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HEAT ACCUMULATOR

Filed Feb. 24, 1927

Fig.1.

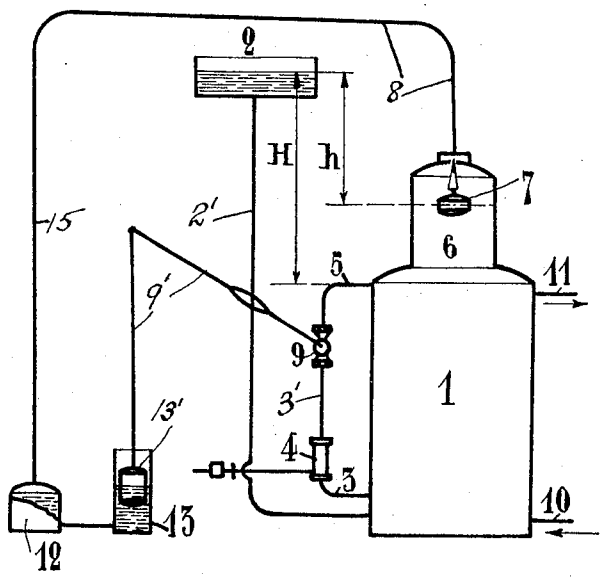
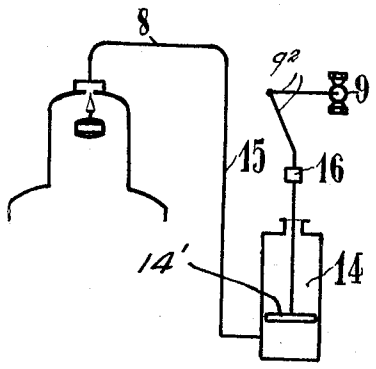


Fig.2.



INVENTOR
Auguste Beaurrienne

BY
Emil Bonnelycke

ATTORNEY

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AUGUSTE BEAURRIENNE, OF PARIS, FRANCE

HEAT ACCUMULATOR

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The present invention relates to heat accumulators, and more particularly to systems for filling an accumulating tank or boiler with hot water at a substantially definite and constant temperature; the steam formed during the course of operations being utilized to regulate the opening and closing of a valve that controls the circulation of the water.

The invention further and more especially involves the employment of a circulation pipe, external to the tank, which is fitted with the afore-mentioned control valve and, in addition, has mounted on it a source of heat; this pipe embodying lower and upper inlet and outlet branches which open into the tank. Production of steam takes place at a level higher than that of the inlet branch, in a steam chamber or dome formed by the top part of the tank. The hot water drawn off at the upper part of the tank can be partially vaporized and cooled.

In the accompanying drawings, which illustrate the invention in diagrammatic section:

Figure 1 is a view representing one form which the invention may take in practice;

Fig. 2 shows another way in which the automatic operation of the control valve can be effected.

Referring to Fig. 1, 1 indicates a closed tank or boiler, full of water and communicating, by way of a pipe 2′, with a source of water under pressure—for instance, an elevated reservoir 2—capable of receiving water from the tank 1 when the water therein expands consequent on being heated, and of supplying to said tank the quantity of water necessary to compensate for the contraction or shrinkage that takes place in the water in the tank when it cools. A circulation pipe or conduit is connected to the tank and comprises an inlet portion 3 that leads from the lower part of the tank, an intermediate vertical portion 3′ and an upper outlet portion 5 that leads into the upper part of said tank; the aforesaid intermediate portion 3′ extending through a suitable source of heat, indicated diagrammatically at 4, and being provided at a point above such heat source with a sluice valve 9 which, however, does not have a tight fit, so that a certain small amount of water can leak through it when closed.

The reduced upper part 6 of the tank forms a dome, as will be apparent from Fig. 1; and in the top of this dome there is a valve seat for a float valve 7 of the needle type, such seat being connected to a steam delivery pipe or conduit 8. The cold water supply pipe 10 leads to the bottom part of the tank, and the hot water delivery pipe 11 leads from its upper part slightly below the dome 6. Finally, H indicates the column of water extending from the upper portion 5 of the circulation pipe to the level of the water in reservoir 2—in other words, the height of such level above portion 5—and h indicates the height of said level above the float 7 when the valve proper carried thereby is closed.

The heat source 4 having a hypothetical temperature higher than the boiling temperature of the water under a pressure equal to that of column h, and the sluice valve 9 being closed, the quantity of water that leaks past said valve is too small, hypothetically, to absorb, by simple heating, the amount of heat supplied by said source. Vaporization of the water will therefore take place, the steam or vapor entering into the tank by way of the branch 5 and rising into and condensing in the water in the dome 6. As soon as the temperature of the water reaches the boiling point under pressure h, steam will collect in the upper part of the dome; and when the boiling temperature under said pressure is exceeded, the steam pressure in the dome will cause the level of the water therein to sink. Consequently, the float valve will likewise drop and the steam will be free to pass into the pipe or conduit 8 where a pressure will be set up which will closely approximate pressure h.

This pressure is utilized to control the opening of sluice valve 9, Figs. 1 and 2 showing two ways of effecting that object. In Fig. 1, the pipe 8 is connected by a second pipe or conduit 15 to a closed vessel 12 which, in turn, is connected at its bottom to an open vessel 13. Vessels 12 and 13 contain liquid, and the last-named vessel is equipped with a float 13′ that is connected by a suitable link-

age 9′ to the sluice valve 9, so that the steam pressure is thus transmitted through pipes 8 and 15 to the closed vessel 12, where it acts upon the liquid therein, with the result that the liquid in the open vessel 13 rises, carrying with it the float 13′ and, in consequence, opening valve 9 through the intermediary of the linkage 9′.

In Fig. 2, the steam pressure is transmitted through pipes 8 and 15 to a cylinder 14 wherein a piston 14′ is movably fitted. This piston is caused to ascend under the pressure imposed upon it and in so doing operates valve 9 by means of the linkage 9^2 which connects its stem or rod with the valve.

Irrespective of the precise character of the automatic device employed for opening the sluice valve, the latter, when opened, will permit circulation of water through the circuit 1—3—3′—9—5; and this water will absorb the heat supplied by the heater 4, whereupon the formation of steam ceases. The previously formed steam which is still present in the dome 6 condenses and passes back into the tank 1, the water level rises in said dome and carries the float valve 7 into closed position, the pressure in the pipes 8, 15 drops, and finally, the sluice valve 9 is closed either by the weight of the float 13′ (Fig. 1) or through the agency of a weight 16 secured to the rod or piston 14′ (Fig. 2). In fact, the regulator will oscillate slightly, and the temperature of the water entering the tank will be set at approximately the boiling point under pressure h.

The temperature set for the water entering the tank 1 will approach more nearly to the boiling point under pressure H according as the difference in height between H and h decreases. Hence, it is possible to fill the tank with water at a temperature very near the boiling point under pressure H and to utilize this water directly for, say industrial purposes; a quantity of cold water equal to the quantity of hot water drawn off through pipe 11 being supplied to the tank through pipe 10.

I claim as my invention:

1. A liquid heating system, comprising a tank; a circulation pipe having an inlet branch connected to the lower part of the tank and an outlet branch connected to the upper part thereof; a source of heat and a regulating valve connected one below the other to the circulation pipe; a steam chamber atop the tank above said outlet branch; and means controlled by the production of steam in said chamber for automatically governing the valve.

2. A liquid heating system, according to claim 1, in which the regulating valve is normally closed and is opened by the action of the automatic governing means.

3. A liquid heating system, comprising a tank; a circulation pipe having an inlet branch connected to the lower part of the tank, an outlet branch connected to the upper part thereof, and an intermediate vertical portion connecting said branches; a source of heat and a regulating valve connected one below the other to said intermediate portion; a steam chamber atop the tank above said outlet branch; means acting on said valve to operate the same, and itself under the control of the pressure of the steam in said chamber; and a float valve in the steam chamber controlled by the level of the liquid therein as varied by steam production to regulate communication between said chamber and said valve-operating means.

In testimony whereof I affix my signature.

AUGUSTE BEAURRIENNE.