

March 28, 1944.

G. A. BRACE

2,345,453

REFRIGERATION

Filed July 20, 1938

3 Sheets-Sheet 1

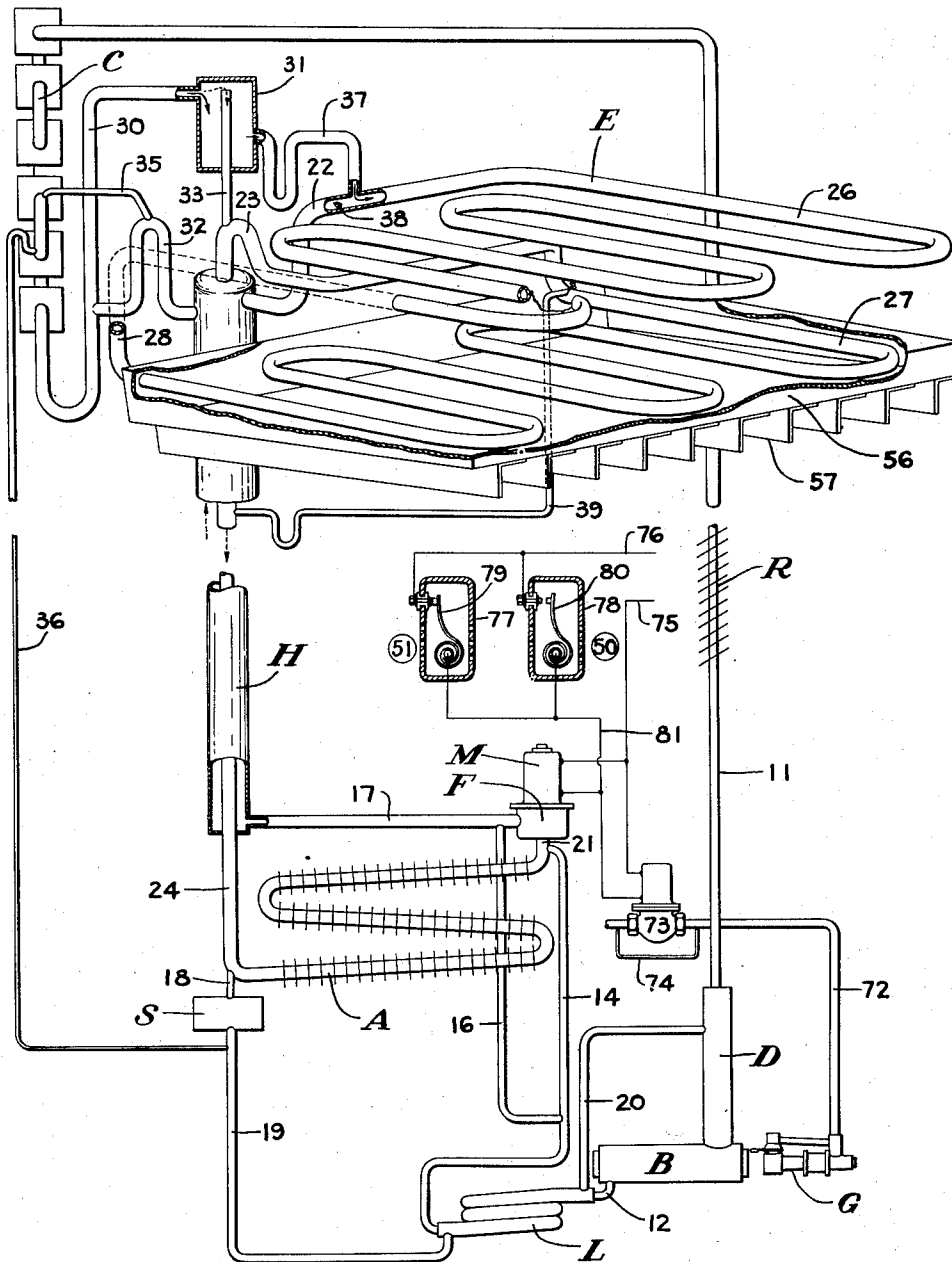


Fig. 1

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3 Sheets-Sheet 2

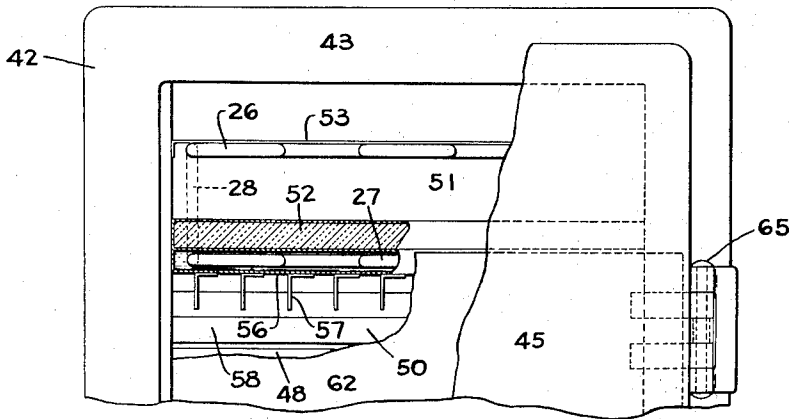
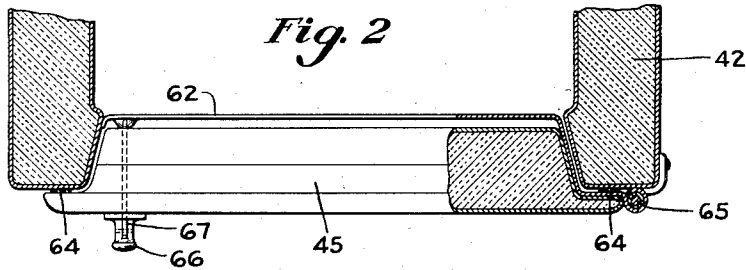


*Fig. 3*

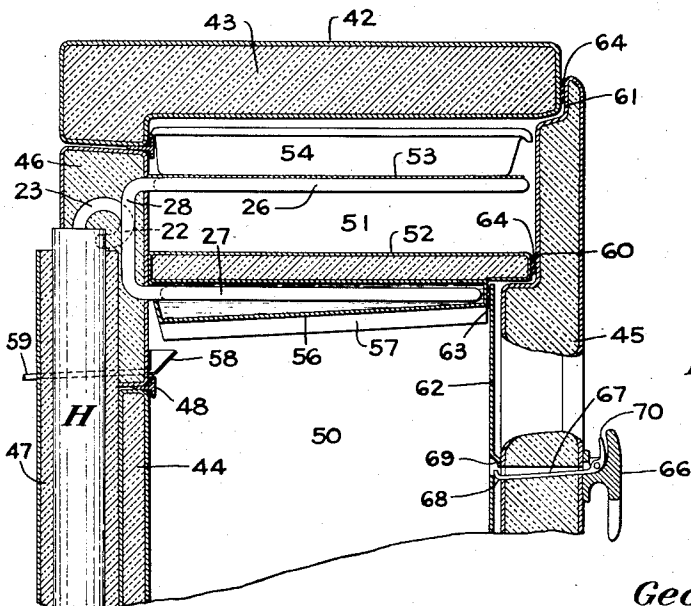


*Fig. 4*

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## REFRIGERATION

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3 Sheets-Sheet 3

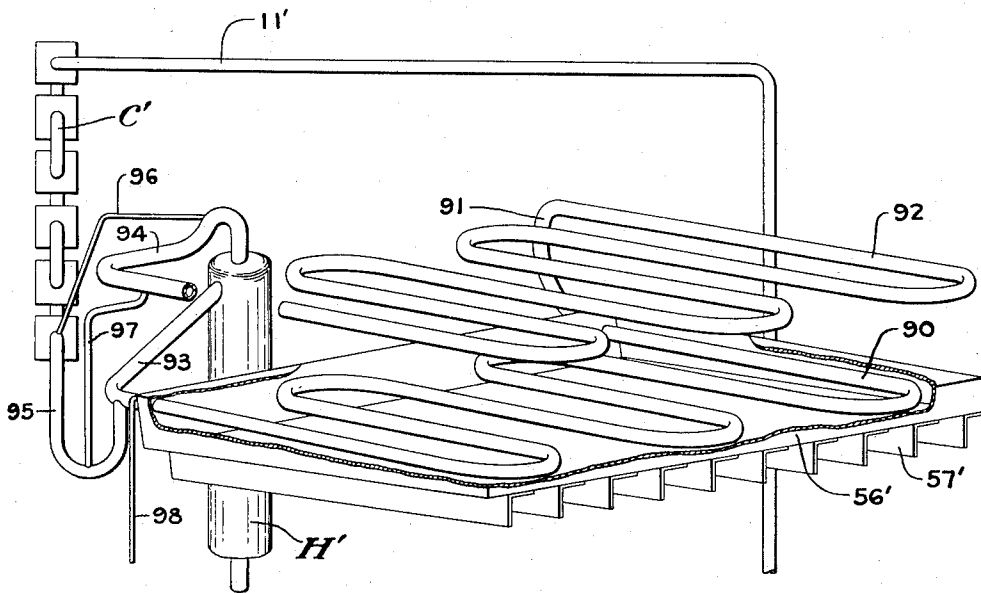


*Fig. 5*

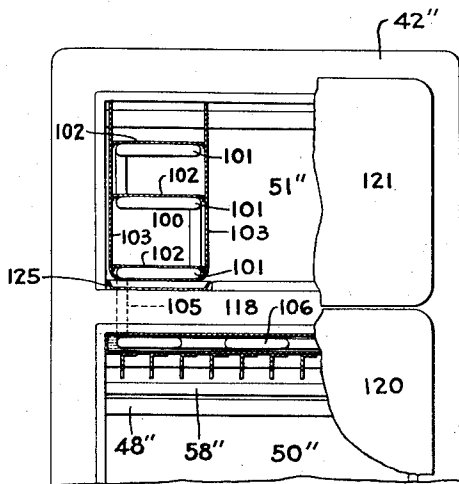


*Fig.6*

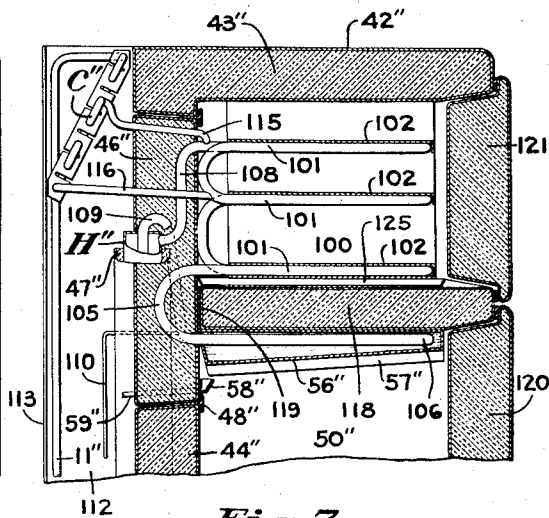


*Fig. 7*

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## UNITED STATES PATENT OFFICE

2,345,453

## REFRIGERATION

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Application July 20, 1938, Serial No. 220,198

21 Claims. (Cl. 62—5)

This invention relates to the art of refrigeration and more particularly to absorption refrigerating systems of the type utilizing an inert pressure equalizing medium.

Much difficulty has been encountered in previous refrigerating mechanisms due to the excessive drying of the air within the refrigerating compartment which causes excessive drying or crisping of stored foodstuffs, producing losses in flavor, appearance and, in some instances, complete spoilage. Additionally, previous refrigerating systems involve a basic compromise between the low temperature refrigerating requirements of ice production and certain foodstuffs, such as meats, and the higher refrigerating temperature requirements of other substances, such as leafy vegetables. Previous systems utilize a single evaporator which operates at a temperature low enough to freeze ice cubes within a reasonably short time; the low temperature of the evaporator accomplishes the primary end of freezing ice cubes but it also dries the air excessively and very quickly accumulates large coatings of frost which interfere with proper heat transfer from the evaporator, are unsightly and difficult to remove.

According to the present invention there is provided a refrigerating machine including two refrigerating compartments which are effectively sealed each from the other and which are cooled or refrigerated by a single evaporator having a plurality of sections which operate at a plurality of temperature levels.

It is an object of the invention to provide a refrigerating system including a high temperature food storage compartment which will be maintained at a safe refrigerating temperature by a chilling unit which operates above the freezing point of water whereby there is no frost formation on the cooler and the humidity within the refrigerating compartment is maintained at a relatively high value in order to protect moist foodstuffs. Additionally, the temperature conditions within the high temperature refrigerating compartment are not permitted to fluctuate materially even though the refrigerating machine is operative cyclically; this is accomplished by providing a thermal fly wheel or heat accumulator to refrigerate the food storage compartment. Such fly wheel or accumulator will prevent the temperature of the surfaces actually in contact with the air within the refrigerating compartment from reaching values low enough to cause the formation of frost, and they will maintain the temperature of those surfaces substantially constant during periods when the machine is not operating to produce refrigeration.

It is another object of the invention to provide a novel multiple evaporator structure which will

operate at a plurality of temperature levels to meet a plurality of refrigeration demands.

It is a further object of the invention to provide a refrigerating system having a plurality of refrigerating chambers which are held at different temperature levels by individual control mechanisms which regulate the same refrigerating system.

It is a further object of the invention to provide a refrigerator having a plurality of refrigerating compartments and to combine various types of refrigerating systems with such compartments to permit the refrigerating demands of any selected compartment to have precedence over the refrigerating demands of associated compartments.

It is another object of the invention to provide a novel refrigerating cabinet structure including a plurality of refrigerating chambers which are sealed from each other and which are provided with individual door structures.

Other and further objects of the invention will become apparent as the description proceeds when taken in connection with the accompanying drawings in which:

Figure 1 is a diagrammatic representation of a refrigerating system including the present invention in which certain portions are illustrated isometrically and on an enlarged scale.

Figure 2 is a fragmentary sectional plan view of a part of the cabinet structure.

Figure 3 is a fragmentary sectional elevational view of the cabinet structure.

Figure 4 is a partial transverse sectional elevational view of the cabinet structure.

Figure 5 is an isometric view illustrating a modified evaporator structure.

Figure 6 is a partial sectional elevational view illustrating another modified evaporator and cabinet structure.

Figure 7 is a transverse sectional elevational view of the modification illustrated in Figure 6.

The invention has been illustrated as applied to a continuous absorption refrigerating system of the type utilizing a circulating motor and fan to circulate the fluids in the system; however, the refrigerating system is not limited thereto and it may be embodied in other constructional forms and variations.

Referring now to Figure 1, there is illustrated an absorption refrigerating system comprising a boiler B, an analyzer D, a rectifier R, a condenser C, an evaporator E, a gas heat exchanger H, a tubular air-cooled absorber A, a solution reservoir S, a liquid heat exchanger L, a circulating fan F driven by an electrical motor M, and a gas burner G for heating the boiler. These elements are suitably connected by various conduits to form a complete refrigerating system

including a plurality of gas and liquid circuits to which reference will be made more fully hereinafter.

The above described refrigerating system will be charged with a suitable refrigerant, such as ammonia, a suitable absorbant, such as water, and an inert pressure equalizing medium, such as nitrogen.

Application of heat to the boiler B generates refrigerant vapor from the strong solution therein contained. The vapor so generated passes upwardly through the analyzer D in counterflow relationship to strong solution flowing downwardly through the analyzer. Further refrigerant vapor is generated in the analyzer by the heat of condensation of absorption solution vapor generated from the boiler. The refrigerant vapor is conducted from the upper portion of the analyzer to the upper portion of the tubular air-cooled condenser C by a conduit 11 which includes the air-cooled rectifier R. Any vapor of absorption solution which may pass through the analyzer is condensed in the rectifier R.

The weak solution formed in the boiler by the generation of refrigerant vapor flows through a conduit 12, the liquid heat exchanger L, and a conduit 14 into the upper portion of the inclined tubular air-cooled absorber A. It is apparent that the upper end of the absorber is at an elevation above the liquid level normally prevailing in the boiler-analyzer system wherefore some means must be provided to elevate the absorption solution into the absorber. For this purpose a small bleed-off conduit 16 is connected between the gas discharge conduit 17 of the circulating fan F and the weak solution conduit 14 below the liquid level normally prevailing in the boiler-analyzer system, whereby the weak solution is elevated into the absorber by gas lift action. The weak solution flows downwardly by gravity through the absorber counter to a stream of pressure equalizing medium and refrigerant vapor flowing upwardly therethrough. The refrigerant vapor content of this mixture is absorbed in the solution to form strong solution and the heat of absorption is rejected to the cooling air by the fins on the exterior walls of the absorber. The strong solution formed in the absorber discharges through a conduit 18 into the solution reservoir S. The solution is returned from the reservoir S to the upper portion of the analyzer D through a conduit 19, the outer path of the liquid heat exchanger L, and a conduit 20.

The lean pressure equalizing medium formed in the absorber discharges therefrom through a conduit 21 into the suction inlet of the circulating fan F. The gas is placed under pressure by the fan F and is discharged therefrom through the conduit 17 into the outer path of the gas heat exchanger H from which the gas is discharged into the evaporator E through the conduit 22. The gas flows through the evaporator in contact with liquid refrigerant discharged from the condenser which evaporates into the gas to produce refrigeration. The resulting rich pressure equalizing medium refrigerant vapor mixture is discharged from the evaporator E through a conduit 23 into the inner path of the gas heat exchanger H from which it is conveyed to the lower portion of the absorber A by a conduit 24. The specific structure and operation of the evaporator will be described in detail hereinafter.

The refrigerant vapor supplied to the condenser C is liquified by heat exchange with air flowing over the cooling fins on the condenser and is

discharged therefrom into the evaporator in a manner to be described more fully hereinafter.

The evaporator E comprises a pair of horizontally positioned evaporator coils 26 and 27 which are serially connected through a riser conduit 28. The free end of the coil 26 is connected to the inert gas inlet conduit 22 and the free end of the coil 27 is connected to the rich gas discharge conduit 23 which opens into the heat exchanger. The liquid refrigerant formed in the condenser discharges into a U-shaped conduit 30 which opens into a gas separation chamber 31. The liquid refrigerant is elevated through the conduit 30 by gas lift action by gas supplied to an inverted U-shaped conduit 32 which is connected to the outer or pressure side of the gas heat exchanger H. The inert gas flowing through the pump is returned to the rich gas conduit 23 from the gas separation chamber 31 by a vent conduit 33. By reason of this construction the level of the condenser is substantially independent of the evaporator level and it may be positioned in the most advantageous manner in the cooling flue customarily provided at the rear of the refrigerating cabinet without adversely affecting the positioning and arrangement of the evaporator within that cabinet.

The condenser is vented through a small vent conduit 35 which opens into the tight portion of the inverted U-shaped conduit 32 which supplies pumping gas to the liquid refrigerant elevating conduit 30. An overflow drain 36 is connected between the condenser C at a level between the point of connection between the condenser C and the event 35 and the level at which the conduits 30 and 32 are joined. The conduit 36 discharges into the strong solution return conduit 19.

The liquid refrigerant discharged into the gas separation chamber 31 is conveyed into the gas inlet pipe 22 through a conduit 37 which includes a U-shaped liquid seal portion. The liquid discharging through the conduit 37 flows into the conduit 22 at a point spaced a short distance from the point of connection between that conduit and the gas heat exchanger H. In order to prevent liquid refrigerant from flowing backwardly along that conduit under any condition a small dam 38 is provided between the gas heat exchanger and the point of connection between the conduits 22 and 37.

The diameter of the conduit forming the coil sections 26, 27 and 28 is relatively small whereby the inert gas flows therethrough at a relatively high velocity. The apparatus is designed in such fashion that the inert gas will drag or sweep a small stream of liquid refrigerant along the bottom portions of the conduits 26 and 27 as the liquid is evaporating into the gas stream. By reason of this construction the inert gas positively propels the liquid refrigerant through the long horizontal coil sections 26 and 27 and insures that the liquid shall be distributed throughout these coils. A full explanation of this phenomena will be found in the co-pending application of Curtis C. Coons and William H. Kitto, filed April 2, 1941, Serial No. 386,395, now Patent No. 2,328,196, dated August 31, 1943. Under some conditions, particularly when a dense inert gas, such as nitrogen, and small diameter conduits are utilized, the liquid might be swept through the horizontal conduit at a rate sufficient to blow a portion thereof into the gas heat exchanger H. If this condition should prevail in any particular design, it may be eliminated by placing obstructions in

the coils 26 and 27; for example, a fine spiral wire coil.

A drain conduit 39 is provided between the gas discharge portion of the conduit 27 and the inner path of the gas heat exchanger H. The drain conduit 39 opens into the top portion of the coil 27 whereby to prevent blockage of that coil by liquid but to permit a given quantity of liquid to accumulate therein without discharge. This is advantageous and necessary for the reason that there is nothing to be gained by draining liquid refrigerant from the evaporator when the control mechanism de-energizes the circulating fan; such liquid is merely stored in the coil 27 and is available to produce refrigeration immediately the control mechanism re-energizes the circulating fan F. Any foreign matter finding its way into the coils 26 and 27 and not evaporated as it passes therethrough is carried by the inert gas stream through the conduit 23 and the inner path of the gas heat exchanger H from which it discharges through the conduit 24 into the solution reservoir S.

Referring now to Figures 1 to 4, the arrangement of the refrigerating mechanism within the cabinet will be described. The refrigerating mechanism is applied to a cabinet 42 which includes a top wall portion 43, a rear wall portion 44, a door structure 45 and suitable side walls. All exterior walls of the cabinet are heavily insulated in any suitable manner. The rear wall 44 is provided with an opening which is closed by an insulated panel element 46. The joint between the wall 44 and the panel 46 is sealed by any suitable gasket 48. The gas heat exchanger H is provided with a suitable insulating blanket 47 which is partially embedded in the rear wall 44 and the panel element 46. The arrangement is such that the entire refrigerating system including the evaporator, the gas heat exchanger and its insulating blanket, and the panel 46 are assembled on a suitable frame which is then mounted along the rear and bottom portion of the cabinet and the evaporator structure is simply inserted through the rear wall opening a distance sufficient to enable the panel 46 to fill that opening.

The evaporator coil sections 26 and 27 extend horizontally within the refrigerating cabinet which is divided into a large relatively high temperature food storage compartment 50 and a small low temperature food storage and ice freezing compartment 51 by an insulated panel 52 which may be attached to or carried by the window element 46 or which may be carried by the side walls of the cabinet 42. If the panel 52 is attached to or carried by the panel 46 it will be inserted in the cabinet when the refrigerating apparatus including the panel 46 and the evaporators are assembled with the cabinet.

It is to be noted from Figure 4 that the coil section 26 substantially divides the compartment 51 so it might be positioned at a relatively higher or relatively lower elevation if desired. An ice tray supporting shelf 53 rests upon the coil 26 and is adapted to support ice trays indicated at 54. The shelf and evaporator coils 53 and 26 have been shown as horizontal; however, if desired, a corner jog may be placed in these elements in order to accommodate one or more very deep ice trays in one corner of the compartment 51 and/or one end may be eliminated to accommodate tall receptacles. This would present no difficulty with respect to the evaporator for the reason that the liquid refrigerant is positively

propelled therethrough by the inert gas stream and the circulation of the liquid will not be prevented by providing such a step in the evaporator structure.

The evaporator coil section 27 underlies the insulated panel 52 and is housed within a tank 56 which contains a suitable eutectic mixture, for example, brine. The lower surface of the tank 56 slopes slightly downwardly and rearwardly from the front of the compartment 50 and is provided with a plurality of air cooling fins 57. The fins 57 terminate a short distance from the panel 46 and overlie a small trough 58 which is carried by the panel 46. The trough 58 is positioned to catch dripping from the fins 57 which will run to the rear end thereof due to slope of the bottom portion of the tank 56. Moisture dripping into the trough 58 is carried out of the refrigerating compartment through a conduit 59 and is disposed of in any suitable manner.

The outer insulated door 45 of the refrigerating compartment is provided with stepped portions 60 and 61 which abut rubber sealing gaskets 64 on the end portion of the insulated dividing panel 52 and on the door frame in order to seal these compartments from each other.

The compartment 50 is also provided with an inner door 62 which is shown as a metal panel shaped to conform to the contour of the inner surface of the door 45 and to rest against the bottom and sides of the door frame and against a suitable rubber gasket 63 on the end portion of the tank 56 to prevent warm air from flowing into the compartment 50 when the door 45 is opened to obtain access to the compartment 51. The doors 45 and 62 are hinged as at 65 on the outer wall of the cabinet 42. The door 45 is provided with a latch 66 which also carries an operating latch 67 for the inner door. The latch 67 is pivotally mounted on the latch 66 and extends through an opening in the door 45. The outer end of the latch 67 is provided with a hook portion 68 which is adapted to engage in a struck-out tongue 69 formed in the door 62. The latch 67 is provided with an upstanding lever 70 which is adapted to be operated to engage the hook 68 and tongue 69 from the outside of the refrigerating compartment in order that the doors 62 and 45 may be opened simultaneously when it is desired to obtain access to the compartment 50.

Gas is supplied to the burner G through a conduit 72 which includes a solenoid control valve 73. The burner G is provided with any suitable safety cut-off device which will discontinue all supply of fuel thereto in the event of flame failure. In order to provide a continuous igniting or pilot flame on the burner G, a suitable by-pass 74 is provided around the valve 73. The solenoid valve 73 and the motor M for the circulating fan F are each connected to one line 75 of a source of electrical energy. The other line 76 of the source of electrical energy is connected to a pair of thermostatic control switches 77 and 78. Each of the switches 77 and 78 is provided internally thereof with thermostats 79 and 80, respectively, which are adapted to open and close the contacts in the respective switches in response to predetermined temperature changes. The thermostats 79 and 80 are each connected to the circulating motor M and to the solenoid valve 73 through an electrical conductor 81.

The thermostatic switch 77 is mounted in the compartment 51 to be responsive to the temperature thereof and the thermostatic switch 78 is

mounted in the compartment 50 to be responsive to the temperature of that compartment. Each of these switches will be set for a different temperature range whereby the refrigerating system will be energized to produce refrigeration in the event that either of the compartments 50 or 51 is in need of refrigeration.

The operation of this form of the invention is as follows: In the event that either of the compartments 50 or 51 reaches a temperature sufficiently high to actuate its associated thermostatic switch to closed circuit position, the refrigerating system will be energized to produce refrigeration. The liquid refrigerant will discharge into the coil 26 and will be swept therethrough by the inert gas stream as it is evaporating into the inert gas. However, if the temperature of the compartment 51 is substantially that for which the thermostat 77 has been set, there will be very little evaporation in the conduit 26 and substantially all the liquid refrigerant will be swept into the conduit 27 into which it will evaporate to refrigerate the eutectic mixture contained in the tank 56. The eutectic mixture preferably has a very large specific heat, as a result of which a very large amount of heat can be abstracted therefrom in a short time without unduly lowering the temperature of the fins 57. The refrigeration produced in the coil 27 refrigerates the tank 56 and the fins 57 to cool the air within the compartment 50. The tank 56 and fins 57 present a very large heat exchange area to the air within the compartment 50 and they normally operate at temperatures above the freezing point of water whereby the large heat exchange area is sufficient to maintain safe temperatures within the compartment 50 on a relatively small temperature differential between the air in the compartment and the cooling unit therefor and without causing deposition of frost on the cooling unit. During the operation of the unit some moisture will be collected on the cooling unit which will simply flow down the fins 57 and will then drip into the trough 58 from which it is removed to any suitable point of disposal through the conduit 59.

In the event that the compartment 51 is in need of refrigeration either to freeze ice or to preserve foodstuffs therein contained, the thermostat 77 will energize the system and refrigerant will be supplied to the evaporator as before. Under the conditions most of the refrigerant will evaporate in the coil 26 to produce the desired low temperature conditions in the compartment 51. The compartment 51 is relatively small, is sealed, and will not normally contain moist foods wherefore there will be no substantial quantity of frost deposition on the coils 26. Moreover the air in the compartment 51 has a narrow temperature range which inhibits moisture addition to the air. However, it will eventually become necessary to defrost the cooling coil. For this purpose any suitable manually operated switch can be inserted in the electrical conductor 75 in order to de-energize the refrigerating system regardless of the condition of the thermostatic switches 77 and 78. During the defrosting period a suitable drip tray can be placed in the compartment 51, resting on the panel 52, or it may be hung in any suitable manner from the bottom portion of the coils 26 in order to accumulate the liquid which drips from the coils during the defrosting period.

The arrangement of the coils 26 and 27 and of the liquid supply thereto favors the compartment 51 in some degree because of the fact

that if liquid refrigerant can evaporate in the coil 26 to produce refrigeration in the compartment 51, it will do so. This is justified by the fact that the large heat capacity of the eutectic mixture in the tank 56 will maintain safe refrigerating temperatures within the compartment 50 for a considerable period of time after the thermostat 78 has operated to demand refrigeration and also because of the fact that it is generally preferred by the users of refrigerating systems that ice shall be produced whenever unfrozen water is in the ice trays.

The above described refrigerating system operates very efficiently simultaneously to refrigerate foodstuffs under high humidity conditions and to refrigerate foodstuffs requiring low temperature refrigeration and to freeze ice cubes under proper low temperature refrigerating conditions. The arrangement of the doors 62 and 65 together with the dividing panel 52 insures that there shall be no communication whatsoever between the compartments 50 and 51. Therefore, a wide differential of temperature and humidity may be maintained between these two compartments. An additional important feature of the construction disclosed is the fact that the vegetable storage chamber 50 is not opened to allow warm air to flow therein and to lose refrigeration every time the ice storage compartment is opened. This feature markedly improves the overall efficiency of the system.

Referring now to Figure 5 there is disclosed a modified form of the invention. Certain portions of this form of the invention are identical with those disclosed in connection with Figure 1 and are given the same reference characters primed. The evaporator condenser structure disclosed in Figure 5 is designed and intended to be utilized in the refrigerating system disclosed in Figure 1. Therefore, only those portions of the structure which are different from that disclosed in Figure 1 will be described in detail herein.

The evaporator in Figure 5 comprises a box-cooling coil 90, which in size and shape is identical with the coil 27 of Figure 1, connected by a riser conduit 91 to a low temperature freezing coil 92, which in size and shape is identical with the coil 26. The coil 90 is encased in a eutectic tank 56' which is provided with cooling fins 57'.

The inert gas is conducted from the outer path of the heat exchanger H' to the inlet of the coil 90 through a conduit 93. The rich gas is discharged from the coil 92 into the inner path of the gas heat exchanger through a conduit 94. The refrigerant vapor liquified in the condenser C' is conducted into the gas inlet conduit 93 through a U-shaped conduit 95. The condenser is vented by a small vent conduit 96 connected between the discharge conduit of the condenser and the conduit 94. A re-circulating conduit 97 is connected between the gas outlet conduit 94 and the tight portion of the U-shaped conduit 95. A drain 98, corresponding to the drain 39, is connected to the upper portion of the gas inlet end of the coil 90.

The operation of this form of the invention is as follows: When the control mechanism has energized the refrigerating system the liquid refrigerant will flow into the box-cooling coil 90 through the conduit 95 and will be propelled through the coil 90 by the inert gas stream flowing therethrough. Any refrigerant not evaporated in the coil 90 will be carried upwardly through the conduit 91 into the coil 92 through

which it will be propelled by the inert gas stream as it is evaporating to produce refrigeration. In the event that any liquid refrigerant is not evaporated in either of the conduits 90 or 92, it will flow through the conduit 97 into the U-shaped condenser discharge conduit 95 for re-circulation through the evaporator or for storing therein in the event that the control mechanism has de-energized the circulating fan. The arrangement of the conduits 97 and 95 prevents inert gas from by-passing through the conduits 92, 95 and 97 by reason of the fact that the right portion of the conduit 95 is continuously sealed with liquid refrigerant enroute from the condenser to the evaporator coil 90. The drain conduit 98, which corresponds to the drain conduit 39 previously described, functions in exactly the same manner. During operation of the refrigerating system foreign material, principally absorption solution, will find its way into the evaporator and will be circulated through the evaporator coils and the return drain 97. This will continue until a small quantity of the foreign material has been accumulated after which it will offer so much resistance to the flow of the inert gas stream that it will be blasted across the connection between the conduits 94 and 97 by the inert gas stream and will be blown through the inner path of the gas heat exchanger and thence into the strong solution reservoir, thereby purging the evaporator system.

This form of the invention is designed and intended to be utilized in a cabinet in the same manner in which the mechanism of Figure 1 is to be utilized. The operation of this form of the invention is substantially the same as that described in connection with Figure 1 except that the condenser can be brought low enough within the air cooling flue without providing a gas lift pump to elevate the liquid into the evaporator. There is a slight difference in operation between the two forms of the invention in that the box-cooling is favored in Figure 5 over ice freezing and low temperature storage by reason of the fact that the liquid refrigerant flows first into the box-cooling coil 90.

Referring now to Figures 6 and 7, there is disclosed a third modification of the invention. This form of the invention is designed and intended to be utilized with the refrigerating system disclosed in Figure 1 except in the particulars noted hereinafter. Certain elements of this form of the invention are identical with those disclosed in Figure 1 and are therefore given the same reference characters double primed.

The evaporator includes an upper ice freezing and low temperature refrigerating section 100 which comprises three horizontal serially connected U-shaped segments 101. The evaporator segments 101 each support tray-supporting shelves 102 which are attached to vertical side walls 103 forming an ice tray compartment spaced at one side of the upper refrigerating compartment 51''. The lowest evaporator section 101 is connected by means of a conduit 105 with a box-cooling evaporator coil 106 which is similar to the evaporator coil 27 previously described.

The inert gas is led from the outer path of the gas heat exchanger H'' through a conduit 108 into the highest coil section 101. The rich pressure equalizing medium is returned from the evaporator coil 106 to the inner path of the gas heat exchanger through a conduit 109. The

evaporator coil 106 is provided with a suitable drain 110 which opens into the strong solution return conduit.

The condenser C'' is mounted in the top portion of a flue 112 which is formed with the rear wall 44'' of the refrigerating compartment 42'' by a rear panel element 113. The condenser C'' is inclined and extends from its upper portion downwardly and away from the rear wall of the refrigerating compartment, whereby there is no substantial or material heating of the rear walls of the refrigerating compartment by the condenser and cooling air does not flow over different condenser sections serially. The liquid formed in the upper portion of the condenser is discharged therefrom through a conduit 115 into the gas inlet portion of the topmost evaporator coil 101. The bottom portion of the condenser C'' is drained through a conduit 116 into the gas inlet portion of the intermediate coil section 101. By reason of this construction the liquid refrigerant is permitted to flow by gravity from the condenser into the evaporator without necessitating placing the condenser entirely above the evaporator. The parts are so proportioned that the condenser will not extend above the top 43'' of the refrigerating cabinet 42''.

In this form of the invention the gas heat exchanger H'' is partially embedded in the rear wall panel closure element 46'', but the panel 46'' is considerably larger than the panel 46 disclosed in Figure 1 by reason of the much greater height of the evaporator and of the chamber 51''.

The cabinet 42'' is provided with an insulated partition element 118 which divides the interior thereof into two chambers 50'' and 51'' and carries a sealing strip 119 abutting the panel 46'' to provide high and low temperature freezing compartments. The compartment 51'' is closed by an insulated door 121 and the compartment 50'' is closed by an insulated door 120. This cabinet construction insures perfect sealing between the compartment 51'' and 50''.

A drip pan 125 may be placed beneath the evaporator casing in the chamber 51'' to catch drippings during defrosting.

The lowest compartment in the evaporator casing 103 is deeper than the superposed compartments to accommodate deep ice or dessert freezing trays.

The operation of this form of the invention is as follows: The control mechanism operates exactly as before though, if desired, this refrigerating system may be of the type in which the inert gas is preferably a light gas as hydrogen and is circulated by gravity rather than by a positively driven circulative fan. If this type gas circulation is employed, it will be necessary to circulate the absorption solution by a vapor lift pump in a manner well known in this art. The liquid refrigerant flows downwardly through the evaporator by gravity in parallel flow relationship to the inert gas stream into which it evaporates to produce refrigeration. In this form of the invention the diameter of the conduit forming the evaporator is appreciably greater than the diameter of the conduit forming the evaporators previously described, and the inert gas exerts no propelling action on the liquid which flows entirely under the influence of gravity. The refrigeration produced in the coil sections 101 freezes ice in trays supported on the shelves 102 and refrigerates the low tem-

perature compartment 51". The evaporation occurring in the coil 106 refrigerates the eutectic mixture contained in the tank 56" which in turn refrigerates the compartment 50" in the manner previously described. Any unevaporated material and foreign matter finding its way into the evaporator is drained therefrom through the conduit 110 into the strong solution return line.

This form of the invention operates in substantially the same manner as the previous forms except that it provides for gravity flow of the liquid refrigerant through the evaporator and is thereby adaptable for refrigerating systems in which the inert gas is circulated by the density differential between the rich mixture returning to the absorber and the lean mixture returning from the absorber to the evaporator. Also in this form of the invention the low temperature storage compartment has a much greater vertical extend than that described in connection with the previous forms of the invention whereby it is adapted to hold tall bottles and similar receptacles.

The refrigeration occurring in the evaporator section 106 naturally occurs at a relatively high temperature because the inert gas is partially saturated before it reaches this section of the evaporator. If it is desired to favor the high temperature evaporator, the circuits may be rearranged to provide counterflow of the gas and liquid in the evaporator in the manner now well known in this art. The refrigerating effect may be further controlled by changing the point of connection between the evaporator and the supply conduit 116. The supply conduit 116 may discharge directly into the evaporator coil 106 in units designed for large capacity high humidity storage chambers.

The present invention provides a highly efficient absorption refrigerating system in which one refrigerating compartment is maintained at a temperature low enough to freeze ice cubes and to provide for refrigeration of foodstuffs requiring low temperature storage, and another compartment is maintained in a higher though safe refrigerating temperature and at a relative humidity high enough to prevent objectionable drying of foodstuffs stored therein. Various means are provided to insure a complete seal between the two refrigerating compartments and prevent the flow of air or heat therebetween as slight leakage would greatly lower the humidity of the high temperature compartment. The housewife may obtain access to either of the refrigerating compartments without disturbing the other.

The food storage compartment is not cooled directly by the evaporator which may reach temperatures low enough to cause frost deposition, but it is cooled by an eutectic mixture in which the evaporator is embedded. This has the dual advantage of preventing the metallic surfaces in contact with the air in the refrigerating compartment from reaching temperatures below the freezing point of water and also the large heat capacity of the eutectic mixture effectively prevents material variations in the temperature within the food storage compartment as it acts as a thermal fly-wheel and continues to refrigerate such compartment after the refrigerating system has been de-energized by the control mechanism.

The very large area presented by the fins and the lower surface of the eutectic tank provides uniform cooling throughout the food storage compartment without producing strong air cur-

rents and without de-humidifying the air in the food storage compartment.

While I have illustrated and described my invention in detail, it is not to be limited to the particular form and construction described, but other constructional forms and variations may be resorted to without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. Refrigerating apparatus comprising a cabinet, means dividing the interior of said cabinet into two compartments, an evaporator having a refrigerating section in each of said compartments, means for producing refrigerant liquid, means for supplying liquid refrigerant to said evaporator by gravity, and means for propelling a pressure equalizing medium through said evaporator to sweep the liquid refrigerant there-through as it is evaporating into the pressure equalizing medium.

2. Refrigerating apparatus comprising an insulated cabinet, an insulated partition dividing the interior of said cabinet into a pair of compartments which are completely sealed from each other, a door mounted on said cabinet adapted to seal said compartments from each other and from the exterior of the cabinet, an inner door on one of said compartments adapted to seal the same from the other compartment and from the exterior of the refrigerating cabinet when said first mentioned door is opened, manually operable latch means for holding said first mentioned door in closed position, latch means for engaging said second mentioned door to cause the same to be moved to opened position with said first mentioned door, and means providing for selective operation of said latch means.

3. Absorption refrigerating apparatus comprising a pair of refrigerating compartments, an evaporator having a section positioned in each of said compartments, a solution circuit including a boiler and an absorber, a pressure equalizing medium circuit including said absorber and evaporator, means for supplying refrigerant vapor generated in said boiler to said evaporator in liquid phase, and a body of material having a high heat capacity enclosing one of said evaporator sections and extending across substantially the entire top wall of one of said compartments.

4. Absorption refrigerating apparatus comprising a pair of refrigerating compartments, an evaporator having sections positioned to refrigerate each of said compartments, a solution circuit including a boiler and an absorber, a pressure equalizing medium circuit including said absorber and evaporator, means for supplying refrigerant vapor generated in said boiler to said evaporator in liquid phase, an ice tray supporting means associated with one of said evaporator sections, and a finned eutectic tank enclosing the other of said evaporator sections.

5. Absorption refrigerating apparatus comprising a pair of refrigerating compartments, an evaporator having sections positioned to refrigerate each of said compartments, a solution circuit including a boiler and an absorber, a pressure equalizing medium circuit including said absorber and evaporator, means for supplying refrigerant vapor generated in said boiler to said evaporator in liquid phase, a eutectic tank enclosing one of said evaporator sections, and a control mechanism for said refrigerating apparatus including a control element in each of said compartments for energizing said refrigerating

apparatus in response to refrigeration demand in its associated compartment.

6. Absorption refrigerating apparatus comprising a pair of refrigerating compartments, an evaporator having sections positioned to refrigerate each of said compartments, a solution circuit including a boiler and an absorber, a pressure equalizing medium circuit including said absorber and evaporator, means for supplying refrigerant vapor generated in said boiler to said evaporator in liquid phase, and power driven means for circulating pressure equalizing medium through said pressure equalizing medium circuit with sufficient velocity and pressure to circulate the liquid refrigerant supplied to said evaporator therethrough by the frictional drag of the pressure equalizing medium on the refrigerant.

7. Refrigerating apparatus comprising a cabinet having an opening in the rear wall thereof, a plate element positioned to close said opening and insertable from the rear of said cabinet, an insulated imperforate horizontal partition on said plate element extending across the interior of said cabinet to separate the same into upper and lower refrigerating chambers sealed from each other, and cooling units carried by said plate element positioned on opposite sides of said partition in spaced relationship therewith.

8. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and an absorber, a solution circuit including a boiler and said absorber, a condenser extending to a level below the upper portion of said evaporator, a gas lift pump for elevating refrigerant from said condenser into said evaporator, means for supplying gas from said inert gas circuit to said pump to operate the same, a power driven circulator for propelling the inert gas through said inert gas circuit with sufficient force to circulate the refrigerant through said evaporator, a cabinet including an insulated storage compartment, and an insulating panel dividing said storage compartment into a pair of chambers, said evaporator including a section arranged to refrigerate each of said chambers.

9. Refrigerating apparatus comprising a cabinet, means dividing the interior of said cabinet into superposed compartments; an evaporator having a section providing a plurality of shelf-like portions in one of said compartments and a substantially horizontal section in the other of said compartments; means for supplying liquid refrigerant to the higher of said evaporator sections; means for supplying a pressure equalizing medium to said evaporator sections; said means for supplying liquid refrigerant to said evaporator comprising a condenser extending to a level below the top portion of said evaporator, means for draining liquid refrigerant from an intermediate portion of said condenser into the top portion of said evaporator and means for draining liquid refrigerant from the bottom portion of said condenser into an intermediate portion of said evaporator; and a eutectic tank enclosing said horizontal evaporator section.

10. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and an absorber, a solution circuit including a boiler and said absorber, means for liquefying refrigerant vapor produced in said boiler and for supplying the same to said evaporator, a cabinet including an insulated storage compartment, means separating said storage compart-

ment into a plurality of individual chambers sealed from each other, said evaporator including separate sections in each of said chambers, and means in said inert gas circuit for propelling the inert gas through said evaporator sections with a velocity sufficient to sweep or drag the liquid refrigerant therethrough.

11. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and an absorber, a solution circuit including a boiler and said absorber, means for liquefying refrigerant vapor produced in said boiler and for supplying the same to said evaporator, a cabinet including an insulated storage compartment, said evaporator including a substantially horizontal shelf-like coil covering substantially the entire top wall of said compartment, and a body of heat absorption material enclosing said shelf-like coil and in heat transfer relationship with the air in said compartment.

12. Refrigerating apparatus comprising a cabinet having an opening in one wall thereof, a refrigerating mechanism including an upper low temperature evaporator and a lower higher temperature evaporator inserted into said cabinet through the opening in the wall thereof and positioned interiorly of said cabinet, a horizontal insulated partition mounted between said evaporators on said refrigerating apparatus and cooperating with the interior walls of said cabinet to divide the interior of said cabinet into an upper freezing chamber and a lower storage chamber, and a panel on said apparatus positioned in and sealing said opening.

13. Absorption refrigerating apparatus comprising a solution circuit including a boiler and an absorber, an inert gas circuit including an evaporator and said absorber, means for liquefying refrigerant vapor produced in said boiler and for supplying the same to the upper portion of said evaporator, said inert gas circuit being so constructed and arranged that the inert gas is supplied to the upper portion of said evaporator adjacent the refrigerant inlet thereto, power driven means in said inert gas circuit for propelling the inert gas through said evaporator with a velocity sufficient to propel the refrigerant therethrough, a cabinet having an insulated storage compartment and an insulating partition dividing said storage compartment into an upper low temperature refrigerating chamber and a subjacent higher temperature refrigerating chamber, said evaporator having sections in each of said refrigerating chambers.

14. Refrigerating apparatus comprising a cabinet having an insulated storage chamber, means dividing said storage chamber into high and low temperature refrigerating compartments, an absorption refrigerating mechanism associated with said cabinet comprising an inert gas circuit including an absorber and an evaporator in each of said compartments, a solution circuit including a generator and said absorber, means for liquefying refrigerant vapor produced in said generator and for supplying the same to said evaporators in liquid phase, a source of heat for said generator, and thermostatic means arranged to be responsive to the condition of each of said compartments for controlling said source of heat.

15. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and an absorber, a solution circuit including a boiler and said absorber, a cabinet including an insulated refrigerating compartment and an insulating partition dividing said refrigerat-

ing compartment into upper and lower chambers, said evaporator having upper and lower sections positioned in said upper and lower chambers respectively, means for liquefying refrigerant vapor produced in said boiler and for supplying the same to the evaporator section in said lower chamber, and means in said inert gas circuit constructed and arranged to circulate the inert gas through said lower and upper sections and in that order with a velocity and pressure sufficient to circulate the refrigerant through said evaporator sections as it is evaporating into the inert gas.

16. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and an absorber, a solution circuit including a boiler and said absorber, a cabinet including an insulated refrigerating compartment and an insulating partition dividing said refrigerating compartment into upper and lower chambers, said evaporator having upper and lower sections positioned in said upper and lower chambers respectively, and an eutectic tank in heat exchange relationship with the atmosphere in said lower chamber enclosing said lower evaporator section, means for liquefying refrigerant vapor produced in said boiler and for supplying the same to the evaporator section in said lower chamber, and means in said inert gas circuit constructed and arranged to circulate the inert gas through said lower and upper sections and in that order with a velocity and pressure sufficient to circulate the refrigerant through said evaporator sections as it is evaporating into the inert gas.

17. Refrigerating apparatus comprising an insulated cabinet, an insulated partition dividing the interior of said cabinet into a pair of compartments which are completely sealed from each other, a door mounted on said cabinet adapted to seal said compartments from each other and from the exterior of the cabinet, an inner door on one of said compartments adapted to seal the same from the other compartment and from the exterior of the refrigerating cabinet when said first mentioned door is opened, a manually releasable latch for securing said first mentioned door in closed position, and normally disengaged latch means positioned to engage with said second mentioned door to cause the same to move with said first mentioned door, said normally disengaged latch means including an operating part for engaging said normally disengaged latch means with said second mentioned door positioned adjacent said manually releasable latch.

18. Refrigerating apparatus comprising a cabinet having an insulated storage chamber, means dividing said storage chamber into high and low temperature refrigerating compartments, an absorption refrigerating mechanism associated with said cabinet comprising an inert gas circuit including an absorber and an evaporator in each of said compartments, a solution circuit including a generator and said absorber, means for liquefying refrigerant vapor produced in said generator and for supplying the same to said evaporators in liquid phase, a source of heat for said generator, a thermostatic control means arranged to be responsive to the condition of said high temperature refrigerating compartment, a thermostatic control means arranged to be responsive to the

condition of said low temperature refrigerating compartment, and means operatively associating each of said control means with said source of heat for controlling the same in such relation to said source of heat that it may be rendered operative to heat said generator by either of said control means independently of each other.

19. Refrigerating apparatus comprising a cabinet including an insulated refrigerating chamber, an insulated partition separating said chamber into an upper low temperature refrigerated space and a lower high temperature refrigerated space, an absorption refrigerating mechanism associated with said cabinet comprising an inert gas circuit including an absorber and an up-standing evaporator having sections arranged to refrigerate each of said spaces, means in said inert gas circuit for circulating the inert gas therethrough, a solution circuit including a generator and said absorber, a condenser connected to receive refrigerant vapor from said generator and positioned to discharge liquid refrigerant at an elevation below the upper portion of said evaporator, a gas lift pump arranged to convey refrigerant liquid from said condenser to the upper portion of said evaporator, and means for conveying pumping gas from said inert gas circuit to said gas lift pump.

20. Refrigerating apparatus comprising a cabinet including an insulated refrigerating chamber, a plane insulated partition cooperating with the interior walls of said refrigerating chamber to separate said chamber into high and low temperature refrigerating compartments, an absorption refrigerating mechanism associated with said cabinet comprising an inert gas circuit including an evaporator and an absorber, a solution circuit including a generator and said absorber, said evaporator including a conduit in said low temperature compartment coiled to form a plurality of spaced superposed shelf-like portions and a conduit in said high temperature compartment shaped to form a substantially plane coil of extensive area positioned adjacent one wall of said high temperature compartment, and means for liquefying refrigerant vapor expelled in said generator and for supplying the liquid to said evaporator.

21. Refrigerating apparatus comprising a cabinet including an insulated refrigerating chamber, a plane insulated partition cooperating with the interior walls of said refrigerating chamber to separate said chamber into high and low temperature refrigerating compartments, an absorption refrigerating mechanism associated with said cabinet comprising an inert gas circuit including an evaporator and an absorber, a solution circuit including a generator and said absorber, said evaporator including a substantially horizontal plane shelf-like section in said low temperature compartment positioned between the top and bottom wall thereof and of an area sufficient to separate said low temperature compartment into upper and lower portions and a substantially plane section in said high temperature compartment having an extensive heat transfer area adjacent one wall thereof, and means for liquefying refrigerant vapor expelled in said generator and for supplying the liquid to said evaporator.