

May 2, 1939.

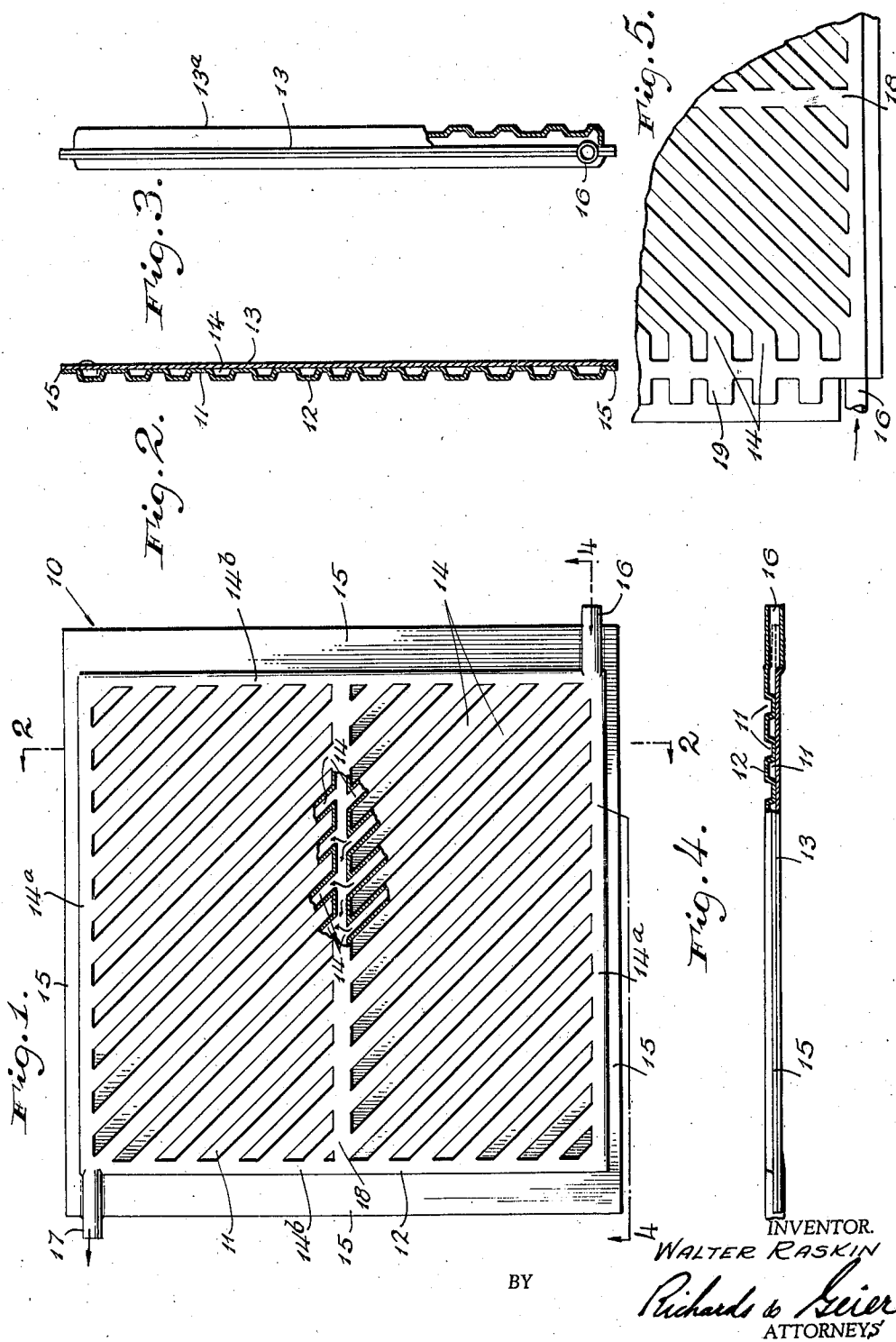
W. RASKIN

2,156,544

EMBOSSED TUBE EVAPORATOR PLATE FOR REFRIGERATING SYSTEMS

Filed Oct. 16, 1936

2 Sheets-Sheet 1



BY

INVENTOR.
WALTER RASKIN
Richard & Seier
ATTORNEYS

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Fig. 6.

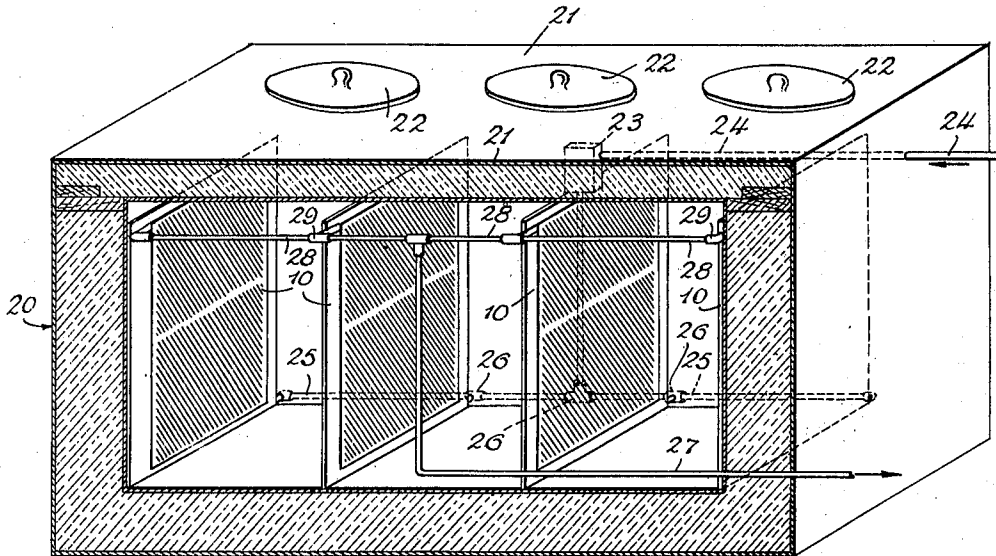


Fig. 7.

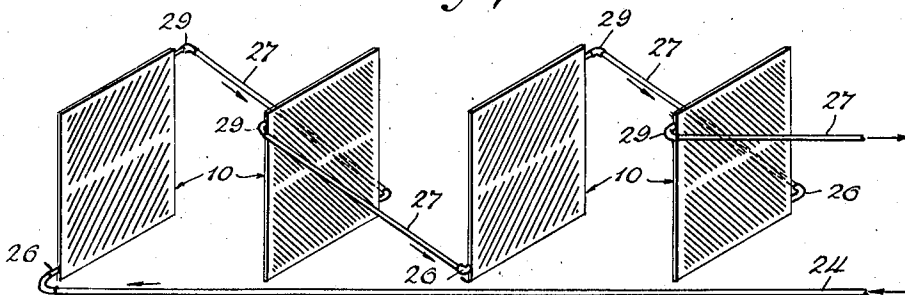
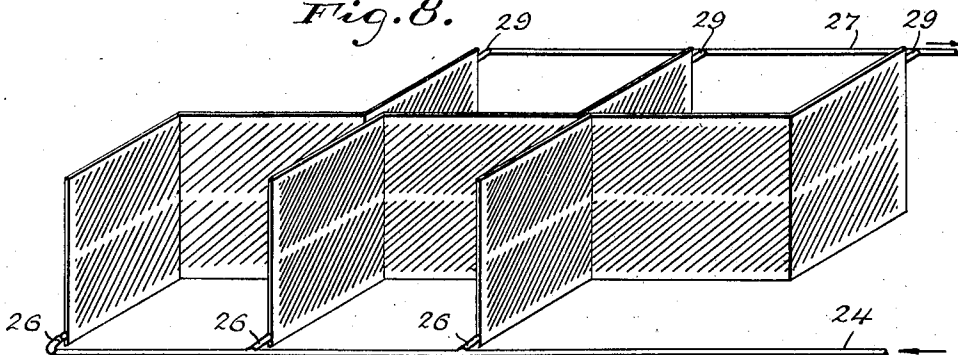


Fig. 8.



INVENTOR
WALTER RASKIN

BY
Richardson & Geier
ATTORNEYS

UNITED STATES PATENT OFFICE

2,156,544

EMBOSSSED TUBE EVAPORATOR PLATE FOR REFRIGERATING SYSTEMS

Walter Raskin, New York, N. Y.

Application October 16, 1936, Serial No. 105,869

3 Claims. (Cl. 62—95)

This invention relates to refrigerated storage cabinets, such for instance, as the dispensing cabinet commonly employed in soda fountains and the like for the storage and dispensation of bulk ice cream, and in particular to an improved evaporator plate used in such cabinets. The invention is not limited, however, to this type of cabinet but has a wide range of utility in connection with the refrigeration of foodstuffs, materials and the like.

One of the principal objects of the invention is to provide a refrigerated storage cabinet having a reduced maintenance and operating cost in comparison with the cabinets now in use.

Another object is to provide a refrigerated storage cabinet with increased storage capacity.

Still a further object is to provide an evaporator unit which has an increased evaporating surface in comparison with those heretofore used and which can easily be installed in any standard cabinet permitting the conversion of such a cabinet into an effective refrigerating chamber.

Most standard types of refrigerated storage cabinets in use to-day, comprise a brine tank in which the storage cans are submerged. Cooling coils are usually mounted adjacent the center of the tank and supplied with refrigerant from a reservoir. The evaporator surface in this type of cabinet is naturally no larger than the surface of the coils and the brine had to be relied upon to absorb the heat from the various parts of the cabinet through the method of transmission by conduction.

Another disadvantage with this type of cabinet is the corrosive effect of the brine on the various parts of the assembly. In the cabinet according to the present invention the brine tanks and cooling coils have been eliminated thus increasing the useful storage space.

Attempts have been made to overcome the disadvantages of the brine type cabinet by equipping the storage cabinet with hollow plate-like intercommunicating evaporator sections consisting of a pair of closely spaced sheet metal members. These metal members are welded together along the edge and are provided with a series of complementary indentations. The resulting hollow partitions are flooded with refrigerant liquid from a receiver or "boiler" provided with a float valve in order to maintain the liquid at constant level.

The present invention has been designed along this principle but with a purpose of eliminating the disadvantages connected with the dry cabinets heretofore used. Because of the non-forced or unguided flow of the refrigerant liquid, foreign substances therein often clogged in the narrow ducts formed by the indentations. This unguided flooding of the evaporator also results in certain portions being "starved", thus reducing the

evaporator surface. The refrigerant liquid naturally will take the shortest course to the outlet since it flows merely by gravity.

These disadvantages may be eliminated by forcing the refrigerant liquid through the plate in a guided directional flow according to the present invention which will be more fully understood from the following detailed description taken in connection with the accompanying drawings illustrating by way of example an embodiment of the inventive concept.

In the drawings:

Figure 1 is a plan view of an evaporator plate, partly in section, according to the invention.

Figure 2 is a cross section along the line 2—2 of Figure 1.

Figure 3 is a side view of an evaporator plate provided with a eutectic pad, partly in section.

Figure 4 is a section along the line 4—4 of Figure 1.

Figure 5 is a view of a portion of an evaporator plate provided with a special header.

Figure 6 is a perspective disassembled view of a refrigerated storage cabinet according to the invention in which the evaporator plates are connected in parallel.

Figure 7 is another form of hook-up.

Figure 8 is a view of a hook-up in which the evaporator plate has been bent to form three sides.

The evaporator 10 illustrated in Figure 1 is preferably made by embossing a series of impressions 11 on a flat piece of sheet metal 12 or the like in such a manner that when another flat sheet 13 is placed against the first one, a series of ducts or passage-ways 14 running diagonally across the evaporator and horizontal and vertical ducts 14a and 14b are formed. These ducts will act as expansion chamber and passage-way for liquid refrigerant or vaporized refrigerant.

The two sheets 12 and 13 are spot-welded together along the diagonally running depressions formed by the embossings to seal the diagonally running ducts 14 and to adequately strengthen the relatively thin metal sheets against separation under the internal gas pressures to which the evaporator is subjected. The outside edges 15 are embossed to correspond with the impressions 11 and welded to the sheet 13 to prevent the leakage or escape of refrigerant. The spot-welds are so placed as to resist the pressure built up by the evaporating refrigerant and to prevent explosion of the ducts.

An inlet fitting 16 and an outlet fitting 17 are provided at opposite diagonal corners to assure effective and positive removal of all refrigerant and oil. These fittings, however, may be placed at any convenient point on the evaporator plate which would allow effective and positive passage of the refrigerant.

The plate 12 may also be provided with a baffle arrangement 18 in order to effect better evaporation. This baffle arrangement may run vertically or horizontally as shown in Figures 1 and 5 respectively.

The plate 13 can also be provided with a eutectic pad 13a embossed in a manner similar to plate 12, to form a receptacle for a freezing solution which will retard the action of the heat transfer. Although such a eutectic pad is not necessary for the function of the evaporator, it may be desirable in order to provide for compressor breakdown which otherwise would make the ice cream soft and unsaleable.

As shown in Figure 5, the evaporator may be provided with a header 19 in which the ducts 14 run straight out to the edge. In this manner the evaporator surface is further enlarged.

It has been found that because of the increased area of heat absorbing surface according to the invention, the running time has been reduced to about 18% of 24 hours resulting in a considerable saving of current consumption. The running time in the conventional cabinets is approximately 33 1/3%.

Figure 6 illustrates a cabinet equipped with evaporators as described herein. The cabinet indicated generally at 20 may have its sidewalls and bottom walls of any suitable insulating material, and the cabinet top 21, also of insulating material, is provided with the usual hatches through which cans of ice cream may be lowered into position in the cabinet. These hatches are normally covered by insulating covers 22.

The evaporator sections 10 are intercommunicating and connected to a receiver tank (not shown) through an expansion valve 23 and intake line 24. In the modification shown in Figure 6, the evaporators are connected in parallel by means of pipes 25 and inlet fittings 26. The suction line 27, which is also connected in parallel with the individual evaporators through pipes 28 and outlet fittings 29 lead to a compressor (not shown).

The operation of the device will be more or less self-evident from the foregoing description, but may be briefly summarized as follows:

By means of a compressor the refrigerant such as sulphur, dioxide, methyl-chloride or freon, is forced through a condenser where it is condensed, and then through the intake line 24 to the expansion valve 23. From here it enters the individual evaporators 10 through the inlets 16 and the gases are drawn through the diagonal ducts 14 and the outlets 17 by the suction in lines 25 and 27 and through which latter line the refrigerant is returned to the compressor, thus completing the cycle. It will thus be seen that the refrigerant is forced through the evaporators in a guided directional flow in contrast to the devices heretofore used.

The invention may be operated with any kind of expansion valve system or metering device, such as high-side float valve, low-side float valve, thermostatic expansion valve, two-temperature valve and the like.

The evaporators may also be connected in series in accordance with the needs of the particular installation. Such a hook-up is illustrated in Figure 7.

As shown in Figure 8, the evaporators may be bent to form three sides, thus providing refrigeration on three sides of each compartment in the cabinet.

The present invention is exceptionally useful for converting brine type of cabinets into dry cabinets. In applying the invention to the former type, the cabinet cover 21 is taken off and the brine tanks, cooling coils and reservoir removed. The improved evaporator assembly according to the invention is then bodily inserted into the cabinet and connected to the compressor and condenser whereupon the refrigerant may be pumped into the unit. Whether the unit is used as new equipment or as replacement it will be seen that it may always be bodily removed with facility and expedition for the purpose of inspection, repair or replacement of parts.

The above detailed description is, of course, merely illustrative of the inventive concept, and apparently different embodiments could be made without departing from the scope thereof.

What is claimed is:

1. A quadrilateral evaporator plate, having substantially parallel top and bottom edges for refrigerated storage cabinets comprising two superimposed metal sheets, one of said sheets being embossed to form channels running obliquely to said edges across said sheet, and a continuous header running along and adjacent the side edges thereof, the other sheet being flat and welded to said embossed sheet along the edges and along said oblique channels to form oblique ducts, all opening into said header, and an inlet and an outlet for the refrigerant at the two opposite corners of said plate towards which said ducts extend.

2. A quadrilateral evaporator plate, having substantially parallel top and bottom edges for refrigerated storage cabinets comprising two superimposed metal sheets, one of said sheets being embossed to form channels running obliquely to said edges across said sheets and a continuous header running along and adjacent the side edges thereof, the other sheet being flat and welded to said embossed sheet along the edges and along said channels to form oblique ducts all opening into said header, means for introducing the refrigerant into said evaporator plate at an angle to said ducts and an additional sheet superimposed upon said flat sheet forming therewith a receptacle adapted to contain eutectic solution.

3. An evaporator for refrigerated storage cabinets comprising two quadrilateral superimposed metal sheets, having substantially parallel top and bottom edges, one of said sheets being embossed to form a continuous header running along and adjacent the side edges of said sheet and two groups of channels running obliquely to said top and bottom edges across said sheet separated by an intervening common channel running substantially parallel to the top and bottom edges of said sheet, the channels of one group being staggered with relation to the channels of the other group, the other sheet being flat and welded to said embossed sheet along the edges and along the edges of said channels to form ducts running obliquely across the evaporator and all opening into said header, the ducts in one group being staggered with respect to the ducts in the other group and separated by said common channel, and an inlet and an outlet for the refrigerant in the two obliquely opposite corners of said evaporator towards which said ducts extend.

WALTER RASKIN.