

May 10, 1927.

1,628,430

P. C. RIBES
AUTOMATIC WATER TRAP
Filed Dec. 29, 1924

Fig. 1

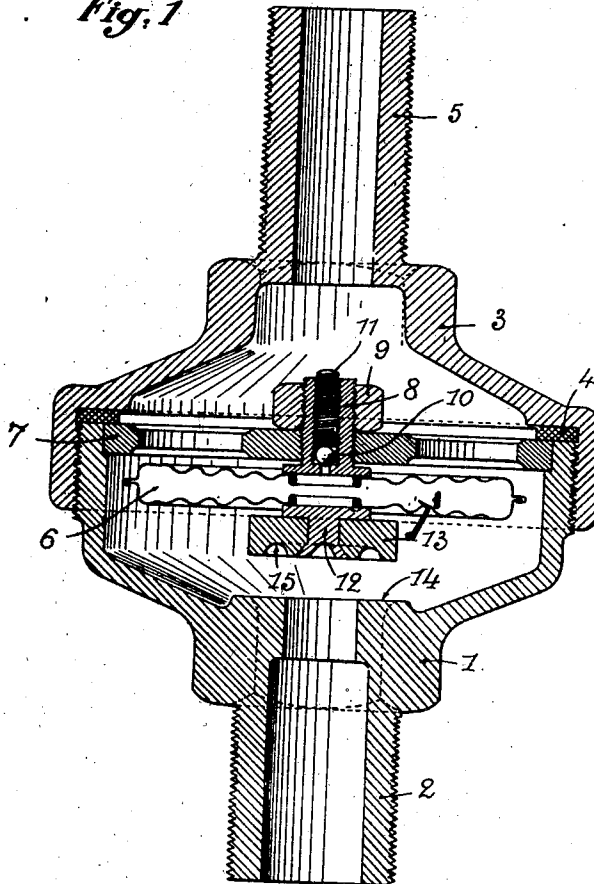
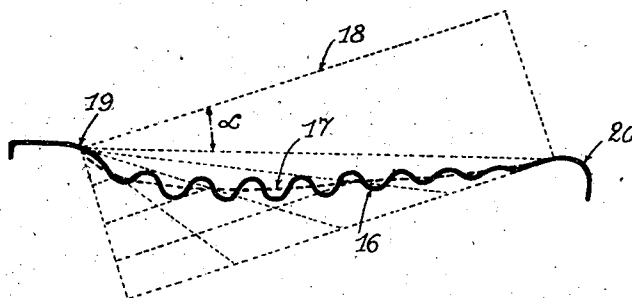


Fig. 2



INVENTOR:
Paul Charles Ribes
BY: Francis E. Boyer
ATTORNEY

Patented May 10, 1927.

UNITED STATES PATENT OFFICE.

PAUL CHARLES RIBES, OF COLOMBES, FRANCE.

AUTOMATIC WATER TRAP.

Application filed December 29, 1924, Serial No. 758,568, and in France October 15, 1924.

The present invention relates to an automatic water and air-trap, which is applicable to all steam conduits, the said apparatus having a most reliable operation and thereby providing for an energetic discharge of the condensed water. The said water-trap is of the type comprising a collapsible container consisting of one or more boxes communicating with each other or employed separately, and whose distortion, under the effect of variations in the pressure of a fluid which they contain, will actuate the closing device of the drain conduit.

The water-trap is essentially characterized by the following features which may be used separately, or preferably in combination:

The liquid contained in the collapsible box or boxes consists of a mixture of water and various organic compounds such as alcohols, ethers or hydrocarbons, the tension of the saturated vapour of the mixture being at all temperatures greater, by a constant or approximately constant quantity, than the tension of saturated water vapour at the same temperature;

The cross section of the walls of each collapsible box has the shape of an arc of a parabola of small parameter, the vertex of the parabola being adjacent the centre of the said wall, the axis of symmetry being outwardly inclined relatively to the mean plane of the said box, whilst the arc of the parabola which is utilized is joined to the peripheral and the central walls by cavettos having a relatively large radius;

The metallic walls of the collapsible box or boxes comprise concentric corrugations whereof the amplitude diminishes gradually towards the periphery;

The closing member of the water-trap consists of a plain flat poppet valve having a circular groove in its lower face by which it is adapted to co-operate with the flat seating of the water-trap body;

The collapsible box or boxes are supported by the part of the main body of the apparatus which comprises the water outlet.

In the appended drawing, which shows by way of example an embodiment of the invention, Fig. 1 is a vertical section of the water-trap and Fig. 2 is, on a larger scale, a half cross section of a collapsible box wall.

The apparatus shown in Fig. 1 consists of a lower portion or body 1 carrying the

drain conduit 2, and the cover 3 which is screwed thereto with the interposition of the packing member 4 and is connected with the steam piping by the conduit 5.

The collapsible device which comprises the box 6 is suspended from the ring 7 which is clamped between the main body 1 and the screwed cover 3; the upper wall of the said box is secured to the screw 8 which is screwed into the ring 7 and is fastened to the latter by means of the nut 9. The screw 8 has formed therein a central tapped hole having disposed at the lower part the valve ball 10, and through which a liquid may be poured into the box 6 in which a vacuum is then produced. After these operations are effected, the said ball is secured in place by means of the screw 11 and the latter is preferably soldered to the screw 8.

The lower wall of the box 6 is secured to the head 12 to which the valve 13 is riveted. The said valve, which co-operates with the flat seating 14 for the closing of the orifice of the drain conduit 2, is characterized by the fact that it comprises a circular groove 15 upon its lower flat face.

Fig. 2 shows the shape of the diametrical section of one of the box walls; 16 indicates this wall which comprises suitable corrugations on either side of the parabola 17 of small parameter (for example on the order of 2 mm.); the said corrugations, which are concentric, decrease in amplitude from the centre to the periphery of the wall, i. e., from left to right of the figure. The axis of symmetry 18 of the parabola is somewhat inclined to the mean plane of the wall, and the angle α has for instance a value of some 20 degrees; the corrugated part of the wall is provided with the cavettos 19 and 20 having a relatively large radius.

The liquid contained in the box 6—or in the boxes, should the apparatus comprise a plurality of boxes communicating with each other or independent—consists of a mixture of water and organic compounds such as alcohols, ethers or hydrocarbons; by way of example, a mixture having the following percentage composition may be employed:

	Parts.	105
Water	50	
Hexane	25	
Benzine	25	

A mixture of this kind has a saturated vapour tension which is higher at all temperatures—or at least within the temperature limits at which the apparatus is usually working—to the saturated vapour tension of water at the same temperature, the difference between the vapour tensions being constant (or approximately so) at the different temperatures. The said mixture is of a reducing nature, so that it will maintain a constant volume and will not attack the metal of the box or boxes, and further, its freezing point may be made very low.

When the apparatus is filled with steam, the temperature within the box 6 will be the same as the temperature outside the box, and the valve 13 will be applied upon its seat 14 due to the difference between the vapour tension of the liquid in the said box or boxes and the tension of the steam.

When water is condensed within the apparatus, the pressure outside the box 6 will remain the same as the pressure in the steam conduit, but the pressure within the said box will be lowered at the same time as the temperature, and will attain a value below that of the steam pressure. At this time the box 6 will contract and will lift the valve 13. This movement takes place in a very abrupt manner, due on the one hand to the presence of the groove 15 in the valve 13 and on the other hand to the general paraboloid form of the box walls and to the concentric corrugations of decreasing amplitude of the said walls. By reason of the disposition of the said box walls and of their large radius cavettos 19 and 20, the stresses are uniformly distributed upon the surface of the said walls, so that the life of the said boxes is augmented while the said valve will have a constant lift irrespectively of the operating pressure. The abrupt ascent of the valve allows of forcing the expelled water of condensation and hence of recovering this hot water, it being for example delivered to the boiler.

In virtue of the constant or substantially constant difference between the vapour tension of the liquid within the collapsible box or boxes and the tension of the steam, the valve 13 will operate instantly under all pressures for temperature differences of even a few degrees. By the use of a properly composed mixture, the water-trap can be made to operate for any given temperature of the water of condensation.

Obviously, the said invention is not limited to the particular details of construction hereinbefore set forth, these being given solely by way of example.

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

1. A water-trap comprising a body, a

steam and water inlet and a water outlet on said body, a collapsible box supported by and within said body, a closing member for said water outlet and supported by said box and a liquid contained within said box and having substantially the following composition:

	Parts.
Water-----	50
Hexane-----	25
Benzine-----	25

2. A water-trap comprising a body, a steam and water inlet and a water outlet on said body, a cylindrical collapsible box supported by and within said body, the half diametrical section of the end walls of said box being an arc of a parabola of small parameter, the vertex of the parabola being adjacent the wall centre and its axis being inclined and outside the box, a fluid contained within said box and the pressure whereof, according to the temperature within said box, varies in accordance with a predetermined law and a closing member for said water outlet and supported by one end wall of said box.

3. A water-trap comprising a body, a steam and water inlet and a water outlet on said body, a cylindrical collapsible box supported by and within said box, each end wall of said box comprising a central portion and a paraboloidal portion, the half diametrical section of said paraboloidal portion being an arc of a parabola of small parameter the vertex of the parabola being adjacent said central portion and its axis being inclined and outside the box and cavettos of relatively large radius connecting said paraboloidal portion with the central portion and the peripheral wall of the box, a fluid contained within said box and the pressure whereof, according to the temperature within said box, varies in accordance with a predetermined law and a closing member for said water outlet and supported by one end wall of said box.

4. A water-trap comprising a body, a steam and water inlet and a water outlet on said body, a cylindrical collapsible box supported by and within said body, the half diametrical section of the end walls of said box being an arc of a parabola of small parameter, the vertex of the parabola being adjacent the wall centre and its axis being inclined and outside the box, concentric corrugations provided on said end walls and the amplitude whereof diminishes gradually from the centre towards the periphery, a fluid contained within said box and the pressure whereof, according to the temperature within said box, varies in accordance with a predetermined law and a closing member for said water outlet and supported by one end wall of said box.

5. A water-trap comprising a body, a steam and water inlet and a water outlet on said body, a collapsible box supported by and within said body, a flat valve supported by said box and adapted to close said water outlet, a circular groove provided on the flat bearing surface of said valve, and a fluid contained within said box and the pressure whereof, according to the temperature within said box, varies in accordance with a predetermined law.

In testimony whereof I have signed my name to this specification.

PAUL CHARLES RIBES.