No. 812,130. PATENTED FEB. 6, 1906.

G. M. HILGER.

VACUUM TRAP.

APPLICATION FILED DEC. 24, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

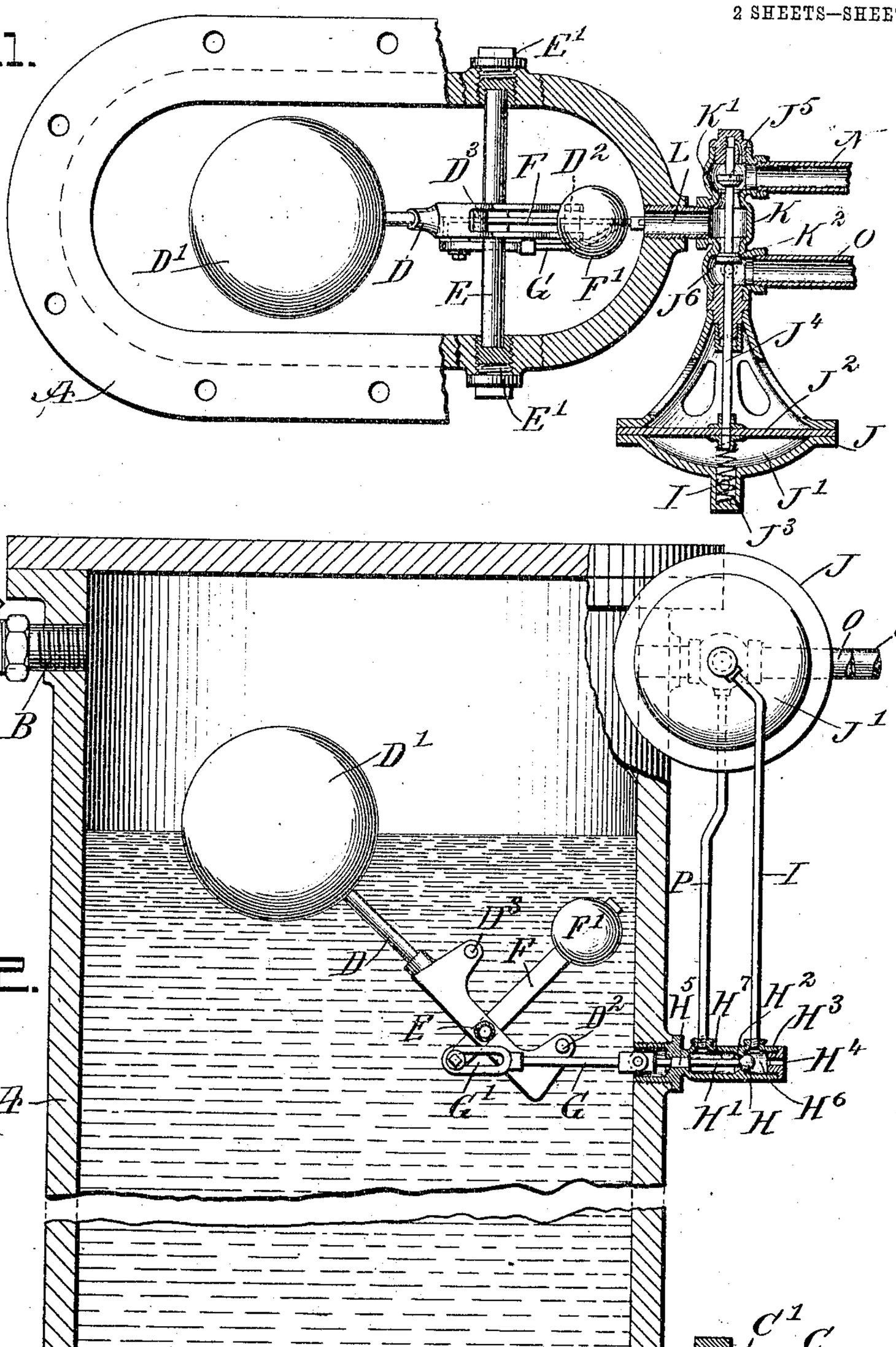

Fig. 2.

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2 SHEETS—SHEET 2.

Fig. 3.

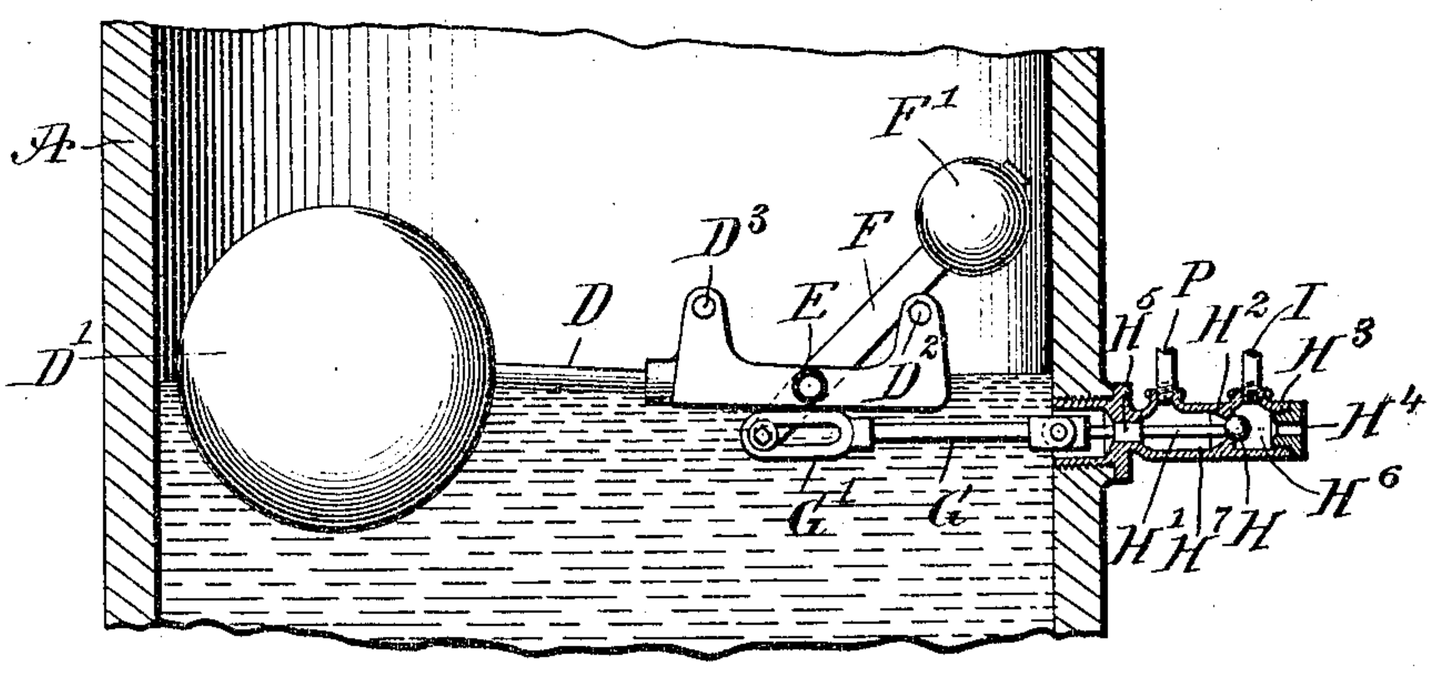
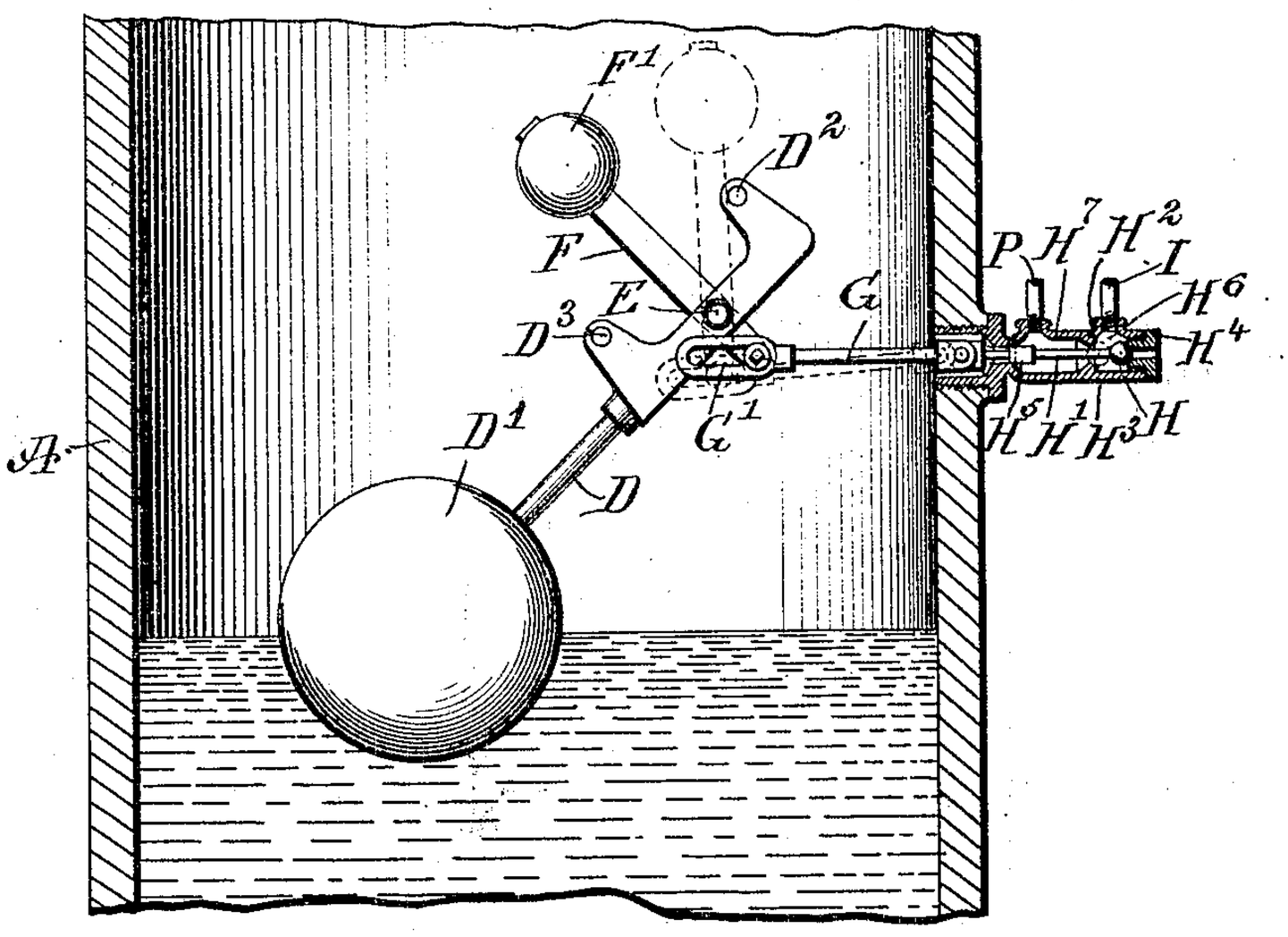


Fig. 4.



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VACUUM-TRAP.

No. 812,130. Specification of Letters Patent. Patented Feb. 6, 1906.

Application filed December 24, 1904. Serial No. 238,243.

To all whom it may concern:

Be it known that I, GEORGE M. HILGER, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented a new and Improved Vacuum-Trap, of which the following is a full, clear, and exact description.

The object of the invention is to provide a new and improved vacuum-trap designed for use in connection with vacuum-separators, vacuum oil-separators, and other apparatus requiring removal of the liquid while the latter is under a vacuum, the trap being simple and durable in construction, automatic in operation, and arranged to allow the condensating liquid of the apparatus to flow under gravity-pressure into the trap and to be forced out of the latter under pressure to a suitable place of discharge.

The invention consists of novel features and parts and combinations of the same, as will be more fully described hereinafter and then pointed out in the claims.

A practical embodiment of the invention is represented in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a plan view of the improvement, the case-cover being removed and parts being shown in section. Fig. 2 is a sectional side elevation of the same. Fig. 3 is a like view of the same, showing the parts in a different position; and Fig. 4 is a similar view of the same, showing the parts in still another position.

The closed casing A of the vacuum-trap is provided in its upper portion with an inlet-pipe B, having a check-valve B′ and connected with a vacuum apparatus from which the liquid is to be discharged into the casing A. From the lower end of the casing A leads a pipe C, having a check-valve C′ and connected with a collecting-tank or other place of discharge for the liquid. In the casing A is arranged a float D′, held on one end of a lever D, fulcrumed on a transversely-extending shaft E, supported at its ends in screw-plugs E′, screwing in the sides of the casing A, as plainly indicated in Fig. 1, it being understood that the said float D′ rises and falls with the liquid accumulating in the casing A and discharging periodically therefrom, as hereinafter more fully described. The float-lever D is provided on opposite sides of its fulcrum with pins or projections D^2 and D^3, adapted to alternately engage opposite sides of a lever F, mounted to swing on the shaft E as a fulcrum and provided at its upper end with a weight F′. The lower end of the weighted lever F engages an elongated slot G′ in a link G, connected with the stem H′ of a valve H, adapted to be seated on a seat H^2, arranged within a valve-casing H^3, secured to the casing A and extending at the outside thereof, as plainly illustrated in the drawings. The outer end of the valve-casing H^3 is provided with an apertured cap H^4, opening to the atmosphere, and on the stem H′ is secured or formed a piston H^5, mounted to slide in a suitable bearing formed on the casing H^3, so as to prevent the liquid within the casing A from passing into the valve-casing H^3. The latter is provided with two chambers H^6 and H^7, separated from each other by the valve-seat H^2, the chamber H^6 being in communication with the outer air by the apertured cap H^4. From this chamber H^6 leads a pipe I to the chamber J′ of a diaphragm-casing J, containing a diaphragm J^2, pressed on its outer face by the atmosphere, the inner face, which extends within the chamber J′, being pressed on by a spring J^3. A stem J^4 is secured to the diaphragm J^2 and extends through a valve-casing K, connected by a pipe L with the interior of the casing A at or near the top thereof, the said valve-casing K being also connected by a pipe N with a suitable steam-supply, such as a boiler, and by a pipe O with the top of a vacuum-producing device of any approved construction.

The valve-casing K is provided with valve-seats K′ and K^2, on which are adapted to be seated valves J^5 and J^6, held on the diaphragm-stem J^4, the arrangement being such that when one valve is seated on its seat the other is off its seat, and vice versa. As shown in Fig. 1, the valve-seat K′ is intermediate the pipes N and L, while the valve-seat K^2 is intermediate the pipes O and L, and when the several parts are in the position shown in Fig. 1 and the valve J^6 is on its seat K^2 and the valve J^5 is off its seat K′ then the steam under pressure can pass by way of the pipe N, the valve-casing K, and pipe L into the upper end of the casing A to press on the liquid contained therein and force the said liquid out through the valved pipe C to a suitable place of discharge. When the position of the valve J^5 and J^6 is reversed—that is, when the valve J^5 moves onto its seat K′ and the valve J^6 moves off its seat K^2—then

the steam-supply is cut off from the casing A and the interior thereof is connected with an apparatus for producing a vacuum in the casing A.

The chamber H^7 in the valve-casing H^3 is connected by a pipe P with the valve-casing K at a point between the valve-seat K^2 and the pipe O, so that when the valve J^6 is in a closed position, as shown in Figs. 1 and 2, and the valve H is at the same time on its seat H then atmospheric pressure passing through the cap H^4, chamber H^6, and pipe I into the chamber J′ counterbalances the atmospheric pressure on the outside of the diaphragm J^2, so that the spring J^3 holds the valve J^6 in a closed position and the valve J^5 open. When the valve H is opened, it closes the aperture in the cap H^4, (see Fig. 4,) and communication is now established between the chambers H^7 and H^6 by way of the valve-seat H^2, so that air is drawn from the chamber J′ by way of the pipe I, chamber H^6, valve-seat H^2, chamber H^7, pipe P, valve-casing K, and pipe O to cause the atmospheric pressure on the outside of the diaphragm J^2 to move the latter, and with it the stem J^4 and valves J^6 and J^5, for the valve J^5 to move onto its seat K′ and the valve J^6 to move off its seat K^2.

The operation is as follows: When the float-lever D and the weighted lever F are moved from the position shown in Fig. 4 into the position shown in Figs. 1 and 2 by the rising water accumulating in the casing A, then the steam entering the casing A by way of the pipe N, open valve-seat K^2, casing K, and pipe L forces the water out through the pipe C to a place of discharge, and during the time the water passes out of the casing A the float D′ falls with the falling water, and in doing so the lever D finally assumes the position shown in Fig. 3—that is, the pin D^2 engages one side of the weighted lever F. As the water still passes out of the casing A the float D′ falls farther downward, and in doing so causes the lever D to impart a swinging motion to the lever F by the pin D^2, so that the lever F is finally moved into and past a vertical position to then swing suddenly downward by the action of its weight F′ to shift the link G, and with it the valve-stem H′ and valve H, for the several parts to assume the position shown in Fig. 4. When this takes place, the diaphragm-chamber J′ is closed to the atmosphere and connected with the vacuum-producing apparatus, as previously explained, so that the diaphragm J^2 is actuated and causes the valve J^5 to move onto its seat K′ and the valve J^6 to move off its seat K^2. Thus the steam is shut off from the casing A and the interior thereof is connected with the vacuum-producing apparatus, so that a vacuum is produced in the casing A to allow the water of condensation to flow from the vacuum apparatus by way of the pipe B into the casing A to accumulate therein. As the water accumulates in the casing A the float D′ is caused to rise, thereby imparting a return swinging motion to the lever D, which by its pin D^3 finally engages the lever F to swing the same back into a vertical and past a vertical position for the lever F to then complete its return stroke. The lever F in doing so pulls on the link G, thereby moving the valve-stem H′ and the valve H in an inward direction for the valve H to be finally seated on its seat H^2. When this takes place, the chamber J′ is disconnected from the vacuum-producing apparatus and is again connected with the atmosphere, thus allowing the spring J^3 to move the diaphragm J^2 outward, and consequently to return the valve J^6 to its seat K^2 and to move the valve J^5 off its seat K′ to again admit steam to the interior of the casing A, and the above-described operation is then repeated.

From the foregoing it will be seen that the vacuum produced in the casing A corresponds to that in the vacuum apparatus to be drained of the liquid, so that the liquid can flow from the vacuum apparatus by way of the pipe B into the casing A, and when a change in the valve mechanisms takes place by the action of the rising water on the float D′ and its lever D then steam is admitted to the casing A to force the accumulated water out of the casing to a suitable place of discharge. The steam entering the casing A is prevented from flowing into the vacuum apparatus by way of the pipe B, owing to the check-valve B′, contained in the said pipe B.

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

1. A vacuum-trap having a casing for the accumulation of the liquid, a connection with a pressure-supply and a vacuum apparatus, a valve mechanism in the said connection, for alternately connecting the casing with the pressure-supply and the vacuum apparatus, a fluid-pressure device for actuating the said valve mechanism, and a float-controlled valve for alternately connecting the said fluid-pressure device with the said vacuum apparatus and the atmosphere.

2. The combination with a casing, of a valve mechanism, a float-lever carrying a float acted on by the liquid accumulating in the casing, the said float-lever being provided with projections on the same side of the lever at opposite sides of its fulcrum, a weighted lever mounted to swing on the fulcrum of the float-lever, and extending between the said projections on the float-lever, the said projections being adapted to alternately engage opposite sides of said weighted lever, and a slotted link engaged by the said weighted lever and connected with the said valve mechanism.

3. The combination with a device to be controlled, of a weighted lever connected

with the said device, and a float-lever carrying a float, and provided with two projections extending from the same side of the lever and located at opposite sides of the fulcrum, the said projections being adapted to alternately engage opposite sides of the said weighted lever.

4. The combination with a diaphragm-casing, and a spring-pressed diaphragm therein, of a valve-casing having connection with the apparatus to be controlled, a connection with a pressure-supply, a connection with a vacuum-producing device, and valves controlled by the said diaphragm, for alternately connecting the said apparatus connection with the pressure-supply and the vacuum-producing apparatus.

5. The combination with a diaphragm-casing, and a spring-pressed diaphragm therein, of a valve-casing having connection with the apparatus to be controlled, a connection with a pressure-supply, a connection with a vacuum-producing device, valves controlled by the said diaphragm, or alternately connecting the said apparatus connection with the pressure-supply and the vacuum-producing apparatus, and a float-controlled valve having connection with the pressure side of the diaphragm and with the said vacuum connection.

6. The combination with a liquid receiving and discharging casing having an inlet and a discharge for the liquid, a valve mechanism, a float-controlled device connected with the said valve mechanism, a valve-casing having connection with the said liquid receiving and discharging casing, a connection with a pressure-supply, a connection with a vacuum-producing device, a spring-pressed diaphragm alternately connected by the said valve mechanism with the atmosphere and the said vacuum-producing connection, and valves in the said valve-casing, controlled by the said diaphragm.

7. A vacuum-trap comprising a casing for the accumulation of the liquid, a connection between the said casing and a pressure-supply and a vacuum apparatus, a valve mechanism in the said connection, for alternately connecting the casing with the pressure-supply and the vacuum apparatus, a diaphragm-casing, a spring-pressed diaphragm therein connected with the valve mechanism to actuate the latter, and a float-controlled valve for alternately connecting the diaphragm-chamber with the atmosphere and the vacuum apparatus.

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

GEORGE M. HILGER.

Witnesses:
JOHN P. CLEMES,
PAUL KRAUTZ.