

Dec. 10, 1929.

P. WALTER

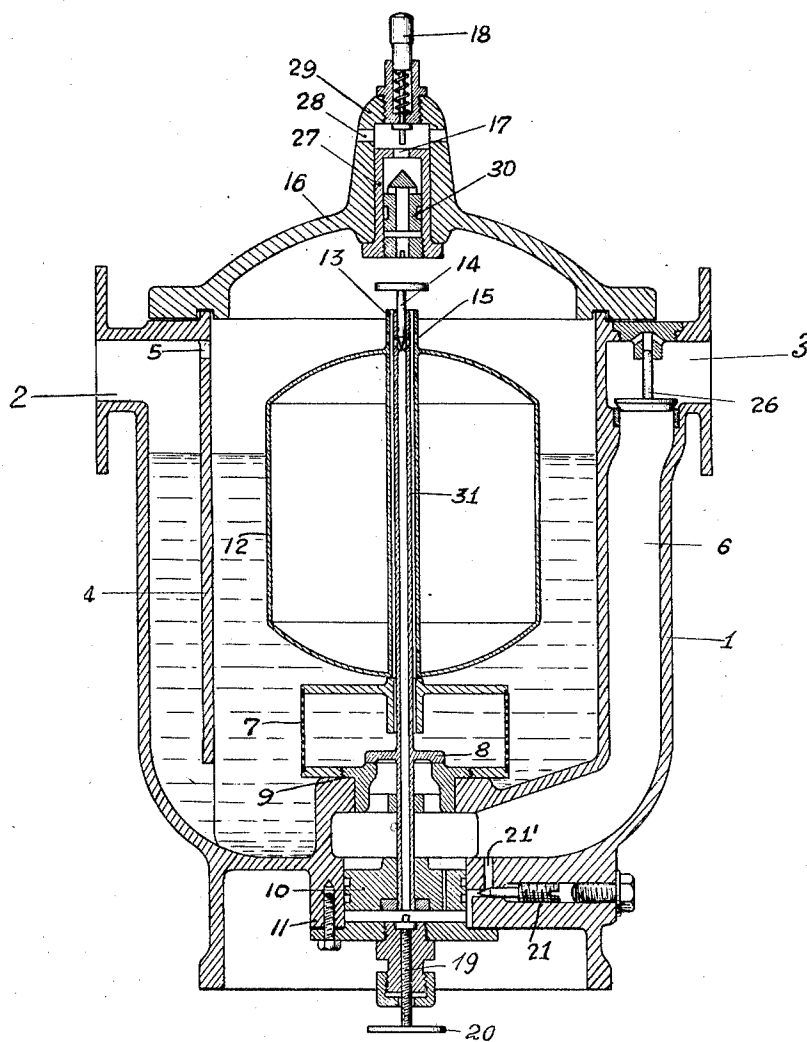
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STEAM TRAP

Filed Oct. 15, 1927

4 Sheets-Sheet 1

FIG.-1



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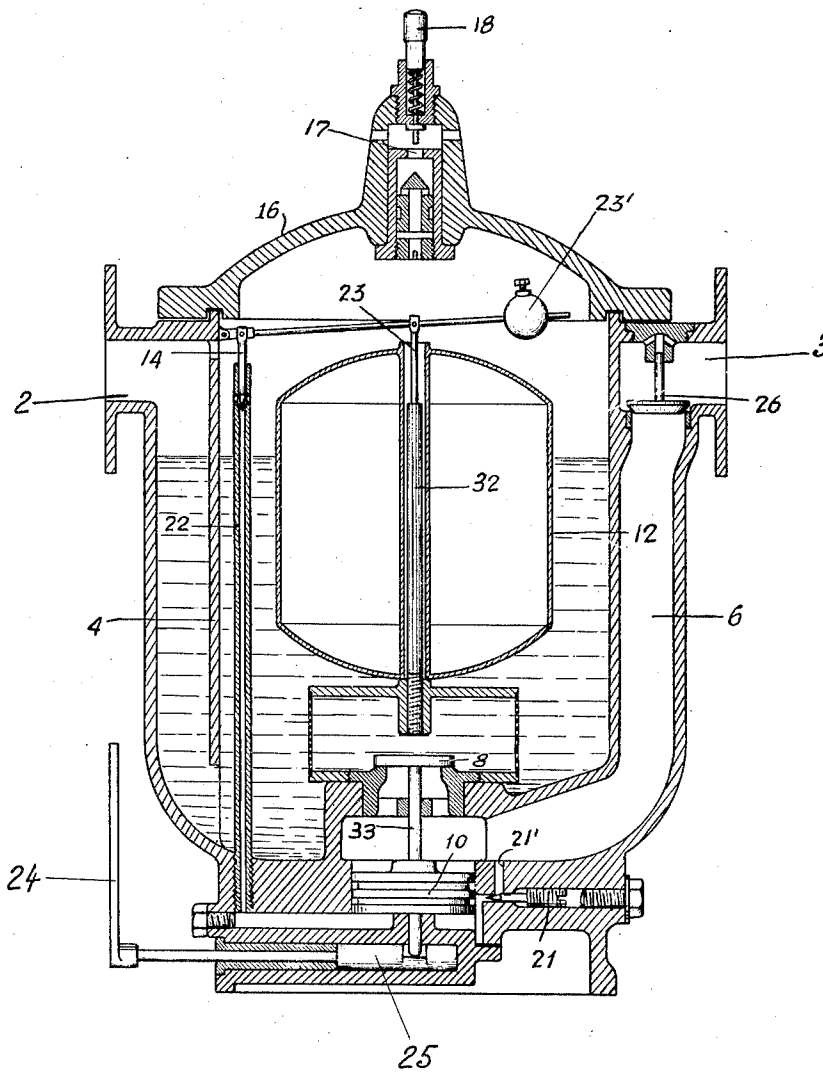
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FIG.-2



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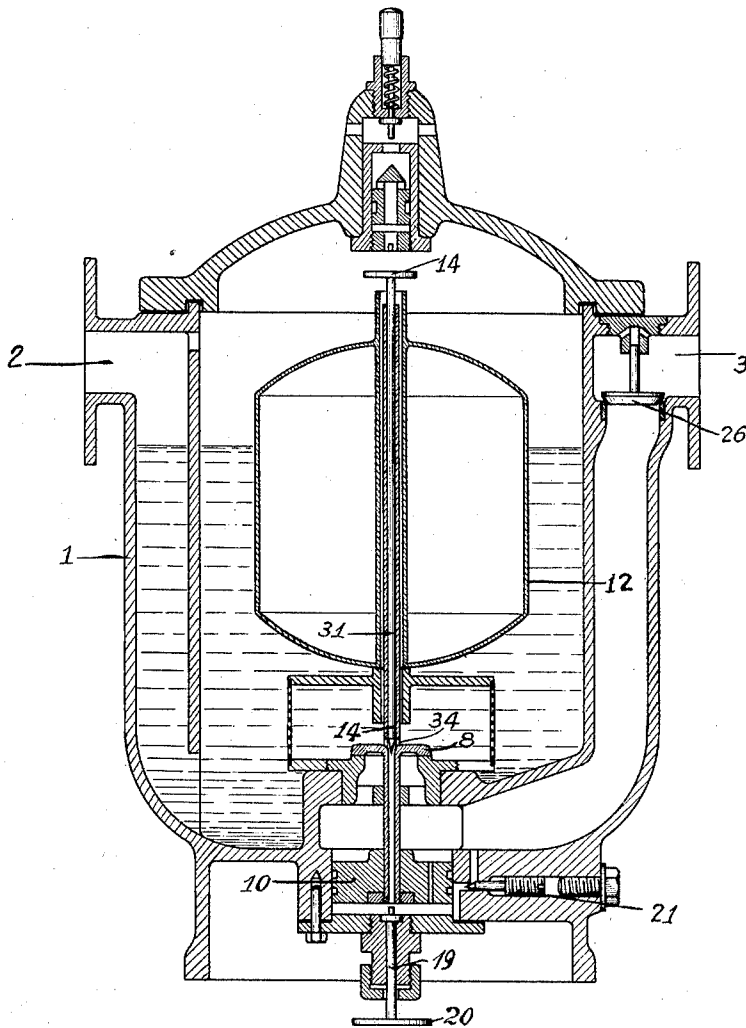
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FIG. - 3



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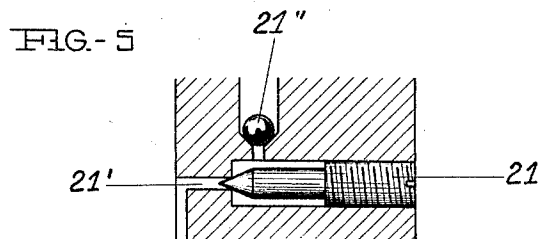
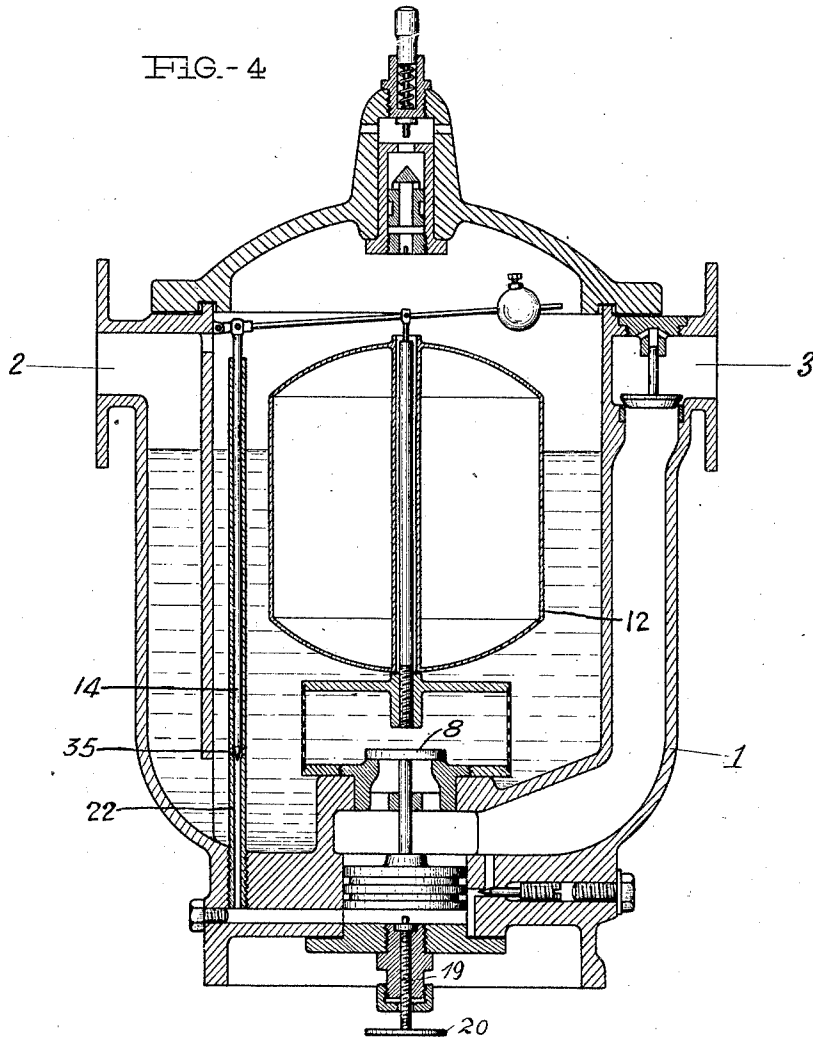
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STEAM TRAP

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## UNITED STATES PATENT OFFICE

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## STEAM TRAP

Application filed October 15, 1927, Serial No. 226,459, and in France October 19, 1926.

This invention relates to a device for draining water of condensation from steam pipes and of the kind wherein the main valve is operated by a piston and the pilot valve by a float, the object of the invention being to produce an apparatus which is of simple construction as well as efficient and of small size.

With this object in view the invention consists in arranging the float, the main valve, the piston, and preferably also the pilot valve along the same vertical axis in the center of the water collecting vessel, the piston being arranged in a cylinder which receives the water from the vessel at the opening of the main valve and which leads it under the pressure through a conduit to the outlet.

The vessel is also provided with means for discharging the air on starting the apparatus as well as for operating the piston by hand and for regulating the movement of the piston so as to effect the discharge of the water without loss of steam.

Figs. 1 to 4 of the accompanying drawings represent vertical sections of different modifications of the apparatus, and

Fig. 5 is a sectional view on an enlarged scale of the regulating valve.

The device consists of a vessel 1 having at the top a steam inlet 2 and a water outlet 3 arranged in diametrically opposite positions and on the same level. At the bottom of the vessel there is a centrally disposed, vertical cylinder which is fitted with a piston 10 and which communicates through a conduit 6 with the water outlet 3. The cylinder is surmounted by and communicates with a drum 7, the communication being normally closed by the main valve 8 which is controlled by the piston 10. The drum communicates with the vessel 1 through its periphery which is constructed as a sieve. The steam inlet 2 is protected by a baffle 4 and the water outlet 3 is provided with a check valve 26 which prevents the water from returning. The domed cover plate 16 of the vessel carries a centrally disposed sleeve 27 provided with an air vent 28. Adjustably arranged within the sleeve is a valve casing 29 which contains a loose valve element 30. An aperture 17 at the top of

the casing 29 forms a seat for the valve element 30 which, however, normally rests at the bottom of the casing. The valve element 30 and its casing 29 are provided with ducts through which and through the apertures 17 and 28 the vessel communicates with the atmosphere so long as the valve element rests on the bottom of the casing. The vessel 1 contains a float 12 which is guided on a centrally disposed vertical shaft above the drum 7 and which operates a pilot valve 14.

In the construction according to Fig. 1, the shaft 31 whereon the float 12 is guided, is connected to the piston 10 and to the main valve 8 and is vertically adjustable together with both. The shaft is hollow and forms at its upper end a seat for the pilot valve 14. The float has a tubular extension 13 which guides the valve 14 and which is provided with lateral apertures 15. A wide head on the stem of the valve 14 is engaged by the extension 13 of the float for lifting the valve 14 from its seat.

In the construction according to Fig. 2, the pilot valve 14 is seated in the upper end of a vertical pipe 22 which communicates with the cylinder space under the piston 10 and which rises into the steam space of the vessel 1. The valve 14 is controlled by a weighted lever 23 which traverses the float 12 and which is normally supported by means of an arm 23 on the upper end of the solid shaft 32 whereon the float is guided. The shaft 32 is rigidly connected to the drum 7, and the valve 8 and the piston 10 are interconnected by a separate shaft 33.

The construction shown in Fig. 3 is similar to that of Fig. 1, but the seat for the valve 14 is formed further down the shaft 31 on a level with the main valve 8, the stem of the valve 14 being extended down the shaft which communicates with the water space of the vessel through apertures 34.

The construction of Fig. 4 is a variant of that of Fig. 2, the seat for the valve 14 being arranged in the pipe 22 on a level with the main valve 8, while apertures 35 are made in the pipe so as to admit water into the same instead of steam.

The action is as follows:

While the device is out of operation, the vessel 1 communicates through the valve 30 with the atmosphere and is subjected to atmospheric pressure. To put the device into operation, the steam supply is gradually opened so as to let the air escape through the valve 30. When steam begins to issue from the aperture 28, full pressure can be applied, and the valve 30 will then be applied to the seat 17 so as to close the outlet. The valves 8 and 14 will also be held by the steam pressure in closed position. The water of condensation will now be collected in the vessel 1, and the valve 12 will be gradually raised thereby. The rising of the float is checked by the pilot valve which will be suddenly opened when the pressure of the float is sufficient, and the steam pressure will then be communicated to the cylinder space below the piston 10. The area of the latter is larger than that of the valve 8, and the latter will therefore be opened so as to admit the water into the conduit 6 whence it is ejected by the pressure through the outlet 3. As the water level in the vessel 1 sinks, the pilot valve, and later the main valve, will be closed. In the constructions according to Figs. 1 and 3, the valve 14 is operated directly by the float, and the pressure is communicated to the cylinder through the hollow shaft 31. As the piston rises, it carries the valve 14 and the valve seat with it, and the valve, on striking against the casing 29, will be immediately reclosed. Thus, in the construction according to Fig. 1, where steam passes through the shaft 31 into the cylinder, very little steam will be wasted.

In the construction according to Figs. 2 and 4, the float operates the pilot valve through the medium of the lever 23', and the pressure is communicated to the cylinder through the pipe 22. In one case steam is admitted to the cylinder and in the other case water.

The rate at which the main valve 8 is reclosed may be regulated by means of a screw 21 which controls, as best shown in Fig. 5, a by-pass 21' leading from the lower part of the cylinder into the conduit 6. The by-pass is provided with a check valve 21''.

The main valve can also, in case of need, be opened by hand for which purpose a screw spindle 19, fitted with a hand wheel 20 may be used, as shown in Figs. 1, 3 and 4. A modified device for this purpose is shown in Fig. 2 and consists of a rotary cylinder 25 provided with an eccentric supporting surface for the shaft 33 which is prolonged beyond the piston 10. The cylinder can be rotated by means of a hand lever 24 for lifting the valve.

Also the valve 30 can be opened by hand for testing the apparatus. This is effected by means of a spring-supported plunger 18

which is fitted in the head of the sleeve 27 so that it can be used for depressing the valve while it is held against its seat by the steam pressure.

By arranging the float and valves in alignment with one another, a considerable amount of space is saved, and a reliable steam trap of small dimensions is obtained.

I claim:

1. A steam trap comprising a vessel having in its upper part an inlet for the steam and an outlet for the water, a centrally disposed, vertical cylinder arranged in the lower part of the vessel and adapted to communicate at the top with the vessel, a piston arranged in said cylinder, a discharge conduit connecting the upper part of the cylinder with the water outlet, a valve controlled by said piston and normally closing the communication between the vessel and the upper part of the cylinder, a duct connecting the vessel with the lower part of the cylinder so as to communicate the pressure of the vessel to the piston, a pilot valve normally closing said duct, a float guided vertically inside the vessel above the cylinder, and means enabling the float, when raised by accumulated water of condensation, to open said pilot valve.

2. A steam trap as claimed in claim 1 wherein the lower part of the cylinder is connected through a by-pass with the discharge conduit, a check valve in said by-pass, and an adjusting screw whereby the communication through said by-pass can be regulated.

3. The structure claimed in claim 1 in combination with means for operating the piston and opening the main valve by hand.

4. The structure claimed in claim 1 in combination with a screw arranged under and coaxial with the piston so as to allow of being used for raising the latter and opening the main valve, and a hand wheel on said screw arranged so as to be accessible from the outside.

5. The structure claimed in claim 1 in combination with a valve mounted in a central position at the top of the vessel, said valve being adapted to close under the steam pressure and to open by gravity when the pressure is relieved, so as to establish communication between the vessel and the atmosphere.

6. The structure claimed in claim 1 in combination with a valve mounted in a central position at the top of the vessel, said valve being adapted to close under the steam pressure and to open by gravity when the pressure is relieved, so as to establish communication between the vessel and the atmosphere, and a spring-pressed plunger mounted above said latter valve so as to be accessible from the outside for depressing and opening the valve by hand.

7. The structure claimed in claim 1 in combination with a valve casing surmounting the

vessel and formed with top and bottom apertures through which the vessel can communicate with the atmosphere, and a valve element in said casing adapted to be held against and to close the top aperture thereof when the vessel is under steam pressure and to rest by gravity on the bottom of the casing in the absence of steam pressure, said valve element being provided with ducts through which the casing apertures communicate with the vessel and with the atmosphere when the valve element is unsupported by steam pressure.

8. A structure as claimed in claim 1 wherein the piston has a larger surface area than the main valve.

9. The structure claimed in claim 1 in combination with a sieve which encloses and protects the main valve.

10. The structure as claimed in claim 1 in combination with a hollow vertical shaft connecting the piston and the main valve and serving as a guide for the float, said shaft constituting the duct through which the vessel communicates with the lower part of the cylinder and containing the seat for the pilot valve, a stem on the latter and a head on said stem adapted to cooperate with the float for opening the valve.

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