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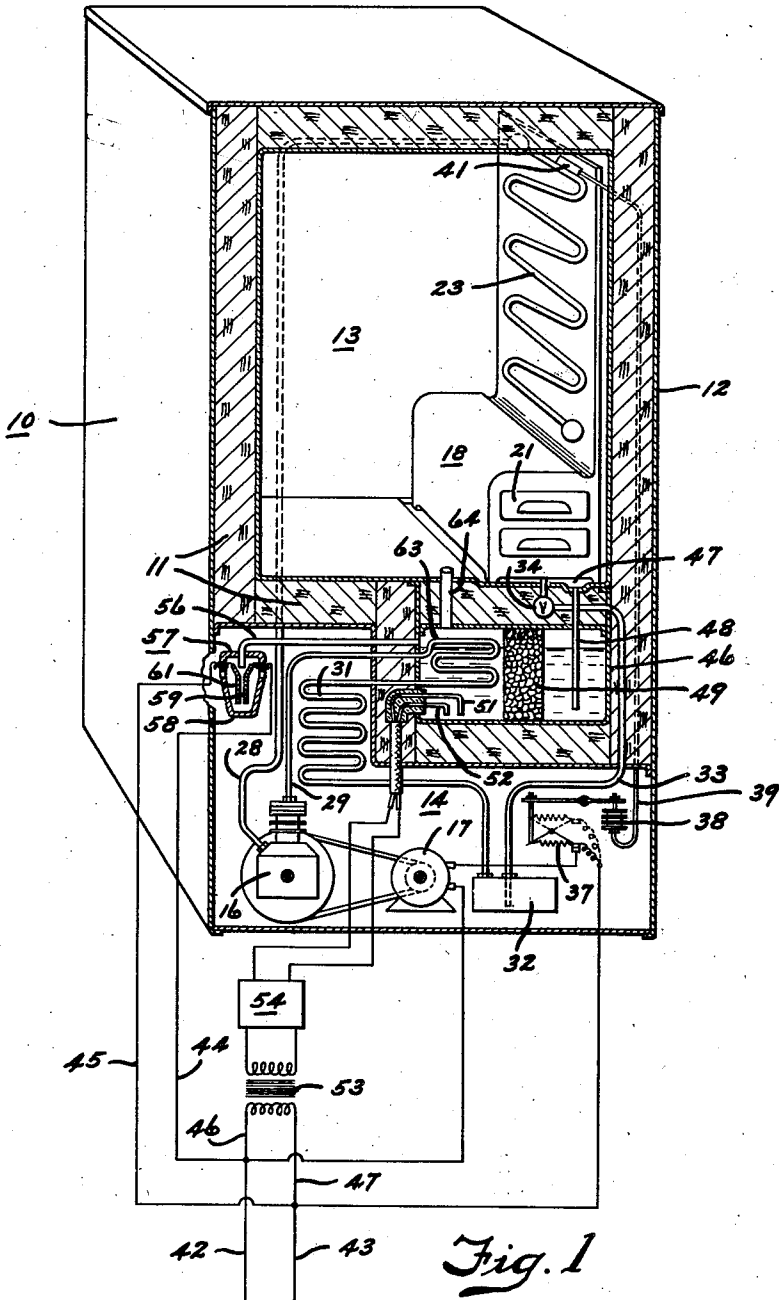
R. E. GOULD

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REFRIGERATING APPARATUS

Filed April 25, 1936

2 Sheets-Sheet 1



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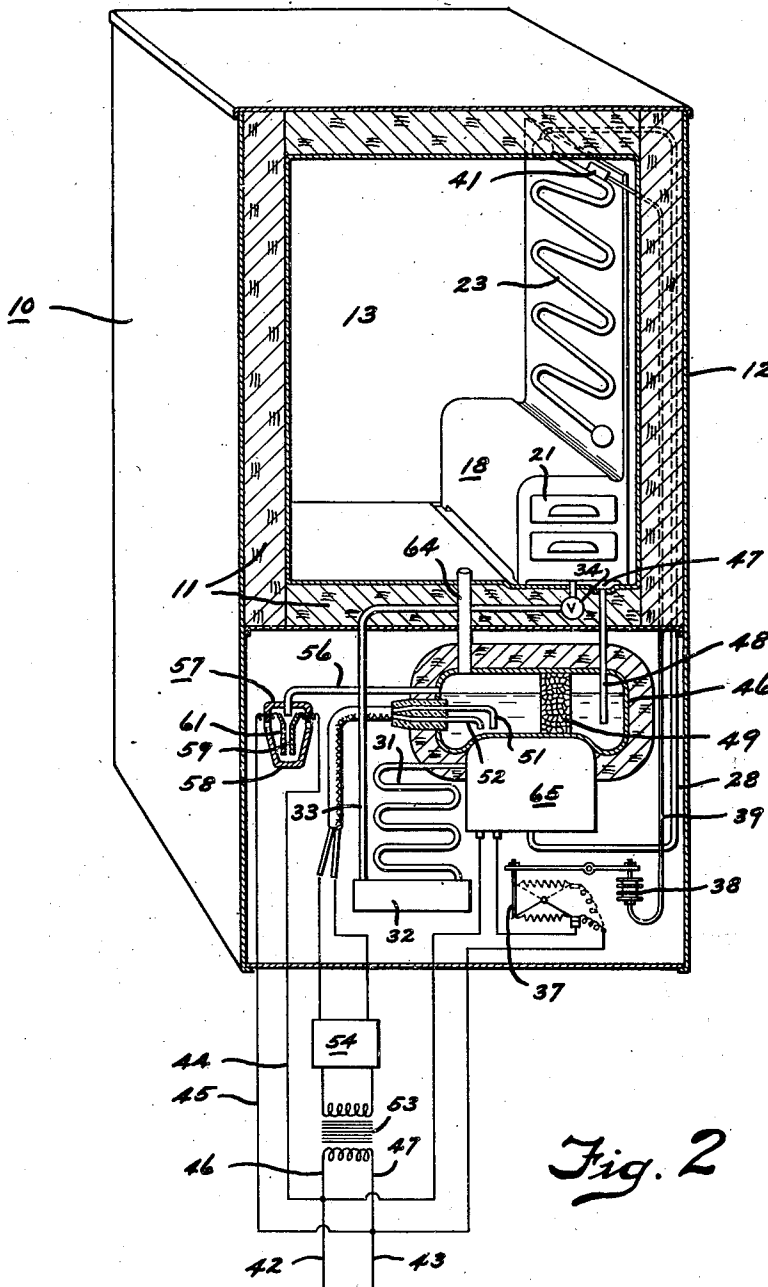
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UNITED STATES PATENT OFFICE

2,090,413

REFRIGERATING APPARATUS

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14 Claims. (Cl. 62—103)

This invention relates to refrigeration and particularly to refrigerating apparatus wherein the air within the refrigerated compartment thereof is conditioned.

An object of my invention is to provide a portable refrigerator cabinet with an improved apparatus for conditioning air within the food storage compartment thereof.

Another object of my invention is to provide an improved mechanically refrigerated cabinet having means for increasing the moisture content of air within the food storage compartment thereof which air has been dehumidified by the cooling effect of an evaporator disposed within the food compartment.

A further object of my invention is to remove impurities from water dripping from an evaporator of a refrigerating system disposed within a food storage compartment, to sterilize purified water and to heat the sterilized purified water to cause evaporation thereof into the food compartment to rehumidify air therein.

In carrying out the foregoing objects it is a still further object of my invention to utilize a heat dissipating portion of a refrigerating system to cause evaporation of the sterilized purified condensate water into the food storage compartment and to provide means for evaporating excess water dripping from the cooling element disposed within the food storage compartment exteriorly of the compartment.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a vertical sectional view through a refrigerator cabinet having my invention embodied therein and showing somewhat diagrammatically certain elements employed in the invention; and

Fig. 2 is a view similar to Fig. 1 but showing a modified form of my invention.

Referring to the drawings, for illustrating my invention, I have shown in Fig. 1 thereof a refrigerating apparatus of the portable unitary household type which can be moved from one locality to another by simply disconnecting the electrical cord leading thereto. The apparatus shown in Fig. 1 comprises a cabinet generally represented by the reference character 10 and which includes a plurality of insulated walls 11 supported by a metal shell or a plurality of panels 12 which form the exterior surface of cabinet 10. The walls 11 are lined with a metal member

which forms a food storage chamber or compartment 13 and the metal panels 12 extend beyond the lowermost portion of chamber 13 to form walls of a machine compartment 14 below the insulated compartment and in which a refrigerant liquefying and circulating unit of a closed refrigerating system is mounted. The chamber 13 is provided with the usual door opening for providing access thereto and a door for closing the opening (not shown). The closed refrigerating system associated with cabinet 10 comprises a compressor 16 operatively connected, through suitable belt and pulley connections, to an electric motor 17. A cooling element or evaporator 18 is located within the food storage compartment 13 and is preferably insulated from the air within the chamber or compartment 13 and arranged to form walls of a sharp freezing compartment adapted to receive trays 21 for the making of ice cubes. A second cooling element or evaporator 23 preferably of the flat sheet metal plate type is adapted to be vertically mounted along one side wall of chamber 13. A pipe or conduit (not shown) connects evaporator 18 with evaporator 23 in series relation in the refrigerating system.

Operation of compressor 16 withdraws gaseous refrigerant from evaporator 23 through a pipe 28 and compresses the vaporized refrigerant and forces same under pressure through a pipe 29, into the condenser 31 where the compressed refrigerant is cooled and liquefied in any well known manner. The liquefied refrigerant flows into a receiver 32 where it is stored prior to its flow through a pipe 33 to evaporator 18. An expansion device or valve 34 is interposed in the liquid refrigerant supply pipe 33 adjacent evaporator 18 and this device or valve controls the flow of liquid refrigerant into the evaporator 18. Refrigerant flowing through the valve 34 passes through suitable passages provided in evaporator 18 where it absorbs heat from the contents of trays 21 and causes a portion of the refrigerant to vaporize. Ordinarily there is more liquid refrigerant permitted to enter evaporator 18 than can be vaporized therein and this excess liquid refrigerant passes through a pipe to suitable passages provided in evaporator 23 for causing evaporator 23 to produce a cooling effect sufficient to cool the air and consequently food products stored in the compartment 13. The arrangement of the evaporators and the flow of refrigerant therethrough as herein disclosed are well known to those skilled in the art and it is obvious that evaporator 18 will be maintained

at a much lower temperature than the temperature of evaporator 23.

The operation of motor 17, and consequently compressor 16 of the refrigerant liquefying and condensing unit, is controlled by any suitable or conventional snap acting switch 37 having contacts interposed in an electric circuit leading to the motor. A bellows 38, having a pipe connection 39 to a thermostatic bulb 41, is employed to actuate switch 37. The bulb 41 is positioned in compartment 13 in intimate thermal contact with evaporator 23 and a volatile liquid contained therein is thus responsive to temperatures of the evaporator for causing expansion and contraction of the bellows 38 to actuate switch 37. Obviously thermal bulb 41 thereby tends to maintain the evaporators 18 and 23 and compartment 13 between predetermined temperature limits by controlling operation of motor 17 and consequently compressor 16. The electric supply lines 42 and 43 leading to switch 37 and motor 17 have branch wires 44, 45, 46 and 47 extending therefrom for a purpose to be presently described.

Since it is well known that in order to cool food products stored within the compartment 13 of cabinet 10 to any appreciable degree the temperature of the air therein must be reduced below the dew point of moisture contained in the air. This cooling action of evaporator 23 causes moisture to be withdrawn from the air in the food compartment 13 and from food products stored therein. The moisture accumulates on the walls of the evaporator 23 thus creating a so-called drying action of the foods. Others have provided means for supplying moisture to the air within a food storage compartment of the refrigerator cabinet to increase the humidity of the air so as to prevent drying of the foods and ordinarily such means have included a plurality of permanent pipe connections extending to and from the refrigerator cabinet. My invention particularly relates to this type of apparatus and particularly to a portable apparatus such, for example, as small household refrigerator cabinets or cabinets for installation in apartments which cabinets can be readily moved from one locality to another.

The apparatus of my invention is therefore provided with means for increasing the humidity of the dehumidified air within the compartment 13. This means in the present disclosure comprises a tank or receptacle 46 surrounded by insulating material and disposed exteriorly of compartment 13. Moisture accumulating or condensing on evaporator 23 flows therefrom, during nonoperating periods of the refrigerant liquefying and condensing unit, and is received in an elongated trough 47 provided in the food compartment bottom wall. A pipe 48 conveys the drip water caught in trough 47 from compartment 13 and delivers the water to the tank 46. A means for removing impurities such as flavors and odors from the drip or condensate water is provided in tank 46. This water purifying means is preferably in the form of a partition 49 extending across the tank 46 and formed of activated charcoal or any other suitable clarifying or purifying material. The drip water conveyed to the collecting tank 46 flows through the partition 49 to the opposite side thereof thus permitting odors and flavors to be removed from the water by being taken up by the charcoal. It is a desirable and an important feature of my invention to sterilize the water purified by the charcoal partition 49 within the tank or collector 46. Therefore, any suitable sterilizing means, such for example as

silver electrodes 51 and 52 which dip into or are submerged in the purified water within the tank 46 and which are energized by relatively low voltage current, thereby inducing ions into the liquid which sterilize the same, may be employed. Any suitable source of current may be used to energize the electrodes 51 and 52. For example, a transformer 53 connected across the branch wires 46 and 47 and a rectifier 54 may furnish unidirectional current of about two volts across the electrodes. Thus the drip or condensate water is purified and then sterilized to insure that all impurities are removed therefrom.

It will be noted that I have provided an overflow for the tank or collector 46 which comprises a conduit or pipe 56 having one of its ends connected with the tank near the top portion thereof. The other end of the overflow pipe 56 communicates with an electrical heating device generally represented by the reference character 57 and utilized for causing evaporation of excess water flowing from tank or collector 46 to the atmosphere outside the food storage compartment 13. The excess water evaporating device 57 comprises a vented porcelain or the like receptacle 58 having a pair of contacts or electrodes 59 and 61 positioned in the receptacle in spaced apart relation to one another and connected to the branch wires 44 and 45. Excess water flowing from tank 46 through pipe 56 into the device 57 upon contacting both electrodes 59 and 61 in receptacle 58 completes the electrical circuit through wires 44 and 45 and causes heat to be generated by the resistance of the water to the flow of electrical current therethrough and consequently the water vaporizes or evaporates into the atmosphere outside of the refrigerated food compartment. The excess water evaporating device 57 is therefore normally ineffective and is rendered effective by the flow of water thereinto. The water evaporating device 57 thereby insures disposal of any excess water which tends to accumulate in the collector tank 46.

In order to cause the sterilized purified condensate water to re-enter the food compartment 13 I have provided means to heat same in tank 46 to cause vaporization or evaporation thereof. This means in the present invention comprises a heat dissipating portion of the refrigerant liquefying and condensing unit or portion of the refrigerating system associated with or mounted in the refrigerator cabinet 10. It will be noted that the condenser 31 of the refrigerant liquefying and condensing unit disclosed in Fig. 1 of the drawings includes several pipe loops or turns 63 which are disposed in the tank 46 in intimate heat exchange relation with the water therein. A pipe or conduit 64 communicates with the interior of tank 46 and with the food storage compartment 13. The heat of condensation of refrigerant in the closed refrigerating system is thereby utilized to vaporize the sterilized purified condensate water within tank 46. This heat is transferred from the loops or turns 63 of the condenser coil or unit 31 to the water and causes heating of the water to vaporize same and causes flow of the sterilized purified water through pipe 64 into the food compartment 13 of the cabinet 10 where it is mixed with or absorbed by air therein to rehumidify the air dehumidified by the cooling effect produced by evaporator 23 of the refrigerating system.

In the modified showing of my invention disclosed in Fig. 2 of the drawings the refrigerating system associated with or mounted in the re-

frigerator cabinet 10 comprises a unit 65 which includes a motor directly connected with a compressor. It will be noted that the dome of unit 65 is disposed in intimate thermal contact with the bottom metal wall of tank 46 so as to transmit the heat of compression of refrigerant in the refrigerating system to the water in tank 46. This heat of compression of refrigerant within unit 65 causes the sterilized purified condensate water to evaporate and flow through pipe 64 into the food storage compartment to rehumidify the air dehumidified by the cooling effect produced by evaporator 23 of the refrigerating system.

From the foregoing it will be seen that I have provided an improved refrigerating apparatus wherein air within the food storage compartment thereof is treated to maintain same at a predetermined moisture content for the purpose of preventing drying of the food and to prevent transference of odors or flavors from certain foods to certain other foods stored in the compartment. My invention removes moisture from the air in the food storage compartment which air is ordinarily contaminated by odors or flavors of foods and conveys the contaminated moisture out of the food compartment of the refrigerating apparatus where impurities are removed therefrom and where the purified water is then sterilized and caused to re-enter the food compartment. Thus my invention reduces contamination of the air to a minimum since contamination thereof in the present apparatus can take place only by the insertion of foods into the storage compartment. My invention permits the use of devices for removing impurities from condensate water and for sterilizing same so that condensate water may be employed to treat air in a refrigerating apparatus of a portable household cabinet.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A refrigerating apparatus comprising in combination, a cabinet having walls forming a food storage compartment therein, a cooling element exposed to air within said compartment, said cooling element cooling the air and condensing moisture therefrom which drips from the cooling unit whereby the air within said compartment is dehumidified, means for removing impurities from the drip water, and means for heating the purified drip water to cause evaporation thereof into the air in said food storage compartment to rehumidify the air.

2. A refrigerating apparatus comprising in combination, a cabinet having walls forming a food storage compartment therein, a cooling element exposed to air within said compartment, said cooling element cooling the air and condensing moisture therefrom which drips from the cooling unit whereby the air within said compartment is dehumidified, means for collecting the drip water flowing from said cooling element exteriorly of said food compartment, means for removing impurities from the water in said collecting means, and means for heating the purified drip water in said collecting means to cause evaporation thereof into the air in said food storage compartment to rehumidify the air.

3. A refrigerating apparatus comprising in combination, a cabinet having walls forming a

food storage compartment therein, a cooling element exposed to air within said compartment, said cooling element cooling the air and condensing moisture therefrom which drips from the cooling unit whereby the air within said compartment is dehumidified, means for collecting the drip water flowing from said cooling element exteriorly of said food compartment, means for removing impurities from the water in said collecting means, means for heating the purified drip water to cause evaporation thereof into the air in said food storage compartment to rehumidify the air, an overflow for removing excess water from said collecting means, and means for causing evaporation of excess water flowing from said collecting means into the atmosphere exteriorly of said food compartment.

4. A refrigerating apparatus comprising in combination, a cabinet having walls forming a food storage compartment therein, a cooling element exposed to air within said compartment, said cooling element cooling the air and condensing moisture therefrom which drips from the cooling unit whereby the air within said compartment is dehumidified, means for collecting the drip water flowing from said cooling element exteriorly of said food compartment, means for removing impurities from the water in said collecting means, means for heating the purified drip water to cause evaporation thereof into the air in said food storage compartment to rehumidify the air, an overflow for removing excess water from said collecting means and means associated with said overflow for heating excess water flowing from said collecting means to cause evaporation thereof into the atmosphere exteriorly of said food compartment.

5. A refrigerating apparatus comprising in combination, a cabinet having walls forming a food storage compartment therein, a cooling element exposed to air within said compartment, said cooling element cooling the air and condensing moisture therefrom which drips from the cooling unit whereby the air within said compartment is dehumidified, means for collecting the drip water flowing from said cooling element exteriorly of said food compartment, means for removing impurities from the water in said collecting means, means for heating the purified drip water to cause evaporation thereof into the air in said food storage compartment to rehumidify the air, an overflow for removing excess water from said collecting means and means associated with said overflow for heating excess water flowing from said collecting means to cause evaporation thereof into the atmosphere exteriorly of said food compartment, said last named means being normally ineffective and rendered effective automatically by the flow of excess water thereto.

6. A refrigerating apparatus comprising in combination, a cabinet having walls forming a food storage compartment therein, a refrigerating system associated with said cabinet and including a cooling element and a unit for circulating a refrigerant medium therethrough, said refrigerant circulating unit being located outside of said food compartment and said cooling element being disposed within said compartment for cooling the air therein and condensing moisture therefrom which drips from the cooling unit whereby the air within said compartment is dehumidified, means for collecting the drip water flowing from said cooling element exteriorly of said food compartment, means for removing impurities from the water in said collecting means,

means for sterilizing the purified water, and means for heating the sterilized purified water to cause evaporation thereof into the air in said food storage compartment to rehumidify the air therein.

7. A refrigerating apparatus comprising in combination, a cabinet having walls forming a food storage compartment therein, a refrigerating system associated with said cabinet and including a cooling element and a unit for circulating a refrigerant medium therethrough, said refrigerant circulating unit being located outside of said food compartment and said cooling element being disposed within said compartment for cooling the air therein and condensing moisture therefrom which drips from the cooling unit whereby the air within said compartment is dehumidified, means for collecting the drip water flowing from said cooling element exteriorly of said food compartment, means for removing impurities from the water in said collecting means, means for sterilizing the purified water, and means for heating the sterilized purified water to cause evaporation thereof into the air in said food storage compartment to rehumidify the air therein, said heating means comprising a heat dissipating portion of said refrigerant circulating unit of the refrigerating system disposed in intimate heat exchange relation with the sterilized purified water in said water collecting means.

8. A refrigerating apparatus comprising in combination, a cabinet having walls forming a food storage compartment therein, a refrigerating system associated with said cabinet and including a cooling element and a unit for circulating a refrigerant medium therethrough, said refrigerant circulating unit being located outside of said food compartment and said cooling element being disposed within said compartment for cooling the air therein and condensing moisture therefrom which drips from the cooling unit whereby the air within said compartment is dehumidified, means for collecting the drip water flowing from said cooling element exteriorly of said food compartment, means for removing impurities from the water in said collecting means, means for sterilizing the purified water, means for heating the sterilized purified water to cause evaporation thereof into the air in said food storage compartment to rehumidify the air therein, an overflow for removing excess water from said collecting means, and means for causing evaporation of excess water flowing from said collecting means into the atmosphere exteriorly of said food storage compartment.

9. A refrigerating apparatus comprising in combination, a cabinet having walls forming a food storage compartment therein, a refrigerating system associated with said cabinet and including a cooling element and a unit for circulating a refrigerant medium therethrough, said refrigerant circulating unit being located outside of said food compartment and said cooling element being disposed within said compartment for cooling the air therein and condensing moisture therefrom which drips from the cooling unit whereby the air within said compartment is dehumidified, means for collecting the drip water flowing from said cooling element exteriorly of said food compartment, means for removing impurities from the water in said collecting means, means for sterilizing the purified water, means for heating the sterilized purified water to cause evaporation thereof into the air in said food storage compartment to rehumidify the air

therein, said heating means comprising a heat dissipating portion of said refrigerant circulating unit of the refrigerating system disposed in intimate heat exchange relation with the sterilized purified water in said water collecting means, an overflow for removing excess water from said collecting means, and means associated with said overflow for heating excess water flowing from said collecting means to cause evaporation thereof into the atmosphere exteriorly of said food storage compartment.

10. A refrigerating apparatus comprising in combination, a cabinet having walls forming a food storage compartment therein, a refrigerating system associated with said cabinet and including a cooling element and a unit for circulating a refrigerant medium therethrough, said refrigerant circulating unit being located outside of said food compartment and said cooling element being disposed within said compartment for cooling the air therein and condensing moisture therefrom which drips from the cooling unit whereby the air within said compartment is dehumidified, means for collecting the drip water flowing from said cooling element exteriorly of said food compartment, means for removing impurities from the water in said collecting means, means for sterilizing the purified water, means for heating the sterilized purified water to cause evaporation thereof into the air in said food storage compartment to rehumidify the air therein, said heating means comprising a heat dissipating portion of said refrigerant circulating unit of the refrigerating system disposed in intimate heat exchange relation with the sterilized purified water in said water collecting means, an overflow for removing excess water from said collecting means, and means associated with said overflow for heating excess water flowing from said collecting means to cause evaporation thereof into the atmosphere exteriorly of said food storage compartment, said last named means being normally ineffective and rendered effective automatically by the flow of excess water thereto.

11. A refrigerating apparatus comprising in combination, a cabinet having walls forming a food storage compartment therein, a cooling element exposed to air within said compartment, said cooling element cooling the air and condensing moisture therefrom which drips from the cooling unit whereby the air is dehumidified, means for collecting the drip water, and means for heating the sterilized drip water to cause evaporation thereof into the air in said food storage compartment to rehumidify the air.

12. A refrigerating apparatus comprising in combination, a cabinet having walls forming a food storage compartment therein, a cooling element exposed to air within said compartment, said cooling element cooling the air and condensing moisture therefrom which drips from the cooling unit whereby the air is dehumidified, means for collecting the water flowing from said cooling element exteriorly of said food compartment, means for sterilizing the collected drip water, and means for heating the sterilized drip water in said collecting means to cause evaporation thereof into the air in said food storage compartment to rehumidify the air.

13. A refrigerating apparatus comprising in combination, a cabinet having walls forming a food storage compartment therein, a closed refrigerating system associated with said cabinet including a cooling element exposed to air within said compartment and a unit for liquefying and

circulating refrigerant through the cooling element, said cooling element cooling the air within said compartment and condensing moisture therefrom which drips from the cooling element
5 whereby the air is dehumidified, means for collecting the water dripping from said cooling element, and means for heating the collected drip water to cause evaporation thereof into the air
10 in said food compartment to rehumidify the air therein, said heating means comprising a heat dissipating portion of said refrigerant liquefying and circulating unit of the refrigerating system disposed in intimate heat exchange relation with the collected drip water.

15 14. A refrigerating apparatus comprising in combination, a cabinet having walls forming a food storage compartment therein, a closed re-

frigerating system associated with said cabinet including a cooling element exposed to air within said compartment and a unit for liquefying and circulating refrigerant through the cooling element, said cooling element cooling the air within
5 said compartment and condensing moisture therefrom which drips from the cooling element whereby the air is dehumidified, means for conveying the drip water out of said food compartment, means for exposing water to the air in
10 said food compartment to rehumidify the air therein, and said last named means including a heat dissipating portion of said refrigerant liquefying and circulating unit disposed in intimate heat exchange relation with the water exposed to
15 the air in said food compartment.

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