

and the receptacle N discharge in a spray or shower through the perforations. By the time the piston stroke is completed, the slide-valve of its cylinder A is shifted by its eccentric to shut off the supply of steam and establish communication between the ports, and admit the steam in the cylinder above the piston to pass below the piston, where, coming in contact with the sprays or showers from the perforated water-receptacles, it is condensed and forms a vacuum into which water is forced through the suction-pipe by atmospheric pressure. At the same time that the left slide-valve was shifted to shut off the supply of steam from its cylinder, the right slide-valve was, by its eccentric, shifted to admit steam to its cylinder. Acting on the piston, this steam causes it to descend, and this, through the medium of the shaft J, causes the left piston to ascend. The continued discharge of the water receptacles attached to this latter piston, perfects the condensation of the steam below the piston, and the water follows it up and fills the cylinder. By the descent of the right piston, the water is, of course, expelled from the right-cylinder through the openings *a a* in its compartment C. By the time the stroke of the right-cylinder piston is completed, the slide-valve belonging to said cylinder is shifted, and steam is admitted below the piston from above it. Spray from the water-receptacles attached to the piston condenses the steam, and, forming a vacuum, causes water to flow in from the suction-pipe D. Simultaneously with the shifting of the right slide-valve to shut off the supply of steam from its cylinder, the left valve was shifted to admit steam to the left. By the action of the steam on the left piston, the latter descends and expels the water below it, and by means of the shaft J raises the right piston, and so permits the right chamber to fill. Thus the operation continues, each chamber filling while the other is discharging, and vice versa.

Claim.

1. The combination with the two water-cylinders or chambers and their connected pistons of valves constructed and arranged to admit steam to each cylinder or chamber above its piston, and afterward to exhaust such steam into the same cylinder or chamber below its piston, substantially as and for the purpose herein set forth.

2. In combination with hollow pistons, the perforated water-receptacles constructed for operation, substantially as and for the purpose specified.

3. The combination, with the cylinder and hollow pistons, of perforated cups arranged below the pistons, substantially as and for the purpose herein described.

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Witnesses:

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