

Nov. 14, 1939.

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2,180,071

REFRIGERATOR

Filed Sept. 12, 1938

4 Sheets-Sheet 1

*Fig. 1.*

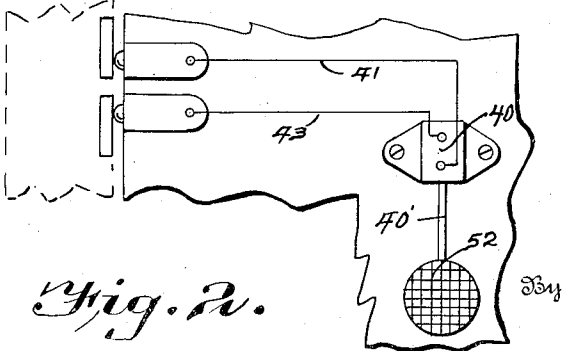
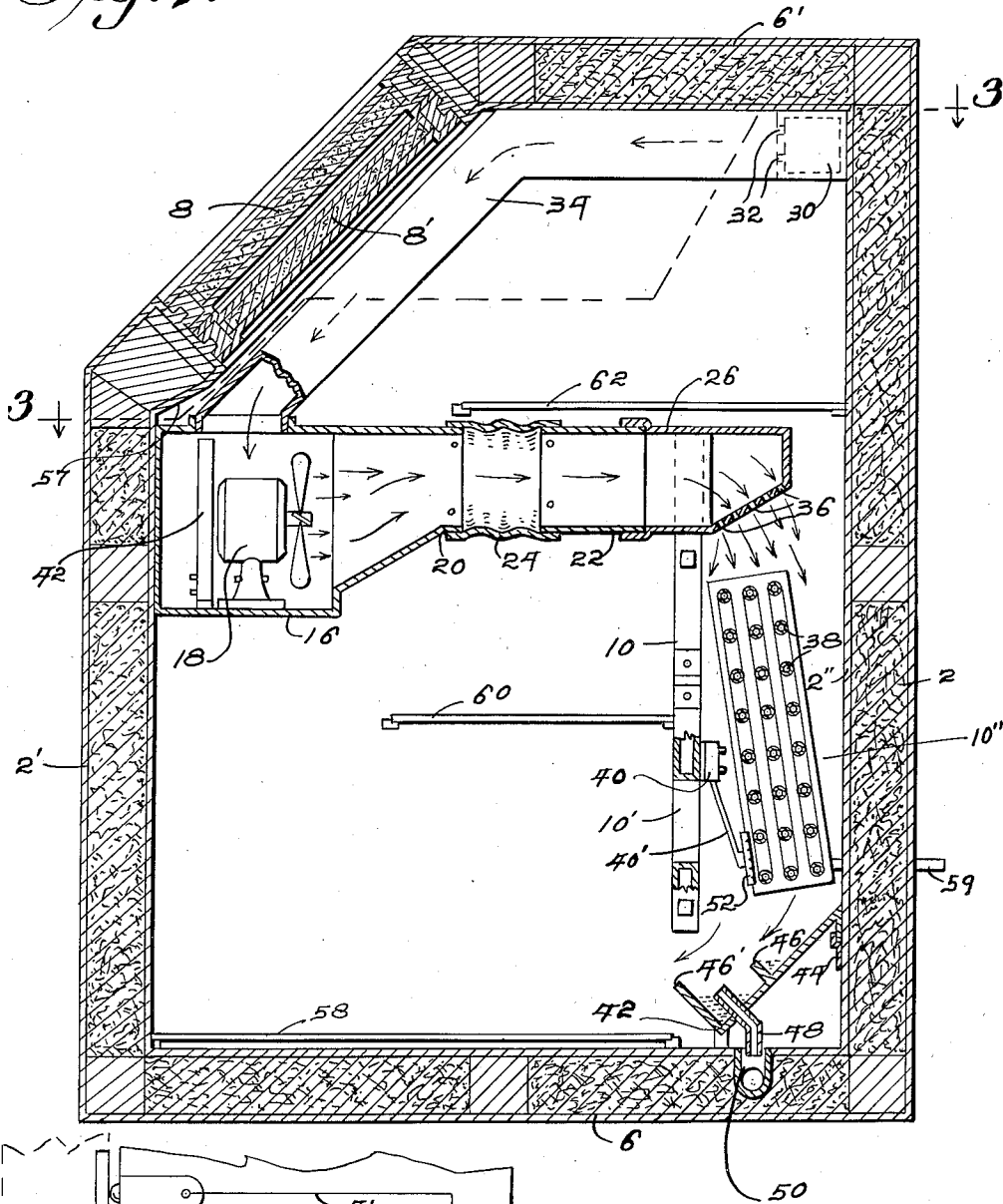


*Fig. 2.*

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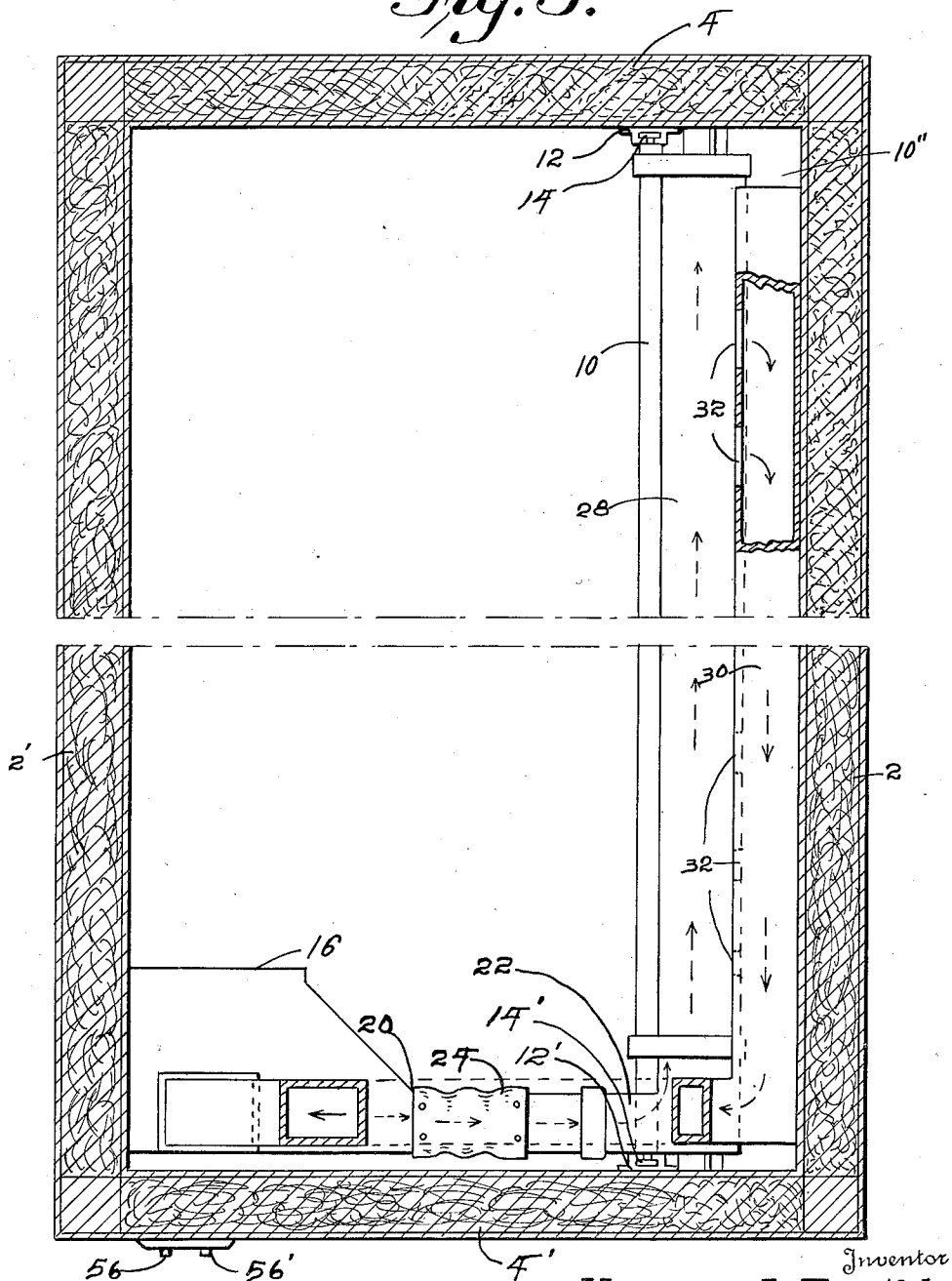
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*Fig. 3.*



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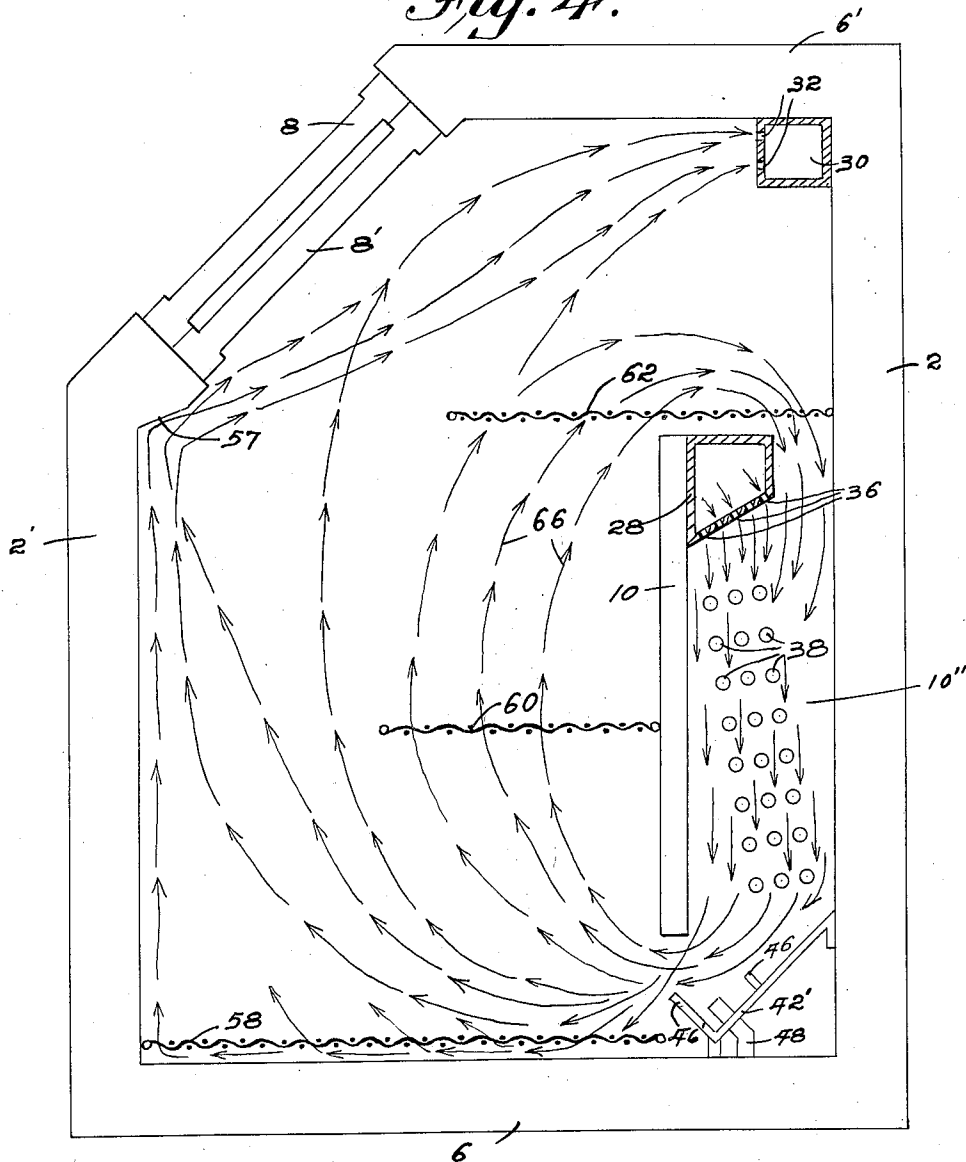
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*Fig. 4.*



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REFRIGERATOR

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4 Sheets-Sheet 4

*Fig. 5.*

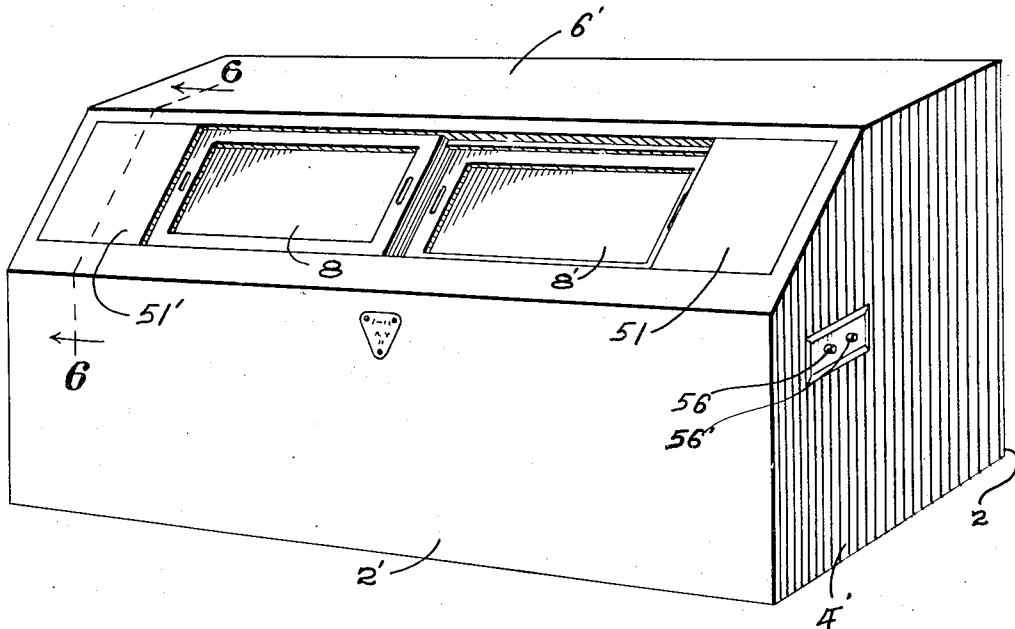
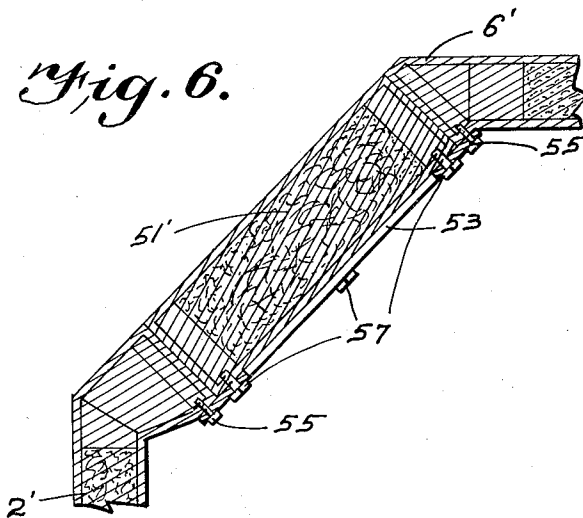


*Fig. 6.*



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## UNITED STATES PATENT OFFICE

2,180,071

## REFRIGERATOR

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Application September 12, 1938, Serial No. 229,629

3 Claims. (Cl. 62—89.5)

The present invention relates to a refrigerator unit, and is particularly adapted to the cooling and air conditioning of food and beverage products prepared and sold in sealed containers. Although this unit is specifically designed for this purpose, it may readily be appropriated for practically all types of refrigeration.

There is at present a great demand for these prepared foods and beverages, such as milk, beer, soft drinks, and the like, which are usually sold in bottles or cans. In order to preserve these products, or maintain them at a desirable temperature for human consumption, it is necessary, or desirable, to maintain their temperature, as near as possible, to a predetermined degree. The method generally used in cooling such products is with water. This has its disadvantages as the containers are naturally always wet and disagreeable to handle, the labels, in many instances become detached from the containers and float about in the water, making it necessary at frequent intervals to draw off the water and clean the refrigerator in order to keep it in proper condition.

With the present arrangement a practical and efficient cooling method may be effected by dry refrigeration, which will eliminate the disadvantages of the water cooler.

As the cooling effect in dry refrigeration is distributed throughout the cabinet by the circulation of the air currents, it has always been difficult to maintain a constant temperature, particularly when the cabinet is being constantly opened for filling and dispensing purposes.

It is therefore one of the primary objects of this invention to provide a refrigerator unit of this type which will maintain a more constant temperature under these conditions, than those now in general use.

Another object of the invention is to provide a forced air flow along the same convectional lines as the natural circulation of air within the unit.

Still another object of the invention is to locate the heat exchange unit in a separate compartment within the refrigerator having air inlets adjacent the top and air outlets adjacent the bottom for allowing the circulating air to pass downwardly over the heat exchange unit.

Still a further object of the invention is to provide an electrically operated defroster adapted to be automatically controlled by the ice film on the heat exchange unit.

These and other objects of the invention will appear more fully from the following specifications

tions taken in connection with the drawings which form a part of this application and in which:

Fig. 1 is a vertical sectional view of the refrigerator showing in particular the air circulating means, the heat exchange unit, the defrosting heating unit, and the control for automatically operating the air circulating means and the heating unit.

Fig. 2 is a wiring diagram of the automatic control.

Fig. 3 is a view taken along line 3—3 of Fig. 1.

Fig. 4 is a diagrammatical view showing in particular the direction of circulating air within the refrigerator unit.

Fig. 5 is a perspective view of the cabinet.

Fig. 6 is a sectional view of the cabinet taken along line 6—6 of Fig. 5.

The refrigerator unit comprises a cabinet that is completely enclosed by side walls 2 and 2', end walls 4 and 4', a bottom wall 6, a top wall 6', and a pair of sliding doors 8 and 8'. These walls may be made of any suitable insulated materials. The inner surface of the walls is preferably made of metal and painted with a special refrigerator enamel.

Mounted on the inside of the cabinet and in a perpendicular position, is a partition or baffle plate 10 spaced outwardly from the rear wall 2, leaving a comparatively small compartment 10" between the plate and the wall. This longitudinally extending upright partition or plate is removably supported on the end walls 4 and 4' by suitable brackets 12 and 12', which are adapted to receive studs or bolts 14 and 14' rigidly secured to the baffle plate or partition. The baffle plate is also arranged so that there is an air inlet adjacent the top and an air outlet adjacent the bottom of the compartment 10".

Adjacent the top and preferably to one side of the front wall 2' is a housing 16, in which is located a fan or blower 18. Leading from the exhaust side of the blower is a conduit 20, which is connected to a second conduit 22 by a flexible connecting member 24. This flexible member is arranged and attached to the members 20 and 22 so that it may be readily disconnected when it is desirable to remove the baffle plate 10. The conduit 22 is connected to a third conduit 28, which extends laterally along and in rear of the baffle plate 10. The conduit 28 is provided on its under side with a plurality of small openings 36 for directing the air currents downwardly between the baffle 10 and the wall 2. These openings are so arranged in either size or number as

to evenly supply the air flow over the entire compartment 10'.

Located in the uppermost corner of the cabinet adjacent the walls 2 and 6' is a conduit 30 having spaced openings 32 therein through which the warm air along the top of the cabinet is admitted and is drawn by the blower 18 through a conduit 34 into the housing 18, where it is circulated again into the conduit 28. The openings 32 are increased in size in proportion to their distance from the intake end of the conduit 34, in order that the intake supply of air is evenly collected along the entire length of the cabinet.

Supported between the baffle plate and the back wall 2 is a heat exchange unit 38. This unit is preferably angularly disposed between the baffle plate and the back wall, in order to assure a maximum amount of contact with the circulating air current. The baffle plate has adjacent the bottom portion thereof a peep hole 10' through which the heat exchange unit may be observed.

Located adjacent the heat exchange unit and preferably secured to the baffle plate 10 is an automatic control switch 40 for closing an electrical circuit to the blower 18 and the heating unit 52. The switch is provided with an arm 40' having a plate or head 52 positioned on its opposite end. The plate or head 52 is positioned at a point substantially near the heat exchange unit and is adapted to be moved by the film of ice forming on the unit for operating the switch 40.

The head 52 is fashioned of suitable material, as hard rubber, which will not adhere or be frozen to the accumulating film or frost on the coils of the heat exchange unit.

The blower is used for circulating air within the cabinet and may be operated automatically by a thermostat located at some convenient place within the cabinet, or it may be operated manually by the switch 56. The blower is only operated in conjunction with the heating unit when the heat exchange unit is to be defrosted, therefore the control switch 40 functions to close the electric circuit to both the blower and the heating unit.

Positioned beneath the heat exchange unit and extending from the back wall 2 to a point substantially beneath the baffle plate is a removable drip pan 42'. This drip pan extends substantially the full length of the heat exchange unit and is held in position by a track 44 which is rigidly secured to the inner surface of the wall 2 by screws or other suitable means. The drip pan is provided with a step 46 for retaining a small quantity of water. At the lower end of the pan there is a second step 46', which is adapted to retain a substantially greater amount of water. Positioned between the steps 46 and 46' is a drain 48 adapted to drain off the water accumulated by the step 46' after it has reached a predetermined height. This drain is permanently secured to the drip pan and is positioned to drain into a suitable draw-off pipe 50. The draw-off pipe 50 is substantially larger than the drain pipe 48 in order to provide a drain for the cabinet in case it is necessary or desirable to flush or wash the inside of the refrigerator.

The entrance into the cabinet is provided by sliding doors 8 and 8'. These doors are well insulated and may be made of any suitable material such as wood, steel, glass or the like. These doors are preferably located within the cabinet on approximately a 45 degree angle in order to offer better access to the interior of the cabinet.

A small light (not shown) may be provided for lighting the interior of the cabinet and may be operated by the sliding doors or by a manually operated conventional switch, whichever is the most convenient or most practical under the circumstances. Positioned within a portion of the space provided for the sliding doors and adjacent the ends of the cabinet are insulated panel members 51 and 51'. These panels are held in position by a metal flange 53 which is attached to the cabinet by screws 55. The frame extends inwardly about the opening occupied by the panel and is secured thereto by screws 57. This feature allows for a maximum opening within the cabinet for installation of equipment and at the same time the sliding doors are kept at convenient size.

Referring in particular to Figs. 1 and 2 the automatic control 40 is so located in respect to the heat exchange unit 38 that when an excess of ice has formed on the unit 38 the member 52 will be forced away from its original position and through its connection with the control switch 40 will close an electric circuit through the wires 41 and 43 to both the blower and the heating unit. By the operation of the blower, air will be drawn through the heating unit 42 and forced downwardly over the heat exchange unit 38, defrosting the same. When the ice has been removed the member 52 will be allowed to return to its normal position and the switch 40 will operate to break the electric circuit to the heater 42. The operation of the heater and blower may also be manually operated by suitable switches 56 and 56'.

The cabinet is constructed with a step 57 located adjacent the top of the side wall 2' and just below the sliding doors 8 and 8'. This step is designed to deflect the upward currents of air toward the rear of the cabinet to prevent them from being passed out through the door opening when the doors are opened. The cabinet is also provided with shelves 58, 60 and 62 arranged substantially as shown in Fig. 4, although the shelves may be positioned in any other location to best accommodate the particular item to be cooled. It is desirable always to have the bottom shelf 58 positioned a short distance from the floor in order that the air may have ample room to circulate beneath the lower shelf.

The heat exchange unit is supplied with a refrigerant from any standard source through the pipe 59.

In use, the cabinet is filled with whatever commodity is to be cooled, the heat exchange unit is supplied with the desired refrigerant and the blower 18 is started by the manual switch 56, or by a thermostat. Air will be drawn in through the openings 32 into the conduit 30, through the conduit 34 to the blower housing 16. The air is then forced through the conduits 20, 22, and 24 to the conduit 28 and through the opening 36 into the space 10' between the baffle plate and wall 2. The cooler air will circulate within the cabinet as shown by the lines 66 in Fig. 4, while the warmer air will collect or be drawn towards the top wall 6' to be drawn again by the blower through the above mentioned conduits and over the heat exchange unit 36.

When the proper temperature has been reached, the blower may be stopped by the thermostat or the manually operated switch 56.

It may be necessary at intervals to defrost the heat exchange unit, because of the collection of

ice caused by the moisture in the circulating warm air. This defrosting may be controlled automatically or manually by the switches 56 and 56'. If done automatically the member 52 as described above is moved by the ice film until the switch 40 is operated; this closes an electric circuit which operates both the blower and the heater 42. When the defrosting has been accomplished, the member 52 is allowed to return to its original position by the melting away of the ice, thereby operating the switch 40 to break the circuit to the heater. The switch 40 may also be wired to break the circuit to the blower 18, but it is preferred to have the circuit to the blower broken by a thermostat which is positioned within the cabinet to register the temperature of the space occupied by the products to be cooled. Both the heater and the blower are always manually operable by the switches 56 and 56'. When the blower and heating unit are in operation for defrosting the heat exchange unit, the heat exchange unit may be observed through the peep hole 10' in order to ascertain when the operation has been completed.

While the invention is shown and described in a preferred form, it will be understood that it has been done for illustration only, and that the invention is best defined in the appended claims. I claim:

1. A refrigerator comprising a cabinet having a front door, an interior removable upright longitudinally extending partition, means at the opposite ends of the cabinet for detachably supporting the partition, said partition being spaced from the rear wall of the cabinet to form a compartment open at top and bottom and a heat exchange unit mounted in the compartment, a longitudinally extending conduit having air intake ports and located in the upper part of the cabinet, said conduit having a downwardly extending transverse leg at one end terminating in a walled fan chamber, a fan in the chamber and an electric

motor therefor, a transversely extending conveying-conduit connected with said chamber, a coupling in said conveying-conduit, a longitudinally extending discharge-conduit connected at one end to the conveying-conduit, and said discharge-conduit having air ports directly above the heat exchange unit.

2. A refrigerator comprising a cabinet having a front door, an interior upright longitudinally extending partition in the cabinet spaced from its rear wall to form a compartment having open top and bottom, a heat exchange unit mounted in the compartment, a longitudinally extending conduit having air inlet ports and located in the upper part of the cabinet, said conduit having a transversely and downwardly extending leg at one end terminating in a fan chamber below the door, a fan and its motor located in the chamber, a transversely extending conveying-conduit connected with said chamber, a longitudinally extending discharge-conduit connected at one end of the conveying-conduit, and said discharge-conduit having air outlet ports directly above the heat exchange unit.

3. The combination with a cabinet having a longitudinally extending upright partition adjacent its rear wall and forming a compartment open at top and bottom, and a heat exchange unit in said compartment, of air-circulation means comprising a fan and its motor located in a fan chamber, a horizontal conveying-conduit extended from said chamber transversely of the cabinet, a longitudinally extended discharge-conduit connected with the conveying conduit and said discharge-conduit having discharge ports directly over the heat exchange unit, an inclined trough extending longitudinally of a bottom corner of the cabinet beneath the heat exchange unit, said trough being stepped to form a plurality of water containers, and a drain pipe connected to the lowermost container.

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