May 30, 1939. M. E. JOHNSTON 2,160,333

THERMAL ACCUMULATOR

Filed Nov. 2, 1937 2 Sheets-Sheet 1

Fig. 1.

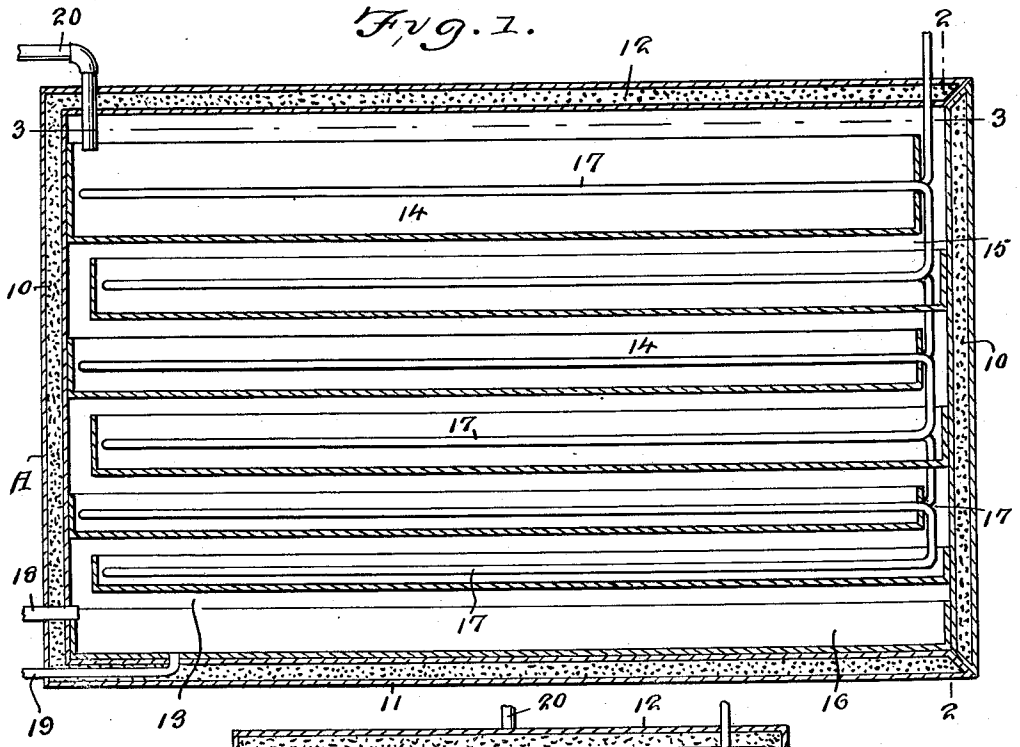
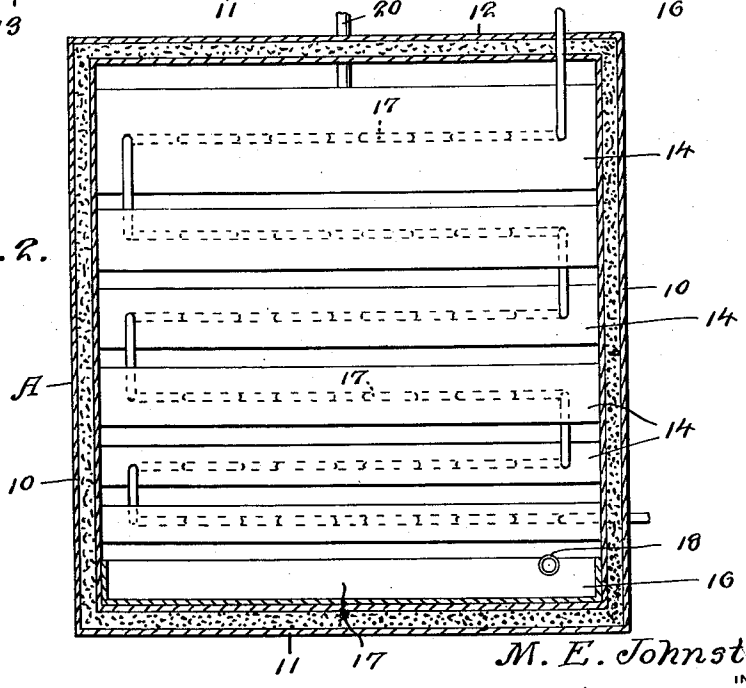


Fig. 2.



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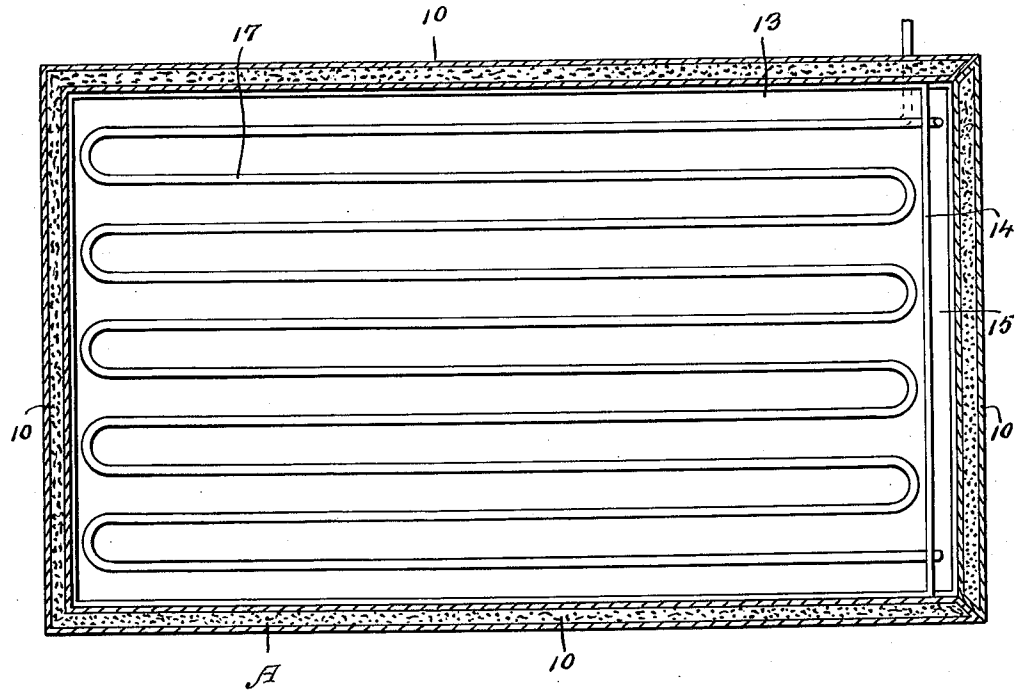
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Fig. 3.



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2,160,333

THERMAL ACCUMULATOR

Marshall E. Johnston, St. Petersburg, Fla.

Application November 2, 1937, Serial No. 172,463

3 Claims. (Cl. 62—95)

The invention relates to a fluid cooler and more especially to a thermal accumulator.

The primary object of the invention is the provision of a device of this character, wherein fluid flowing either by gravity or forced circulation through a series of tanks wherein a determined amount of cooling surface is immersed and so arranged that the fluid under circulation is usable for air conditioning, for milk cooling, beer cooling or the like or for water cooling for bakeries, bottling plants, etc.

Another object of the invention is the provision of a device of this character, wherein a solution is solidified by freezing and the primary heat transfer is through an extended wet ice surface, the heat accumulating effect of a quantity of ice being had, an extended ice surface in compact form and the effectiveness of forming and controlling said extended ice surface as well as being effective for forming and maintaining an extended wet ice surface during the useful period when heat is being accumulated.

A further object of the invention is the provision of a device of this character, wherein the construction thereof is novel in its entirety and is adaptable for the cooling of water for drinking purposes, for air conditioning and for the cooling of other liquids, being economical in the operation thereof and highly efficient in its working.

A still further object of the invention is the provision of a device of this character, which is simple in construction, thoroughly reliable and efficient in operation, durable, and inexpensive to manufacture and install.

With these and other objects in view, the invention consists in the features of construction, combination and arrangement of parts as will be hereinafter more fully described, illustrated in the accompanying drawings, which disclose the preferred embodiment of the invention and pointed out in the claims hereunto appended.

In the accompanying drawings:

Figure 1 is a vertical sectional view through the device constructed in accordance with the invention.

Figure 2 is a sectional view on the line 2—2 of Figure 1.

Figure 3 is a sectional view on the line 3—3 of Figure 1.

Similar reference characters indicate corresponding parts throughout the several views in the drawings.

In the accompanying drawings, A designates generally a portion of a freezing enclosure being built with insulated walls 10, bottom 11 and top 12, respectively. One of the walls 10 is arranged as a cover, lid, door or the like giving access to the interior constituting a compartment 13.

Above the bottom 11 within the compartment 13 is arranged a series of shallow trays 14 which extend alternately from the wall on one side to a point near the wall on the other side so that a zigzag passage is left between said trays. The trays 14 in this arrangement are superposed relative to each other leaving a circulating space 15 therebetween and also a sump space 16 at the bottom of said compartment 13. These trays 14 are adapted to be filled with water. On the filling of the uppermost tray of the series, the next succeeding lowermost trays become filled in the supplying of their contents, this being had by gravity. Thus the staggering of the trays enables the fluid entering one of the uppermost trays to traverse the length of the compartment 13 and fall by gravity into the next tray below, there being a continuity of such flow until the fluid has covered the combined length of all of the trays whence it flows by gravity into the bottom or sump space 16.

Located within the trays 14 are the coils 17 of an evaporator or cooling system and these coils 17 are so arranged that a predetermined amount of cooling surface is immersed in the content of each tray. The coils 17 are connected in series with an expansion valve (not shown) which is connected to the top coil and the suction of a compressor (not shown) being connected to the bottom coil. This arrangement causes the fluid to freeze in the top coil first and progressively down to the bottom coil hence the overflow from each tray 14 as the fluid solidifies in freezing will be carried by gravity down to the sump space 16 and a space 15 at all times is assured between the trays 14.

The sump space 16 is communicative with an overflow pipe, a portion being indicated at 18, while leading from this space is an outlet pipe 19, the water being delivered to the trays 14 through an inlet pipe, a portion thereof being indicated at 20.

The control of this device may be accomplished by using a thermostatic expansion valve (not shown) and a pressure control on the compressor or a thermostatic expansion valve and a thermostat or an automatic expansion valve and thermostat, the fluid being circulated through the device under pressure preferably by the use of a circulating pump (not shown) although such fluid may be run through the device by gravity.

In this latter instance the device is usable as a water cooler for bakeries, bottle plants et cetera, while in the use of the device with a circulating pump it affords an air conditioner or for milk cooling or other purposes.

When the device is usable for water cooling on a gravity system or forced circulating system, a float valve (not shown) will be used in the sump space 16 to furnish make-up water as it is used. In the use of the device on other types of cooling systems where the cold fluid is circulated, other means of supplying the make-up fluid will be employed since it is necessary only to make up that which is lost through leakage.

In the use of the device, it is effective as a thermal accumulator for reducing the temperature of comparatively large amounts of fluid for short periods of time with smaller refrigerating apparatus than would necessarily have to be used if the entire cooling load were imposed on the machinery for said period.

What is claimed is:

1. The combination with an enclosure for freezing or cooling, of a series of superposed vertically spaced and staggered arranged trays therein, being spaced from each other and from the bottom of the enclosure and also staggered in their set relation to each other, a liquid filling the respective trays, the trays being decreased in capacity from the uppermost to the lowermost of the series, a series of freezing coils immersed in the contents of said trays and adapted for connection with a refrigerating condensing unit of the compression or absorption type, and means for admitting liquid to the uppermost tray of the series for the gravitation of such liquid successively to the lowermost trays, said freezing coils being arranged substantially at one half the depth of the contents of the respective trays.

2. The combination with an enclosure for freezing or cooling, of a series of superposed vertically spaced and staggered arranged trays therein, being spaced from each other and from the bottom of the enclosure and also staggered in their set relation to each other, a liquid filling the respective trays, the trays being decreased in capacity from the uppermost to the lowermost of the series, a series of freezing coils immersed in the contents of said trays and adapted for connection with a refrigerating condensing unit of the compression or absorption type and arranged substantially at one half the depth of said contents in the respective trays, means for admitting liquid to the uppermost tray of the series for the gravitation of such liquid successively to the lowermost trays, and an overflow communicating with the enclosure beneath the lowermost tray.

3. The combination with an enclosure for freezing or cooling, of a series of superposed vertically spaced and staggered arranged trays therein, being spaced from each other and from the bottom of the enclosure and also staggered in their set relation to each other, a liquid filling the respective trays, the trays being decreased in capacity from the uppermost to the lowermost of the series, a series of freezing coils immersed in the contents of said trays and adapted for connection with a refrigerating condensing unit of the compression or absorption type and arranged substantially at one half the depth of said contents in the respective trays, means for admitting liquid to the uppermost tray of the series for the gravitation of such liquid successively to the lowermost trays, an overflow communicating with the enclosure beneath the lowermost tray, and a liquid discharge leading from the enclosure at the bottom thereof.

MARSHALL E. JOHNSTON.