June 18, 1935. A. TEVES 2,005,013

EVAPORATOR FOR REFRIGERATION MACHINES

Filed Jan. 29, 1932

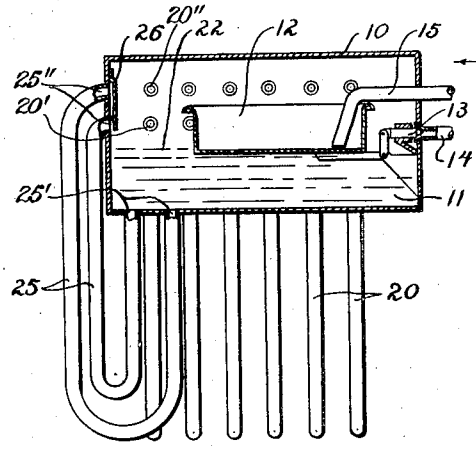


Fig. 1

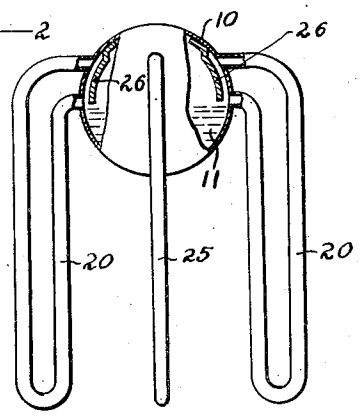


Fig. 2

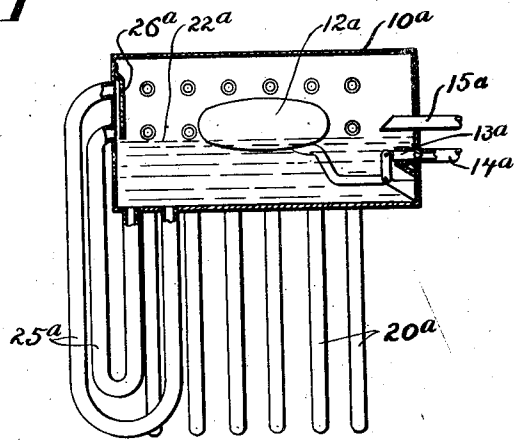


Fig. 3

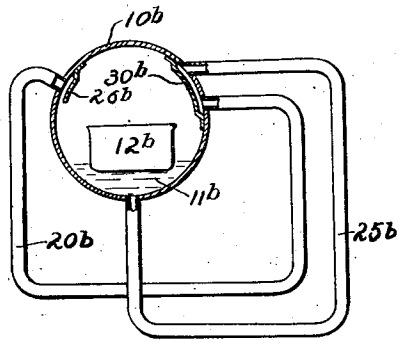


Fig. 4

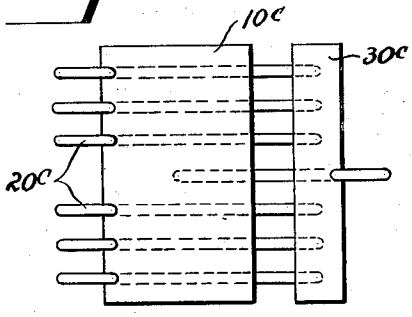


Fig. 6

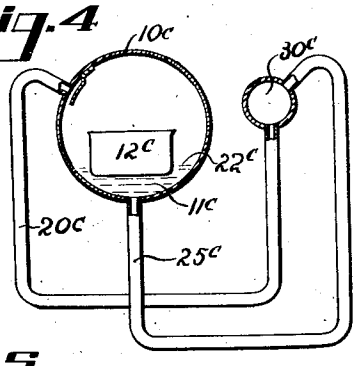


Fig. 5

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EVAPORATOR FOR REFRIGERATION MACHINES

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Application January 29, 1932, Serial No. 589,737
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6 Claims. (Cl. 62—126)

The present invention relates to evaporators for refrigeration systems. Evaporators of the flooded type as most commonly used consist of a reservoir or tank having connected thereto a plurality of tubes opening at both ends into the reservoir member, with one or both ends of such tubes below the normal level of the refrigerating liquid in the reservoir, which level is governed by a float and float-controlled inlet valve, the float being within the reservoir.

In such devices the tubes are ordinarily all filled with the refrigerant liquid during idle periods, and when the compressor is started and the pressure reduced in the evaporator, rapid boiling begins in the tubes, and the gas generated in the tubes lifts the liquid in the tank, often completely filling it and interfering with the action of the float and its valve by prematurely and irregularly lifting the float and closing the valve. During such periods, regular vaporization is hindered and uniform flow is impossible.

Among the objects of this invention, therefore, is the overcoming of this difficulty, and provision of means for preventing such undesirable interference with the operation of the float valve, thereby enabling the valve to keep the level constant at all times and by preventing improper closure of the valve, as well as by reason of the arrangement of the pipes, insuring uniform and more rapid flow.

Other objects will readily occur to those skilled in the art upon reference to the following description and the accompanying drawing, in which

Figures 1 and 2 show respectively a side elevation and an end elevation, partly in section, of an evaporator incorporating the invention;

Figure 3 is a side view similar to Figure 1 of a modified form;

Figures 4 and 5 are sectional views of further modifications; and

Figure 6 is a plan view of the device of Figure 5.

As indicated in the drawing, the evaporator comprises a reservoir portion, designated 10 in the first illustrated embodiment, adapted to contain a body of liquid refrigerant 11, the level of which is controlled by a float 12, which actuates a valve 13. The valve controls the inflow of liquid refrigerant through pipe 14 to maintain the level 22. Refrigerant vapors may be carried off through a pipe, as that designated 15, to the suction side of a suitable compressor, and then to a condenser (not shown) where it is again liquefied, all in the conventional or any desired manner, and thereafter returned to the evaporator through pipe 14. As shown in Figure 1, the float 12 may be an open pan into the body of which the suction outlet tube 15 opens in such manner that it prevents the collection of and removes any liquid refrigerant in the float.

Referring specifically to Figures 1 and 2, it will be seen that the evaporating tubes are of two types, designated respectively 20 and 25. The tubes 20 have both their inlet ends 20' and their outlet ends 20'' arranged above the float-determined liquid level 22, with the inlet ends only slightly above the level 22. All of these evaporating tubes 20, which may be termed the "working tubes", and which preferably exceed in number the control tubes 25, as shown, may be in the form of depending loops which extend well below the liquid level, although other suitable forms may be used and a greater or lesser number employed, as may be found expedient.

In the second or control tube group the tubes are designated 25, and are so connected to the reservoir that their inlet ends 25' are below the liquid level and their outlet or discharge ends 25'' above it. The outlets of both tube systems, as 20''—25'', may be guarded by baffles 26 adapted to prevent violent discharge of liquid and vapor against or upon the float 12.

In operation, when the system is at rest, the level stands idle and substantially undisturbed at 22 and no evaporation occurs, the tubes 25 being of course filled to the same level, and the tubes 20 ordinarily empty. When the compressor is started and the system begins to work, boiling occurs in tubes 25, wherein of course the evaporation is early and relatively violent. The gas generated in those tubes forces the liquid out of them and into the tank, where it raises and disturbs the level 22, thereby permitting liquid to enter the tubes 20 through inlets 20'. The tubes 20 of course stand empty while the system is idle, and my improved evaporator therefore uses less refrigerant than do more conventional flooded evaporators. When the refrigerant overflows into the tubes 20 in the described manner, it boils rapidly and is quickly and completely gasified. Since these tubes do not stand with liquid in them while the system is idle, upon commencing to function they cause no violent belching of mixed liquid and gas, and do not lift the entire body of liquid refrigerant in the tank, in the manner above alluded to. Proper operation of the float is accordingly not interfered with, although a rapid circulation of the boiling refrigerant in the nature of a whirling action takes place. The capacity of the tube system 25 may be just sufficient to raise

the level 22 a desired amount to cause the overflow into the tubes 20, and this raising of the level is done relatively smoothly by reason of the lesser influx from the tubes 25, while the jets from both the outlets 20''—25'' are further prevented from interfering with operation of the float by the baffles 26.

The construction shown in Figure 3 will be seen to be somewhat modified in that a closed float 12a is employed, and the suction or outlet tube 15a opens directly through the side wall and into the interior of the evaporator tank. The arrangement of parts will be seen to be otherwise analogous, and equivalent portions have accordingly been given like reference characters with the addition of the distinguishing character "a" thereafter, and need not be described in detail.

In the modified form of boiler shown in Figures 5 and 6, the working evaporating tubes 20c discharge at one end, as at 20c'', into the reservoir 10c above the normal liquid level 22c, and at their other (inlet) ends are connected to the bottom of a header 30c. The header 30c is also positioned somewhat above the liquid level 22c. The inlet ends of the control tubes 25c are connected to the reservoir 10c below the liquid level, as at the bottom thereof, and discharge as at 25c'' into the upper part of header 30c. Only the control tubes thus normally stand with liquid in them during idle periods, in analogous fashion, while the working tubes 20c stand empty. Moreover, by virtue of the isolated header 30c, through which the output of mixed gas and liquid is delivered from the control tubes directly to the working tubes, the precise increase of level caused by the discharge of the control tubes is not a matter of concern, as in the first embodiment, and since the working tubes stand empty when idle and are of greater capacity than the control tubes, they completely vaporize the partly liquid refrigerant delivered to them by the control tubes, and thus cannot belch liquid into the tank or lift the entire body of liquid in the tank to disturb the float operation.

While the interposed header may be outside the main evaporator tank, as in the embodiment just described, it may also be arranged inside but isolated from the same, as in the embodiment shown in Figure 4, in which the header is designated 30b, and in which to other equivalent parts like reference numerals have been applied, with the substitution of the distinguishing character "b".

While it will be apparent that the illustrated embodiments of my invention herein disclosed are well calculated to adequately fulfill the objects and advantages primarily stated, it is to be understood that the invention is susceptible to variation, modification and change within the spirit and scope of the subjoined claims.

What I claim is:

1. An evaporator for refrigerators comprising a reservoir for liquid refrigerant, a plurality of refrigerating tubes connected thereto each having a portion below but both ends arranged above the normal level of liquid refrigerant, whereby they are normally empty of liquid refrigerant, and at least one refrigerating tube connected to said reservoir with its inlet end below the normal liquid level.

2. An evaporator as defined in claim 1, characterized by the fact that the capacity of the last mentioned tube, the inlet of which is connected to the reservoir below the normal liquid level thereof, is less than the capacity of the reservoir.

3. An evaporator as defined in claim 1, distinguished by the fact that the capacity of the last mentioned tube whose inlet is connected to the reservoir below the normal liquid level thereof is less than the total capacity of the first mentioned tubes.

4. An evaporator for refrigerators comprising a reservoir for liquid refrigerant, a plurality of evaporating tubes connected thereto, each having a portion below but both ends arranged above the normal liquid level in the reservoir, one end of each tube being arranged to open into the reservoir only a slight distance above such liquid level, and other tubes connected to said reservoir and having their inlet ends below said level, whereby disturbances of the liquid level within the reservoir will cause a certain amount thereof to enter the first-mentioned tubes.

5. An evaporator for refrigerators comprising a reservoir for liquid refrigerant, an evaporating tube connected thereto below the normal liquid level to receive liquid refrigerant therefrom at all times, a header arranged above the normal liquid level in the reservoir, to which header the outlet end of said tube is connected, and additional evaporating tube means of greater total surface area and evaporative capacity than said first mentioned evaporator tube, said additional tube means having the inlet end thereof connected to said header and the outlet end to said reservoir above the normal liquid level therein.

6. An evaporator for refrigerators comprising a reservoir for liquid refrigerant, an evaporating tube connected thereto below the normal liquid level to receive liquid refrigerant therefrom at all times, a header arranged above the normal liquid level in and isolated from the reservoir, to which header the outlet end of said tube is connected, and additional evaporating tube means of greater total surface area and evaporative capacity than said first mentioned evaporator tube, said additional tube means having the inlet end thereof connected to said header and the outlet end to said reservoir above the normal liquid level therein.

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