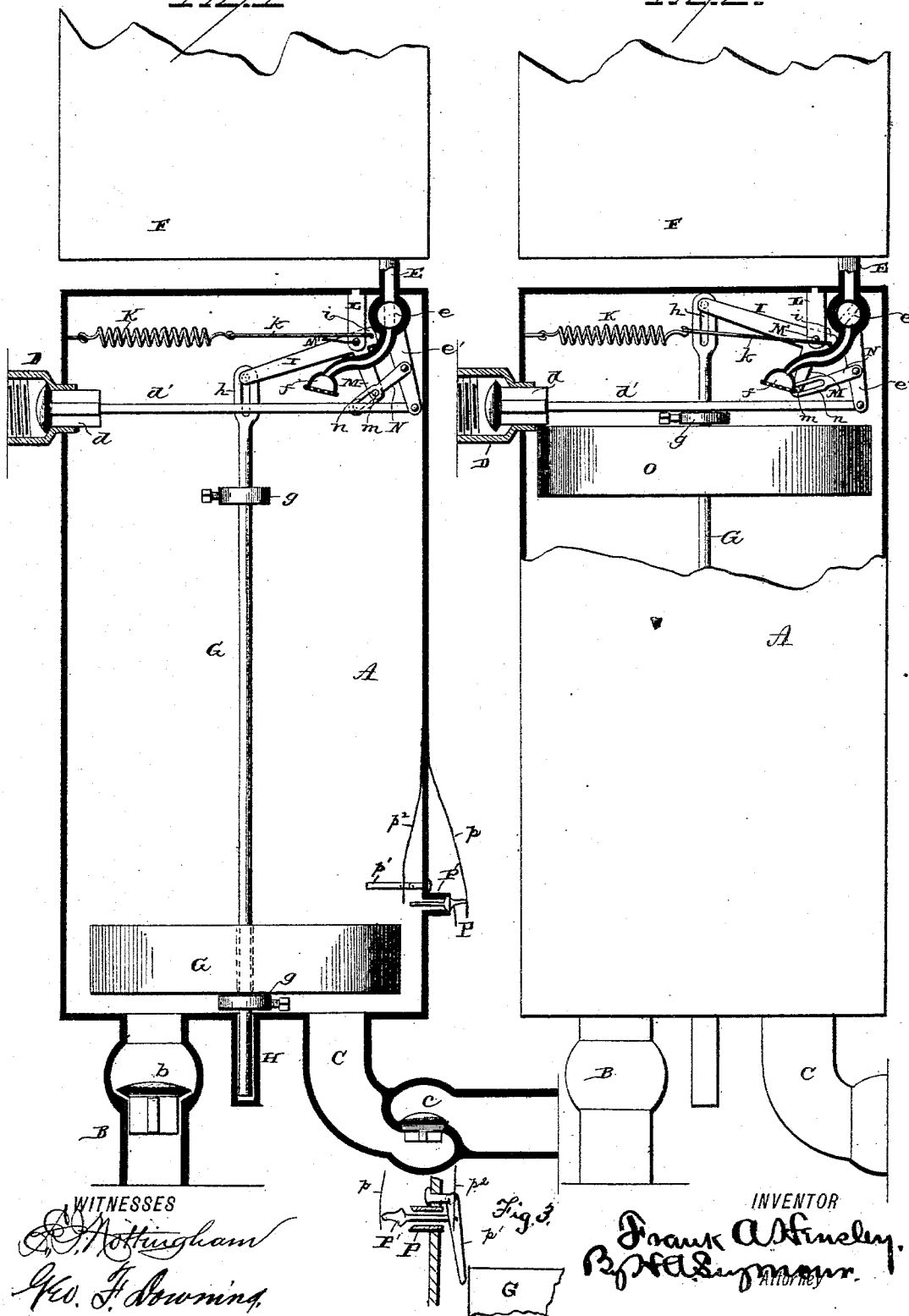


(No Model.)

F. A. HENSLEY.
STEAM VACUUM PUMP.

No. 339,649.

Patented Apr. 13, 1886.



UNITED STATES PATENT OFFICE.

FRANK A. HENSLEY, OF SAN ANTONIO, TEXAS.

STEAM VACUUM-PUMP.

SPECIFICATION forming part of Letters Patent No. 339,649, dated April 13, 1886.

Application filed July 7, 1885. Serial No. 170,901. (No model.)

To all whom it may concern:

Be it known that I, FRANK A. HENSLEY, of San Antonio, in the county of Bexar and State of Texas, have invented certain new and useful Improvements in Steam Vacuum-Pumps; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improvement in steam vacuum-pumps.

The object is to provide an improved system of levers and operating mechanism connected therewith, whereby the rise of the water in the pump-cylinder automatically closes the condenser water-valve and opens the steam-inlet valve, and the fall of the water in the cylinder opens the condenser water-valve and closes the steam-inlet valve. A further object is to provide a pump which in its general construction shall be effective and economical.

With these ends in view my invention consists in certain features of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical section of the pump, the parts being in position to introduce water into the cylinder. Fig. 2 is a similar view, showing the position of the parts when steam is admitted to the cylinder and water being forced therefrom, and Fig. 3 is a detached view of the air-valve.

A represents an upright pump-cylinder of any improved dimensions. The water-inlet pipe B, leading from the water-supply, and the water-outlet pipe C, leading to the point where it is desired to discharge the water, both communicate with the cylinder through its lower head, or through the side of the cylinder at or near its lower end. The water-inlet pipe B is provided with a check-valve, *b*, opening toward the cylinder, and the discharge-pipe C with a check-valve, *c*, opening away from the cylinder.

D represents a steam-inlet pipe communicating with the cylinder at or near its upper end, and provided with a stop-valve, *d*, operated by a valve-rod, *d'*, as will hereinafter appear.

E represents a pipe leading from a cold-water tank, F, into the top of the cylinder and terminating in a sprinkler-head, *f*, for discharging cold-water spray into the cylinder to condense the steam. The pipe E is provided with a stop-cock, *e*, operated by a lever, *e'*, attached to the valve-rod *d'*.

A valve-operating rod, G, is located at the axis of the cylinder, and is allowed a longitudinal movement determined by adjustable collars *g*, secured thereon by set-screws or other suitable means. The lower end of the rod G works in a socket, H, communicating with the lower head of the cylinder. The upper end of the rod G is provided with an elongated closed slot, *h*, in which is loosely secured the end of the long arm I of the main operating-lever. The short arm *i* of said lever is connected with a spring, K, preferably a spiral spring, by a rod, *k*. The lever I is fulcrumed in a depending standard or hanger, L, and is provided with an arm, M, extending at an angle thereto, or the rotary rod M', which forms the bearings on which the lever is fulcrumed, may have the arm M rigidly secured thereto, and thereby caused to vibrate in unison with the rocking of the lever I. A laterally-extending stud or pin, *m*, on the end of the arm M engages an elongated closed slot, *n*, in the end of a bar, N, the opposite end of the bar N being pivotally secured to the lever *e'*, between the stop-cock *e* and its free end. The spring K is secured to the cylinder-casing at a point about in a horizontal plane with the fulcrum of the lever I.

O represents a disk-float which loosely fits within the cylinder, and has a free sliding motion on the rod G.

An air-escape valve, P, is located near the base of the cylinder, and acts automatically in allowing any accumulated air within the cylinder to escape. This valve P rests within the seat P', and is engaged outside of the cylinder by the spring *p*, and is adapted to be engaged inside of the cylinder by the pivoted lever *p'*, which latter is held in a horizontal position by the spring *p*². This lever rests in the path traversed by the float, and as the float moves upwardly the lever turns on its pivot to permit it to pass and assumes the horizontal position after it passes beyond it. When the float strikes the lever during the

descent of the float, the lever is forced downwardly, and coming in contact with the stem of the valve opens it. The length of the lever p' and the thickness of the float G at its edge govern the length of time the escape-valve remains open.

The operation is as follows: In Fig. 1 a vacuum is supposed to have been produced within the cylinder by the condensation of the steam by means of the cold-water spray from the pipe E , the steam-inlet valve is closed and condenser-valve open. Atmospheric pressure will now cause the water to flow upwardly through the water-inlet pipe B into the cylinder, filling the same and lifting the float O . When the float strikes the upper collar, g , it lifts the operating-rod G the length of the slot h before disturbing the position of the lever $I i$, which is retained in its position by the tension of the spring K . As the lower end of the slot h reaches the end of the arm I the rod G lifts the arm I , lowers the arm i , and swings the arm M the length of the slot n without disturbing the lever e' and valve-rod d' . At the moment when the pin m reaches the outer end of the slot n the lever $I i$ has just passed its dead-center with respect to the tension of the spring K and the float O , and hence the rod G has ceased its upward movement. The tension of the spring K now exerts itself to continue the upward movement of the arm I , the slot h allowing it so to do, and at the time forces the lever e' and valve-rod d' connected therewith to the left, opening the steam-inlet valve d and closing the condenser-valve e , as shown in Fig. 2. The force of gravity alone or the pressure of the steam, or both combined, will force the water out of the cylinder into the discharge-pipe C . As the float nears the bottom of the cylinder it engages the lower collar, g , and forces the rod G downwardly. The downward motion of the rod G reverses the motions of the levers I , i e' and the valve-rod d' , thereby closing the steam-valve d and opening the condenser-valve e . By the time the float O reaches the bottom of the cylinder the steam therein will have been in great part or entirely condensed, a vacuum formed, and water will again flow into the cylinder through the supply-pipe. As the float nears the bottom of the cylinder the lever $I i$ is again thrown past its dead-center and the spring K exerts its tension in closing the valves d and e .

It is evident that slight changes might be resorted to in the construction of the several parts described without departing from the spirit and scope of my invention.

Having fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a steam vacuum-pump, the combination, with a pump-cylinder, the water inlet and outlet pipes, a condenser-pipe, a steam-pipe, and valves located in the several pipes, of a vertically-movable rod having stops thereon, levers connecting the rod with the valves in the condenser-pipe and steam-inlet pipe, and a float loosely mounted on the rod and adapted to actuate the same, substantially as set forth.

2. The combination, with the pump-cylinder and the water feed and discharge pipes, of a steam and condenser pipe communicating with the cylinder, valves for opening and closing the steam and condenser pipes, valve-operating mechanism, substantially as described, connected with said valves, a longitudinally-movable rod connected with the valve-operating mechanism and provided with stops, and a float loosely mounted on the rod and adapted to actuate the same, the parts being arranged substantially as described, whereby the steam-valve is opened and condenser-valve closed when the cylinder is filled with water, and the steam-valve closed and condenser-valve opened when the water is discharged, substantially as set forth.

3. The combination, with the valves for opening and closing the steam and condenser pipes, of a system of valve-operating levers positively operated by spring-power, substantially as set forth.

4. The combination, with the valves for opening and closing the steam and condenser pipes, of a spring-actuated angle-lever connected with the valve-operating rods in elongated slots, whereby the effect of the spring-action is reversed and the spring allowed to positively actuate the valves, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

FRANK A. HENSLEY.

Witnesses:

A. DE ZAVALA,
W. R. OREAN.