No. 738,672. PATENTED SEPT. 8, 1903.

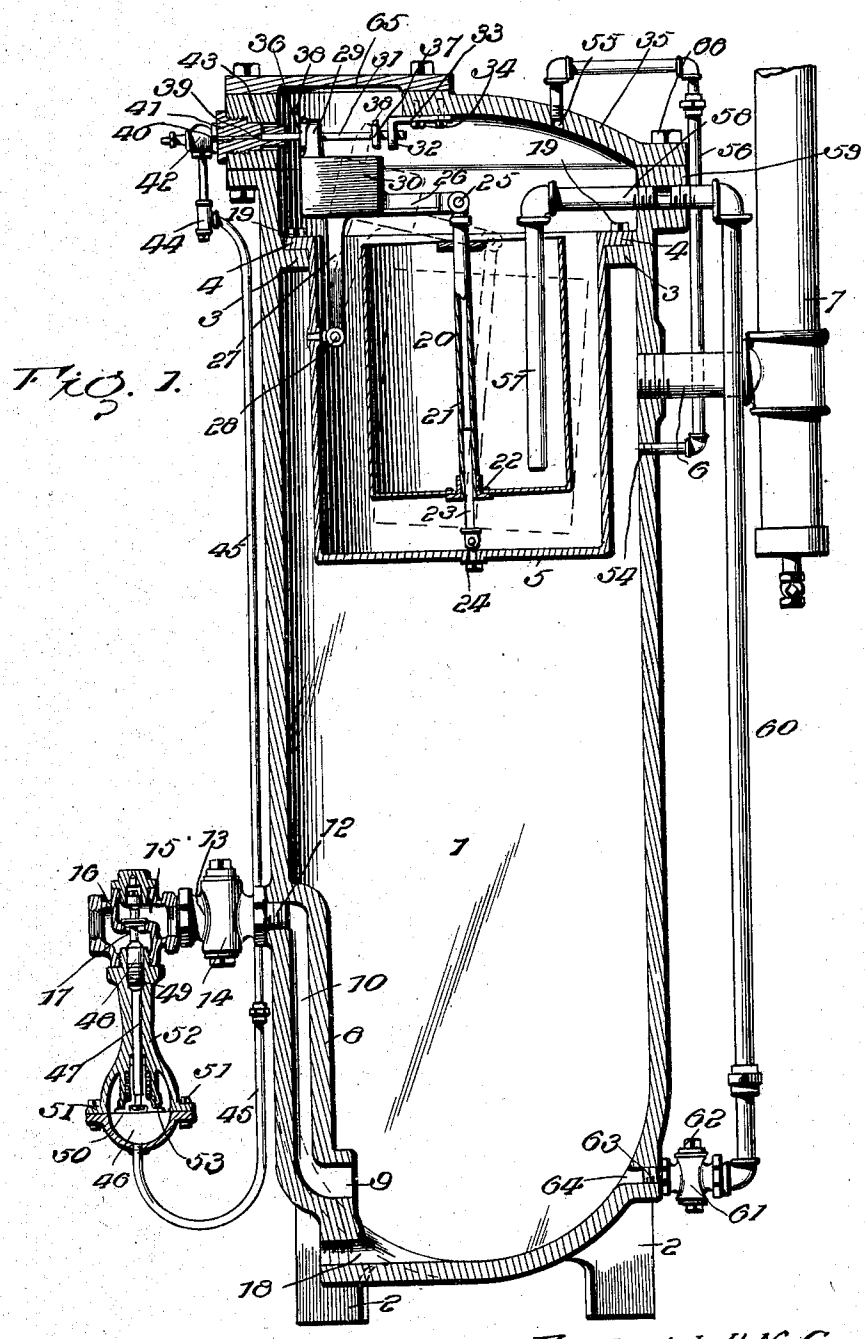
F. H. N. GERWIG.

STEAM TRAP.

APPLICATION FILED MAY 21, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

FIG. 1.



Witnesses

Wm. J. Jacobs

E. W. Bond

Inventor

Frederick H. N. Gerwig

By George J. Bond

Attorney

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STEAM TRAP.

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NO MODEL. 2 SHEETS—SHEET 2.

FIG. 3.

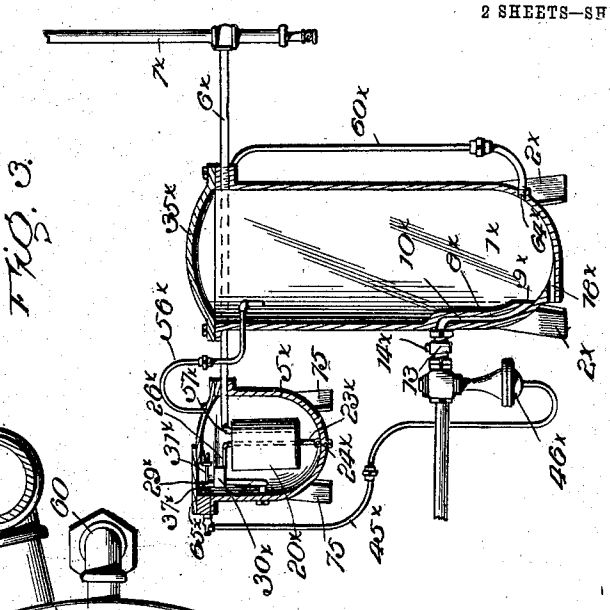
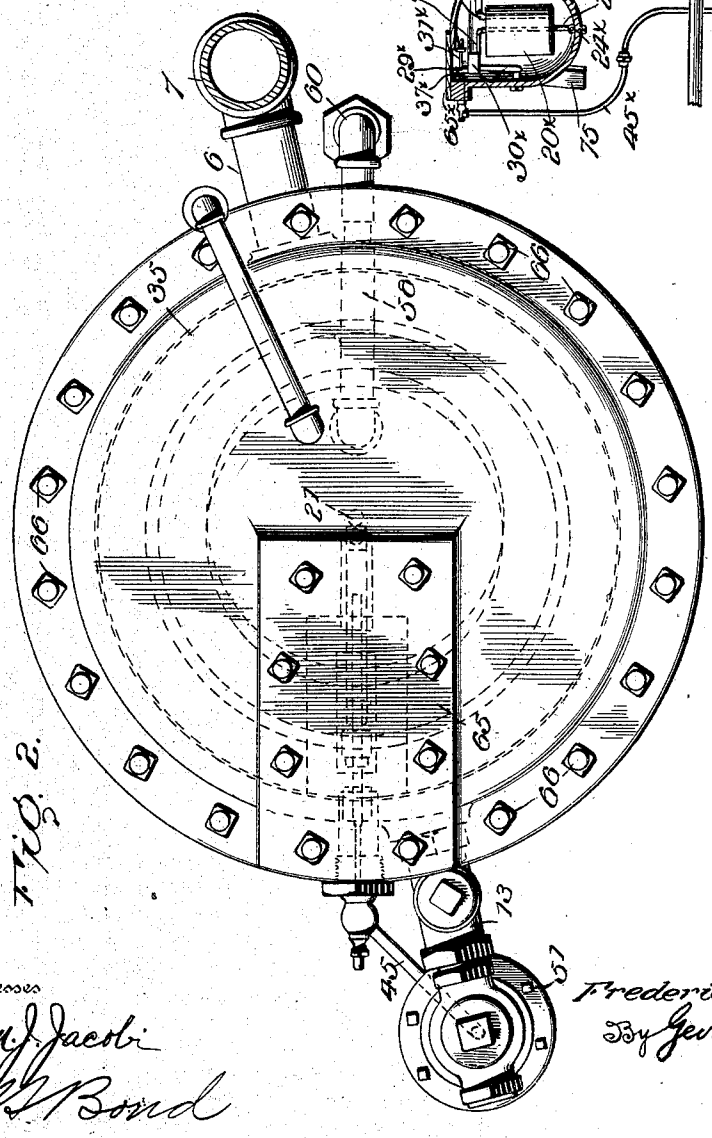


FIG. 2.



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UNITED STATES PATENT OFFICE.

FREDERICK HENRY NICHOLAS GERWIG, OF WILKINSBURG, PENNSYLVANIA.

STEAM-TRAP.

SPECIFICATION forming part of Letters Patent No. 738,672, dated September 8, 1903.

Application filed May 21, 1903. Serial No. 158,114. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK HENRY NICHOLAS GERWIG, a citizen of the United States, residing at Wilkinsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Traps, of which the following is a specification.

This invention relates to certain new and useful improvements in steam traps or eliminators for the water of condensation.

The present invention has for its object, among others, to provide a novel and improved construction of steam-trap of that class in which is employed a pivotally-mounted receptacle adapted to be intermittently actuated. The present construction embodies an eliminator-chamber, a condensing-chamber therein, and a bucket or receptacle within the condensing-chamber, the two chambers having two outlets—one from each—in order that the entire contents of the eliminating-chamber, as well as the contents of the bucket, through one discharge may be made. By the present construction the water of condensation from a number of separators can be simultaneously taken care of. The arrangement of the bucket is such that it is not necessary to attach a counterweight directly thereto, but the counterweight is pivoted on a lever, whereby a bucket may be as light as possible for the greatest capacity before it will drop from its upper position. The counterweight in its upper position exerts no downward force on the bucket, the center of gravity of the weight passing slightly inside the hinged point or fulcrum of the lever; but the said weight exerts its maximum downward force on the bucket in its lowermost position when the contents of the bucket are being discharged.

Another object is to prevent the scale or grit of any kind entering the condensing-chamber in which the working parts of the trap are disposed, and thus wear or injury of the working parts is avoided. The inlet-pipe enters directly into the eliminator-chamber.

A further object is to provide a trap that shall be positive and reliable in its operation. Any pressure above that of the atmosphere in the condensing-chamber will operate it, and it can be placed at any level irrespective of any other appliance. The device is intermittent in its operation, being controlled by predetermined conditions. A siphon is provided between the bucket and the bottom of the eliminator-chamber, whereby the water in the bucket is caused to be discharged by a siphoning action until the water-level around the bucket in the contents-chamber reaches the level of the top of the bucket in the lower position and the level of the water in the bucket is lowered until the buoyancy of the water around the bucket again raises it to the top position, ready for another operation. I employ a simple novel form of discharge-valve embodying a valve-body containing a valve-seat, a valve-stem carrying a valve and a cylindrical portion grooved to prevent leakage, a diaphragm, and a spring to facilitate quick closing of the valve. No stuffing-box is employed on the stem of the valve. The diaphragm-chamber is connected by a pipe with a valve controlled by the movement of the bucket and the lever connected therewith.

Other objects and advantages of the invention will hereinafter appear and the novel features thereof will be particularly pointed out in the appended claims.

The invention is clearly illustrated in the accompanying drawings, which, with the numerals of reference marked thereon, form a part of this specification, and in which—

Figure 1 is a substantially central vertical section through a trap constructed in accordance with my invention. Fig. 2 is a top plan thereof. Fig. 3 is a view similar to Fig. 1, showing a slightly-modified form.

Like numerals of reference indicate like parts throughout the several views.

Referring now to the details, 1 designates the eliminating-chamber, the sides of which in practice preferably are lagged outside to prevent too rapid radiation. This chamber may be of any suitable shape, material, and capacity and supported in any suitable manner—as, for instance, by the legs 2. (Seen in Fig. 1.) Near its upper end it is formed with the inwardly-extending lug or shoulder 3, upon which rests the annular flange 4 of the condensing-chamber 5, which latter is of less diameter than the diameter of the eliminating-

chamber, and this condensing-chamber may be of any suitable capacity, shape, and material.

6 is a pipe communicating with the interior of the eliminating-chamber at any convenient point near the top thereof, this pipe being designed to be connected with an inlet or drain pipe 7 from a line of steam of pipe or vessel as a separator by which water of condensation is collected in the said eliminating-chamber only. The inlet-pipe 6 may be arranged to receive the water of condensation from a number of separators or the like, and the device may be installed to drain any pipe or vessel in which steam is used under pressure. The eliminating-chamber is provided near its lower portion with an enlargement 8, having near its lower end the opening 9, communicating with the interior of the eliminating-chamber near its bottom and serving as a discharge-opening through which the water of condensation is discharged from the eliminating vessel and carried through the passage 10 in said enlargement 8 to an outlet 11, at the upper end thereof, in which is secured a nipple 12, as seen clearly in Fig. 1. This nipple 12 extends from the casing 13, containing an adjusting-valve 14, and connected therewith is the valve casing or chamber 15, having a seat 16 for a valve 17 for a purpose which will soon be explained. At the lowest inside level of the eliminating-chamber 1 is a blow-off opening 18 to permit scale and sediment which may collect in said chamber to be blown out when necessary.

In the form seen in Fig. 1 the walls of the condensing-chamber 10 form a common partition or division between the interior of the eliminating-chamber and that of the condensing-chamber, as will be readily understood. The flanges or lugs 3 and 4 are bolted or otherwise secured together, as at 19, (see Fig. 1,) to form a steam-tight joint between the eliminating and condensing chambers. Inside of the condensing-chamber 5 is a bucket 20, perferably cylindrical in form and having a tube 21 fastened rigidly to the bottom of said bucket and disposed axially thereof. The means 22 for connecting this tube to the bottom of the bucket may be any suitable for the purpose, the bottom end of the tube being open, as shown, to serve as a guide for a cylindrical guiding-stem 23, which is hinged at 24 to the bottom of the condensing-chamber 5 to constrain the bucket at its lower end to move in substantially a vertical direction. The top end of the bucket is attached by means of a hinged joint 25, connecting the upper end of the tube 21 to the horizontal arm 26 of a bell-crank lever, the lower end of the vertical arm 27 of which is pivotally connected, as at 28, to the inner wall of the condensing-chamber, as seen clearly in Fig. 1. This lever is provided with a lug or upward projection 29, and the lever is also provided with a counterbalance-weight 30, which, it will be observed, is disconnected from the bucket and is mounted at the bend or elbow of the lever, as seen clearly in Fig. 1.

31 is a substantially horizontally-disposed needle-valve stem passed loosely through the lug 29 and supported at one end in a lug 32, depending from a bracket 33, secured, as at 34, to the inside of the cap or cover 35 of the eliminating-chamber.

36 and 37 are collars adjustably mounted on the valve-stem 31 by means of set-screws 38 or the like, whereby they may be adjusted as occasion may require, and these collars are disposed upon opposite sides of the lug 29, whereby they are engaged by the said arm when the bucket moves up or down, thus causing the needle-valve 39, carried by said stem, to be operated and to be closed when the bucket is in its uppermost position and open when the bucket drops to the lower position, in which it is indicated in dotted lines in Fig. 1.

40 is a plug or the like having a port 41 communicating with an angle-valve 42 on the outside of the eliminating-chamber, and this plug has a valve-seat 43 for the needle-valve 39. This port communicates by means of a coupling 44, having a reduced exhaust-opening and the pipe 45, with discharge-valve diaphragm-chamber 46.

The valve 17 is carried by a valve-stem 47, which is an enlarged cylindrical part 48, which is secured, as at 49, to prevent leakage, and a diaphragm 50 is clamped between the flanges of the diaphragm-chamber 46 and the flange 51 of the body 53, which forms a guide for the valve-stem, a spring 53 being provided, as seen in Fig. 1, to facilitate quick closing of the valve. It is to be noted that no stuffing-box is required on the stem of this valve; yet it is most efficient and reliable in its operation.

An equalized steam-pressure exists at all times between the eliminating-chamber and the condensing-chamber by means of the openings 54 and 55, as seen in Fig. 1, the former being in the side wall of the eliminating-chamber and the latter in the cap or cover 35 thereof, the said openings being connected by the equalizing-pipe 56, disposed in any convenient manner, so as to afford communication between the chamber 1 below the steam-tight joint formed by the flanges 3 and 4 and the space above the same in order to establish pressure communication between the two chambers so long as the water-level in the eliminating-chamber remains below the opening 54, which opening may be located at any convenient point below the inlet-pipe 6.

57 is a pipe extending downward within the bucket 20, within a short distance of the bottom thereof, when the latter is in its uppermost position, as seen by full lines in Fig. 1. This forms the outlet from the condensing-chamber, and it has a lateral branch 58, engaged in the nipple or enlargement 59 of the wall of the eliminating-chamber, as shown, and communication is afforded between the same and

the bottom of the eliminating-chamber by means of a pipe 60, which connects with the valve-casing 61, provided with an adjusting-valve having a stem 62, by means of which it may be adjusted, the nipple 63 of said valve-casing being connected with the eliminating-chamber and entering into the same through the port or opening 64, all as seen clearly in Fig. 1.

65 is a removable closure permitting access to the interior of the eliminating-chamber at the upper end opposite the collars 36 and 37 when desired. It is also to be understood that the cap or cover 35 is detachably secured in position by means of the bolt 66 or any other convenient means.

With the parts constructed and arranged substantially as hereinbefore described the operation is as follows: Water of condensation and steam entering through the inlet-pipe 6 causes the water to collect and rise in the eliminating-chamber 1 until the level of the water rises above the opening 54 and shuts off steam communication between the eliminating-chamber 1 and the condensing-chamber 5. Radiation of heat from the top and sides of the condensing-chamber will cause the entrapped steam in the condensing-chamber to partly condense, and thereby produce a slight vacuum in the chamber. The pressure in the eliminating-chamber 1 will still be maintained constant by an uninterrupted source of supply from the pipe 6 and the slight difference in pressure between the condensing-chamber and the eliminating-chamber will cause water to be lifted up into the bucket in the condensing-chamber through the pipes 57 and 60 until the bucket 20 is about full of water, when it will fall by gravity into the lower position (shown by dotted lines in Fig. 1) and by the action of the levers 26 and 27 open the needle-valve 39, thus communicating steam-pressure to the diaphragm 50 and lifting the discharge-valve 17 up off its seat against the pressure in the eliminator and discharge its contents. As soon as the water-level in the eliminating-chamber 1 begins to fall it will cause the water in the bucket 20 to be discharged by a siphoning action in the pipes 57 and 60 until the water-level around the bucket in the condensing-chamber 5 will reach the level of the top of the bucket 20 in the lower position, and the level of the water in the bucket will be lowered until the buoyancy of the water around the bucket will again raise it to the top position, ready for another operation, and so on.

In Fig. 3 I have shown a slight modification in which the eliminating-chamber $1^{\times}$ is of substantially the same shape as in the form described in connection with Fig. 1, having the blow-out opening $18^{\times}$, as in the prior form, being supported on supports, as $2^{\times}$, and having the enlargement $8^{\times}$, with passage $9^{\times}$, and the vertical passage $10^{\times}$ and connection with the valve-casing $13^{\times}$, containing a valve $14^{\times}$, all as in said Fig. 1. The condensing-chamber $5^{\times}$ in this form is disposed exteriorly of the eliminating-chamber and the bucket $20^{\times}$ is disposed within this condensing-chamber, being in all respects similar to the form shown in Fig. 1, being guided on the rod $23^{\times}$, hinged at $24^{\times}$, the counterweight $30^{\times}$, lever $26^{\times}$, &c., being the same, and the lever having the arm $29^{\times}$, guided on the rod $31^{\times}$, provided with the collars $37^{\times}$, all corresponding to the similar parts shown in Fig. 1. In this view $6^{\times}$ is the inlet-pipe. The pipe $7^{\times}$ corresponds to the pipe 7 in said Fig. 1, and the pipe $60^{\times}$, corresponding to the pipe 60, being connected with the interior of the eliminating-chamber near its bottom, as at $64^{\times}$, and its other end connecting with the downwardly-extending pipe $57^{\times}$, which extends within the bucket to near the bottom thereof. The pipe $45^{\times}$ serves the same function as the pipe 45, being connected with the diaphragm-chamber $46^{\times}$. The equalized steam-pressure between the condensing-chamber and the eliminating-chamber is maintained by means of the pipe $56^{\times}$, which serves the same function as the pipe 56 in the construction illustrated in Fig. 1. When the condensing-chamber is disposed exteriorly of the eliminating-chamber, as in the form shown in Fig. 3, it is supported upon suitable legs or the like 75.

The operation of the parts shown in Fig. 3 is substantially the same as that illustrated in Fig. 1 and hereinbefore described, the only difference being in the relative arrangement and disposition of the parts and a resultant change in the cap or cover $35^{\times}$ and its connections, the cover to the condensing-chamber in the form shown in Fig. 3 being substantially the same as that to the eliminating-chamber in Fig. 1, the removable closure $65^{\times}$ being disposed over the lever and weight for the same purpose.

From the above it will be seen that I have devised a novel, simple, yet cheap and efficient form of steam-trap most practically adapted for the purposes for which it is intended, and while the structural embodiment of the invention as herein disclosed is what I consider at the present time to be the most preferable it is evident that the same is subject to changes, variations, and modifications without departing from the spirit of the invention or sacrificing any of its advantages. I therefore do not wish to be restricted to the details of construction herein disclosed, but reserve the right to make such changes, variations, and modifications as come properly within the scope of the protection prayed.

What is claimed as new is—

1. In a steam-trap, an eliminating-chamber, a condensing-chamber depending within said eliminating-chamber, each having an independent outlet, and means for maintaining an equalized steam-pressure between said chambers, substantially as described.

2. In a steam-trap, an eliminating-chamber, a condensing-chamber, an outlet from

the eliminating-chamber, means disposed exteriorly of the eliminating-chamber and connected with the condensing-chamber through the top of the eliminating-chamber for maintaining an equalized steam-pressure between said chambers, and a tiltable receptacle within the condensing-chamber.

3. In a steam-trap, an eliminating-chamber, a condensing-chamber depending within said eliminating-chamber, an outlet from each, means for maintaining an equalized steam-pressure between said chambers, a tiltable receptacle within the condensing-chamber, and a siphon connection between said receptacle and the eliminating-chamber.

4. A steam-trap comprising two separate and distinct chambers disposed one within the other, one constituting an eliminating-chamber and the other a condensing-chamber adapted to contain steam and water under pressure, a vertically-movable receptacle within the condensing-chamber, a siphon for discharging the contents of said receptacle into the eliminating-chamber, and a valve controlled by the movements of said receptacle.

5. A steam-trap comprising an eliminating-chamber, a condensing-chamber depending within the eliminating chamber, an inlet for water of condensation into the eliminating-chamber, and an equalizing-pipe leading from the interior of said eliminating-chamber at a point below the connection of said inlet-pipe and connecting with the interior of the condensing-chamber.

6. A steam-trap comprising an eliminating-chamber, a condensing-chamber depending within the eliminating-chamber, a vertically-movable tiltable receptacle within the condensing-chamber, an inlet for water of condensation into the eliminating-chamber, and an equalizing-pipe leading from the interior of the eliminating-chamber at a point below said inlet and connecting with the interior of the condensing-chamber.

7. A steam-trap comprising an eliminating-chamber, a condensing-chamber depending within the eliminating-chamber, a vertically-movable tiltable receptacle within the condensing-chamber, an inlet for water of condensation into the eliminating-chamber, an equalizing-pipe leading from the interior of the eliminating-chamber at a point below said inlet and connecting with the interior of the condensing-chamber, and a counterweighted lever carrying said receptacle.

8. A steam-trap comprising an eliminating-chamber, a condensing-chamber, a vertically-movable tiltable receptacle within the condensing-chamber depending within the eliminating-chamber, an inlet for water of condensation into the eliminating-chamber, an equalizing-pipe leading from the interior of the eliminating-chamber at a point below said inlet and connecting with the interior of the condensing-chamber, and a siphon discharge having one portion extending within said receptacle.

9. A steam-trap comprising an eliminating-chamber, a condensing-chamber depending within the eliminating-chamber, a vertically-movable tiltable receptacle within the condensing-chamber, an inlet for water of condensation into the eliminating-chamber, an equalizing-pipe leading from the interior of the eliminating-chamber at a point below said inlet and connecting with the interior of the condensing-chamber, a counterweighted lever carrying said receptacle, and a siphon discharge having one portion extending within said receptacle.

10. A steam-trap comprising an eliminating-chamber, a condensing-chamber depending within the eliminating-chamber, a vertically movable and tiltable receptacle within the condensing-chamber, a pivotally-mounted counterweighted lever carrying said receptacle, a valve controlled by the movement of said lever, and a siphon discharge from said receptacle.

11. A steam-trap comprising an eliminating-chamber, a condensing-chamber depending within the eliminating-chamber, a vertically movable and tiltable receptacle within the condensing-chamber, a pivotally-mounted counterweighted lever carrying said receptacle, a valve controlled by the movement of said lever, a siphon discharge from said receptacle, and an equalizing-pipe connecting the eliminating-chamber with the condensing-chamber.

12. A steam-trap comprising an eliminating-chamber, a condensing-chamber, a receptacle within the condensing-chamber mounted for vertical and tilting movement, a pivotally-mounted counterweighted bell-crank lever carrying said receptacle, a valve controlled by the movements of said lever, and a siphon discharge having one member extending within said receptacle.

13. A steam-trap comprising an eliminating-chamber, a condensing-chamber, a receptacle within the condensing-chamber mounted for vertical and tilting movement, a pivotally-mounted counterweighted bell-crank lever carrying said receptacle, a valve controlled by the movements of said lever, a siphon discharge having one member extending within said receptacle, an inlet for water of condensation into the eliminating-chamber, and a pipe connecting said eliminating-chamber at a point below said inlet with the condensing-chamber.

14. A steam-trap consisting of two separate and distinct chambers, one depending within the other and constituting an eliminating-chamber and a condensing-chamber adapted to contain steam and water under pressure, a vertically-movable tiltable vessel mounted in the condensing-chamber, a valve-controlled discharge-opening leading outwardly from the eliminating-chamber, a valve therefor,

operated by a diaphragm, a diaphragm-chamber, a pipe leading from the diaphragm-chamber to the interior of the condensing-chamber, a valve controlling the outlet through each pipe, and means for opening and closing such valve by a vertical movement of the vessel, all in combination with two distinct chambers.

15. A steam-trap consisting of two separate and distinct chambers, an eliminating-chamber and a condensing-chamber adapted to contain steam and water under pressure, a vertically-movable tiltable vessel mounted in the condensing-chamber, a valve-controlled discharge-opening leading outwardly from the eliminating-chamber, a valve therefor, operated by a diaphragm, a diaphragm-chamber, a pipe leading from the diaphragm-chamber to the interior of the condensing-chamber, a valve controlling the outlet through each pipe, means for opening and closing such valve by a vertical movement of the vessel, all in combination with two distinct chambers, and an equalizing-pipe leading from the interior of the eliminating-chamber at a point below the inlet-pipe connection and communicating with the interior of the condensing-chamber.

16. In a steam-trap, an eliminating-chamber, a condensing-chamber, a vertically movably mounted and tiltable receptacle within the condensing-chamber, a valve controlled by the movements of said receptacle, an equalizing-pipe connecting the eliminating and condensing chambers, a siphon discharge from said receptacle into the bottom of the eliminating-chamber, a diaphragm-chamber, a valve controlled by said diaphragm, and a connection with the bottom of the eliminating-chamber.

17. In a steam-trap, an eliminating-chamber, a condensing-chamber, a connection between the eliminating-chamber and the upper portion of the condensing-chamber, a vertically movable and tiltable receptacle within the condensing-chamber, a siphonic connection between said receptacle and the lower portion of the eliminating-chamber, a discharge-valve for said eliminating-chamber, and a connection between said discharge-valve and the upper end of the eliminating-chamber and controlled by the movement of said receptacle.

18. An intermittent-flow steam-trap comprising an eliminating-chamber, a condensing-chamber, a vertically movably mounted tiltable receptacle within the condensing-chamber, a pivotally-mounted lever carrying said receptacle, a valve controlled by the movements of said lever, a diaphragm-chamber with diaphragm and valve, a discharge-outlet from the eliminating-chamber connecting with said diaphragm-chamber, and a connection between the bottom of said diaphragm-chamber and the upper end of the eliminating-chamber controlled by the first-mentioned valve, a siphon discharge from the receptacle into the eliminating-chamber, and an equalizing-pipe connecting the eliminating and condensing chambers.

19. An intermittent-flow steam-trap comprising an eliminating-chamber, a condensing-chamber, a vertically movably mounted tiltable receptacle within the condensing-chamber, a pivotally-mounted lever carrying said receptacle, a valve controlled by the movements of said lever, a diaphragm-chamber with diaphragm and valve, and a connection controlled by the first-mentioned valve, a siphon discharge from the receptacle in the condensing-chamber into the lower portion of the eliminating-chamber, and an inlet for water of condensation connected with the eliminating-chamber at a point above the connection of the equalizing-pipe therewith.

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

FREDERICK HENRY NICHOLAS GERWIG.

Witnesses:
A. N. DIEHL,
THOS. G. STITT.