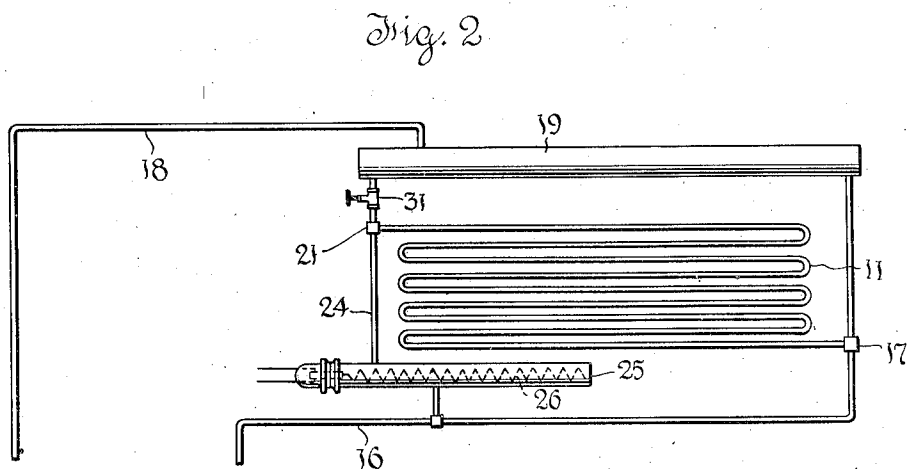
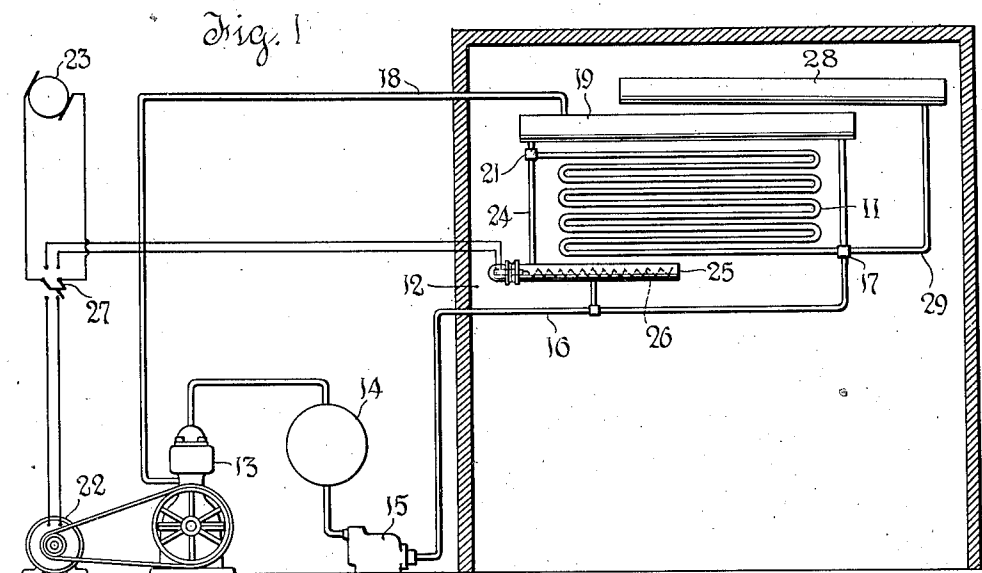


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A. W. RUFF  
DEFROSTING APPARATUS  
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Inventor  
Alonzo W. Ruff  
By *Dodge & Co. Inc.* Attorneys

## UNITED STATES PATENT OFFICE

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## DEFROSTING APPARATUS

Alonzo W. Ruff, York, Pa., assignor to York Ice Machinery Corporation, York, Pa., a corporation of Delaware

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13 Claims. (Cl. 62—115)

This invention pertains to refrigeration systems, particularly to small installations usually employed in refrigerator cabinets of the type found in restaurants and butcher shops. More specifically, the invention comprises means for defrosting the evaporator coils of the refrigerator and a surge receiver into which the refrigerant is driven during the defrosting operation.

It has been somewhat difficult to defrost refrigerator coils with apparatus depending on external application of heat to the coils, the process being slow and causing excessive rises in temperature within the refrigerator cabinet. In small installations it is impracticable to employ the "hot gas" method of defrosting, the number of evaporator coils employed being insufficient for this purpose.

The present invention overcomes the inconveniences herein referred to by providing localized heating of the refrigerant internally of the evaporator coils, an electric heater disposed in or near the bottom of the evaporator and in communication therewith being utilized for this purpose. Upon application of heat through the agency of the heater the refrigerant boils, whereupon the resultant hot gases circulate through the coil and in condensing liberate sufficient heat to defrost the coils.

It is obvious, of course, that the amount of heat applied to effect complete defrosting of the coils is dependent on the volume of refrigerant present in the evaporator. In order to reduce the time and heat necessary for this operation, this invention provides an auxiliary chamber or surge receiver into which most of the refrigerant is forced during application of heat, the pressure evolved by evaporation being sufficient to drive the refrigerant into the surge receiver. Upon cessation of heat application, the refrigerant returns to the evaporator.

The invention will be more fully understood from the following description thereof, reference being had to the accompanying drawing, in which Fig. 1 is a diagrammatic illustration of one form of the invention as applied to a refrigerator cabinet; and

Fig. 2 is a modified form of the invention in which the suction trap is utilized as a surge receiver, only the evaporator coil and its immediate accessories being shown.

In Fig. 1 the evaporator 11, of which only one coil is shown, is disposed within a cabinet 12. The evaporator forms part of a closed system which includes the usual compressor 13, condenser 14 and float trap 15 in the pressure line. The

liquid line 16 connects the float trap with the lower or liquid header 17 of the evaporator and supplies liquid refrigerant thereto, while suction pipe 18 connects compressor 13 and suction trap 19, the latter being in communication with lower header 17 and the upper or gas header 21. The compressor is driven by a motor 22 which receives current supply from a source of electric energy 23.

The foregoing description includes the usual parts and arrangement common to small refrigerator installations, and further explanation thereof is unnecessary.

Interposed between and in communication with the suction trap 19 and liquid line 16 is a pipe or bypass 24 in which there is a defrosting chamber 25 enclosing an electric heating element 26. It will be seen that the heater is adjacent the lower end of the evaporator and above the liquid line 16, being at all times submerged in the liquid refrigerant. Preferably the heating element 26 receives current from source 23, and a multipole switch 27 controls the motor circuit as well as the heating element, the arrangement being such that the motor is inactive during application of heat to the defrosting chamber.

As shown in the drawing, there is disposed above the evaporator coil 11 a relatively large surge receiver 28 connected through pipe 29 with the lower header 17. Although the receiver is illustrated as being above the suction trap 19 it may be disposed in any suitable relation to the evaporator. Usually it is arranged in adjacent relation and parallel to the suction trap and supported by the evaporator. Also it is slightly inclined downwardly toward pipe 29.

In the operation of this form of the invention, assuming the evaporator coil is filled with liquid refrigerant, when it is desired to defrost the coil, switch 27 is thrown over to disconnect the motor and connect the heating element 26 to the source of current supply. Evaporation of the refrigerant immediately begins, with a resultant increase in pressure in the suction trap 19. The liquid refrigerant in the lower part of the coil is forced through pipe 29 into receiver 28 when sufficient pressure has been developed. As the refrigerant is forced into the surge receiver, there is a corresponding increase in the internal surface of the evaporator exposed to the relatively warm vapor therein. It is apparent that rapid heating of the coil is thus possible and, as a result, the defrosting of the evaporator is effected quickly and with minimum application of heat.

When defrosting has been completed the switch 27 is again thrown over to start motor 22 and

open the heater circuit. The liquid in receiver 28 then flows back into the evaporator and the system functions in the normal manner.

The modification illustrated in Fig. 2 omits the separate surge receiver and utilizes the suction trap as a receiver. The relation of the defrosting chamber 25 and heating element 26 with the evaporator coil is the same as that shown in Fig. 1. The connection between suction trap 19 and header 21, however, differs from the previously described arrangement in that a valve 31 is inserted in the connection to cut off communication between the gas header and the suction trap during defrosting. It will be seen that, when the valve is closed, the suction trap communicates only with the liquid header 17 so that, upon application of heat to the defrosting chamber, the gases resulting from evaporation of the liquid refrigerant will fill the upper coils of the evaporator and force the refrigerant from the lower coils into the suction trap. When the evaporator has been defrosted the heater circuit is broken and valve 31 is opened. The liquid refrigerant will then return to the evaporator. In other respects the system functions in a manner similar to that described with reference to Fig. 1.

It is obvious that temperature and pressure control devices may be employed in conjunction with the system described and that the particular arrangement of the apparatus illustrated is susceptible of modifications. It is, therefore, to be understood that the invention is not limited to the exact relation of parts shown in the drawing.

The claims of the present application are limited to method and apparatus in which the refrigerant is displaced from the evaporator by vapor pressure. The remaining patentable subject matter in the disclosure is claimed in my copending application Serial No. 479,542, filed September 3, 1930.

What is claimed is:—

1. The method of defrosting flooded evaporators having liquid and suction connections which comprises suspending the flow of refrigerant through the evaporator, applying heat to the refrigerant to evaporate a portion thereof, and causing the resultant vapor to displace refrigerant in the evaporator during application of heat.

2. The method of defrosting flooded evaporators having liquid and suction connections which comprises suspending the flow of refrigerant through the evaporator, applying heat internally of the evaporator directly to the refrigerant to evaporate a portion thereof, and causing the resultant vapor to displace refrigerant in the evaporator during application of heat.

3. The method of defrosting flooded evaporators which comprises locally heating a portion of the liquid refrigerant in the evaporator to vaporize the same and thereby displacing another portion of the refrigerant in the evaporator.

4. The method of defrosting flooded evaporators which comprises locally heating a portion of the liquid refrigerant in the evaporator thereby to create a vapor pressure in the top of the evaporator, and utilizing said vapor pressure to expel liquid refrigerant from the bottom of the evaporator.

5. The method of defrosting flooded evaporators which comprises locally heating liquid refrigerant at or near the bottom of the evaporator, constraining the resultant vapors to flow through

the liquid refrigerant thereby to create a vapor pressure in the top of the evaporator, and utilizing said vapor pressure to expel liquid refrigerant from the bottom of the evaporator.

6. In a refrigeration system employing liquid refrigerant, an evaporator; a defroster for said evaporator comprising means for locally applying heat to said refrigerant to vaporize a portion of the refrigerant and cause the resultant vapors to displace liquid refrigerant; and a receiver for said displaced refrigerant.

7. In a refrigeration system employing liquid refrigerant, an evaporator; a defroster for said evaporator comprising means submerged in the liquid refrigerant for applying heat thereto to vaporize the refrigerant, and cause the resultant vapors to displace liquid refrigerant; and a receiver for said displaced refrigerant.

8. In a refrigeration system employing liquid refrigerant, an evaporator; a defroster for said evaporator comprising means for applying heat locally to said refrigerant to vaporize a portion of the refrigerant and cause the resultant vapors to displace liquid refrigerant; and a receiver disposed above the evaporator into which said displaced refrigerant is forced during application of heat to the refrigerant.

9. In a refrigeration system employing liquid refrigerant, an evaporator; a defroster for said evaporator comprising means submerged in the liquid refrigerant for applying heat thereto to vaporize the refrigerant, and cause the resultant vapors to displace liquid refrigerant; and a receiver disposed above the evaporator into which said displaced refrigerant is forced during application of heat to the refrigerant.

10. In a flooded refrigeration system, an evaporator; a suction trap disposed above and communicating with said evaporator; a compressor having its discharge connected with the lower end of said evaporator and its suction connected to said trap; means for applying heat to said evaporator to evaporate the refrigerant therein and cause the resultant vapors to displace liquid refrigerant; and means for selectively actuating the compressor and the heat applying means.

11. In a flooded refrigeration system, an evaporator; a suction trap disposed above and communicating with said evaporator; a compressor having its discharge connected with the lower end of said evaporator and its suction connected to said trap; means for applying heat to said evaporator to evaporate the refrigerant therein and cause the resultant vapors to displace liquid refrigerant; means selectively actuating the compressor and the heat applying means; and a receiver for said displaced refrigerant.

12. In a flooded refrigeration system, an evaporator; a suction trap disposed above and having a connection at each end thereof with said evaporator; valve means for closing one of said connections; and means for applying heat locally to said evaporator to evaporate a portion of the refrigerant therein and cause the resultant vapors to force liquid refrigerant into said trap when said valved connection is closed.

13. In a refrigeration system employing liquid refrigerant, an evaporator having liquid and gas headers; a receiver connected to said liquid header; liquid and suction lines communicating with said liquid and gas headers; and means for heating liquid refrigerant in said liquid line.

ALONZO W. RUFF.