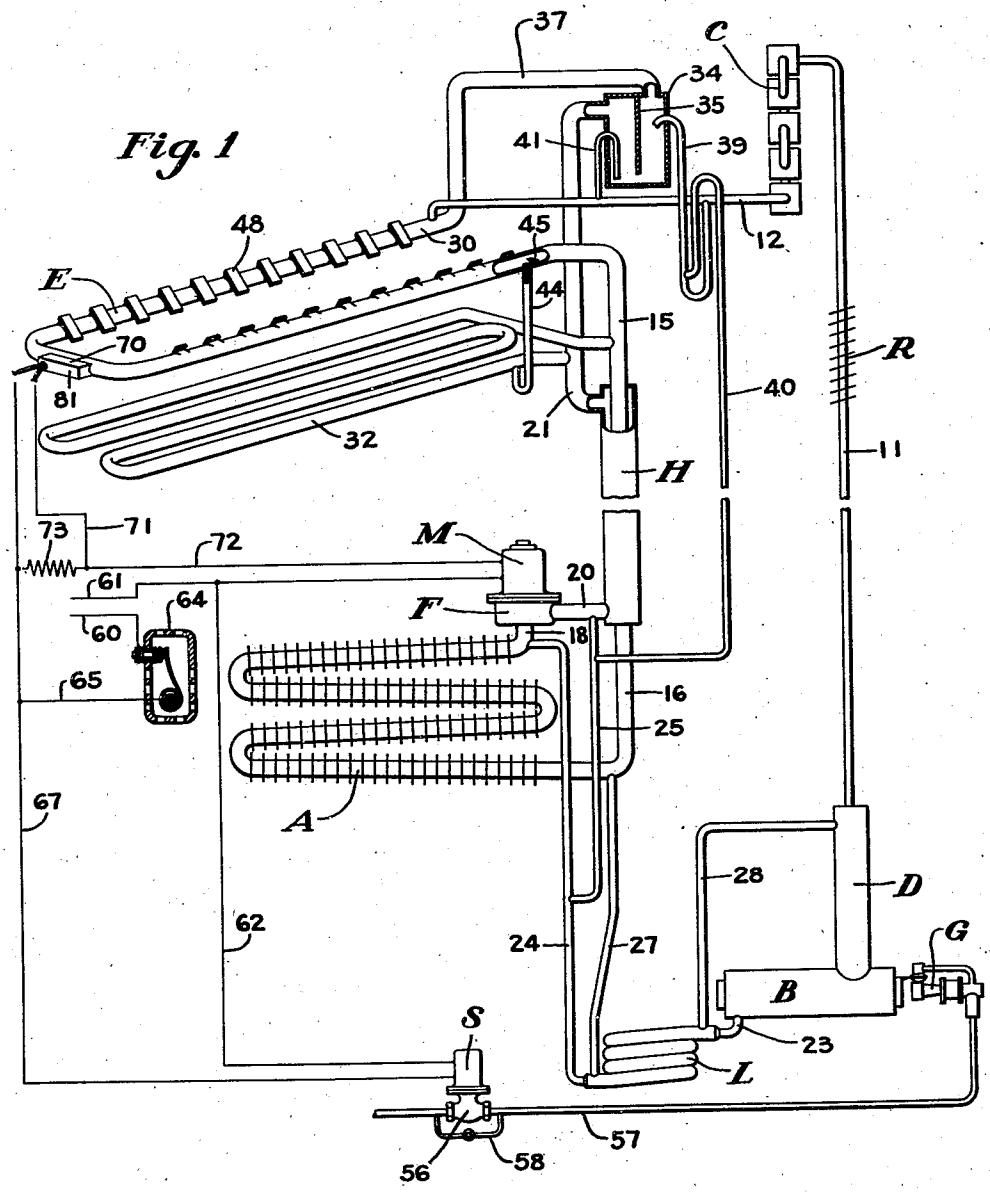
Sept. 29, 1942. G. A. BRACE 2,297,287

REFRIGERATION

Filed July 20, 1938 2 Sheets-Sheet 1

Fig. 1



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REFRIGERATION

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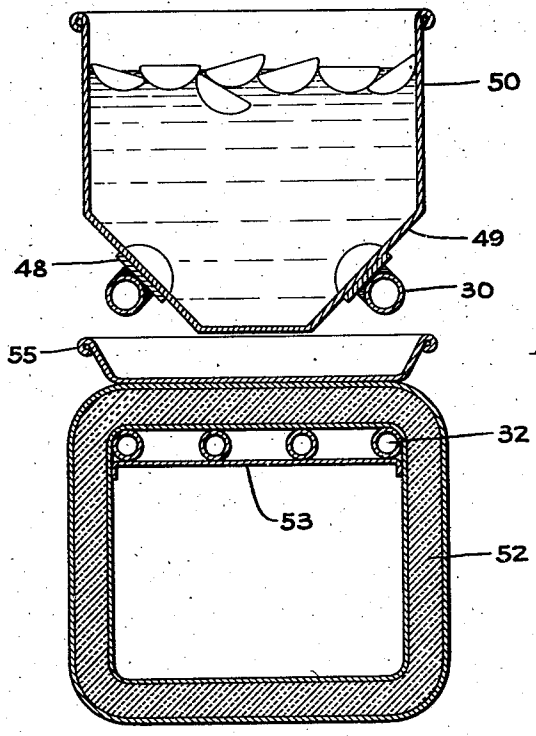


Fig.2

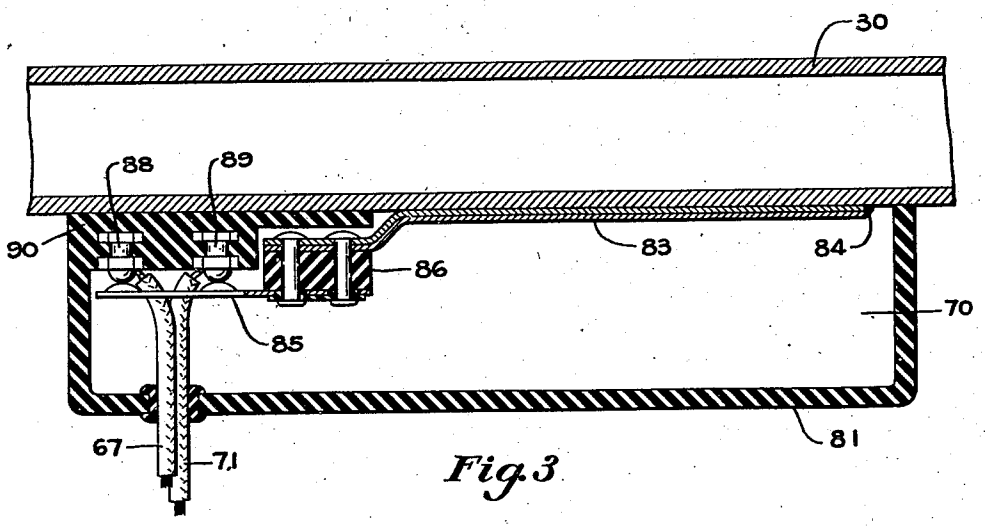


Fig.3

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UNITED STATES PATENT OFFICE

2,297,287

REFRIGERATION

George A. Brace, Winnetka, Ill., assignor to The Hoover Company, North Canton, Ohio, a corporation of Ohio

Application July 20, 1938, Serial No. 220,197

25 Claims. (Cl. 62—5)

This invention relates to the art of refrigeration and more particularly to a novel absorption refrigerating system.

According to the present invention there is provided a refrigerating system of the absorption type which includes a pair of evaporator sections connected in parallel into an inert pressure equalizing medium circuit and adapted to perform different functions. One evaporator section is adapted to be placed in heat transfer relationship with a body of water in order to freeze ice blocks within the body of water periodically. Means are provided to permit periodic discharge of liquid refrigerant and inert gas into the ice freezing evaporator and to discontinue such discharge of inert gas and liquid refrigerant for a period of time in order to permit previously formed ice blocks to melt free of the walls of the water container. The other evaporator section is arranged to refrigerate a low temperature refrigerating chamber.

It is a further object of the invention to provide an absorption refrigerating system in which the production of ice is regulated by a control mechanism which operates to divert certain fluids in the system from their normal paths of flow, to alter the pressure at which certain fluids are circulated, and to prevent the flow of certain fluids in the system.

It is a further object of the invention to provide a refrigerating system in which the production of ice is regulated by diverting and regulating the flow of fluids within the system without introducing any moving parts into the system to accomplish these results.

It is another object of the invention to provide a refrigerating system of the three-fluid type in which liquid refrigerant generated in the system is stored in a suitable receptacle and is utilized to prevent flow of inert gas through an ice freezing evaporator during a period during which it is desired to render the evaporator inoperative in order to free previously formed ice blocks.

It is a further object of the invention to provide a refrigerating system having a plurality of evaporators connected therein, one of which operates periodically and the other of which operates substantially continuously.

It is another object of the invention to provide a three-fluid absorption refrigerating system of the type utilizing a power driven circulator to propel a pressure equalizing medium through certain portions of the system which is controlled by varying the speed of the pressure equalizing medium circulator.

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 view illustrating a refrigerating system embodying the invention and in which the evaporator is shown in perspective.

Figure 2 is a transverse sectional elevational view of the evaporator shown in Figure 1 and associated with a suitable ice freezing water tank and a suitable low temperature insulated refrigerating compartment.

Figure 3 is a detailed view drawn to an enlarged scale illustrating the control mechanism.

Referring now to the drawings and first to Figure 1 thereof, there is illustrated a three-fluid absorption refrigerating system comprising a boiler B, an analyzer D, an air-cooled rectifier R, a tubular air-cooled condenser C, an evaporator E, a gas heat exchanger H, a tubular air-cooled absorber A, a liquid heat exchanger L, a gas burner G for heating the boiler B, and a circulating fan F which is driven by an electrical motor M. The above described elements are suitably interconnected by various conduits to form a plurality of gas and liquid circuits to which reference will be made in more detail hereinafter.

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

The application of heat to the boiler B liberates refrigerant vapor from the strong solution therein contained, which vapor then passes upwardly through the analyzer D in counterflow to strong solution flowing downwardly therethrough. Further refrigerant vapor is generated from the strong solution in the analyzer by the heat of condensation of vapor of absorption solution generated in the boiler. The refrigerant vapor is conveyed from the upper portion of the analyzer to the upper portion of the condenser C by a conduit 11 which includes the rectifier R. Any vapor of absorption solution which may pass through the analyzer is condensed in the rectifier and is returned into the boiler system through the conduit 11.

The refrigerant vapors supplied to the condenser is liquified by heat exchange with cooling air and is conveyed from the condenser into the evaporator E through a conduit 12.

The exact operation and description of the evaporator will be described in detail hereinafter, for the present it is sufficient to say that the liquid refrigerant discharged into the evaporator E evaporates into a stream of pressure equalizing medium flowing therethrough to produce refrigeration. The rich pressure equalizing medium formed in the evaporator E is conveyed therefrom through a conduit 15, the inner path of the gas heat exchanger H, and a conduit 16, which discharges into the bottom portion of the tubular inclined air-cooled absorber A. The pressure equalizing medium flows upwardly

through the absorber A in counterflow relationship to absorption solution flowing downwardly therethrough. The refrigerant vapor content of the rich pressure equalizing medium is absorbed in the solution in the absorber and the heat of absorption is rejected to cooling air flowing over fins mounted on the exterior walls of the absorber vessel. The lean pressure equalizing medium formed in the absorber is conveyed from the upper portion thereof into the suction inlet of the circulating fan F by a conduit 18. The pressure equalizing medium is placed under pressure by the fan and is discharged therefrom through a conduit 20 into the outer path of the gas heat exchanger H. The pressure equalizing medium is then conveyed from the outer path of the gas heat exchanger H into the evaporator E by a conduit 21.

The lean solution formed in the boiler B by the generation of refrigerant vapor is drained therefrom through a conduit 23, the inner path of the liquid heat exchanger L, and a conduit 24 which opens into the upper portion of the absorber A. It is apparent that the upper portion of the absorber A is at an elevation considerably above the liquid level prevailing in the boiler-analyzer system wherefore some means must be provided in order to elevate the weak solution into the absorber. For this purpose, a small bleed-off conduit 25 is connected between the discharge conduit 20 of the circulating fan F and the weak solution conduit 24 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 through the absorber by gravity in counterflow relationship to the rich pressure equalizing medium refrigerant vapor mixture conveyed into the bottom portion of the absorber from the evaporator as previously described. The strong solution formed in the absorber is drained from the bottom portion thereof through a conduit 27 into the outer path of the liquid heat exchanger L from which the strong solution is then conveyed to the upper portion of the analyzer D by a conduit 28.

The evaporator comprises an upper U-shaped ice freezing conduit 30 and a lower W-shaped fast-freezing regfrigerating conduit 32 which is connected to the inert gas supply and return pipes 21 and 15, respectively.

The inert gas supply conduit 21 opens into a gas blocking and liquid refrigerant storage chamber 34 which is divided into a pair of chambers by a partition wall 35 which extends from the top wall of the chamber 34 to a point slightly spaced above the bottom thereof. The conduit 21 opens into the chamber 34 at the top thereof and on the left hand side of the partition 35, as viewed in Figure 1. A conduit 37 connects one leg of the evaporator conduit 30 to the top portion of the chamber 34 on the right hand side of the partition 35, as viewed in Figure 1. The other leg of the U-shaped conduit 30 connects directly into the inert gas return conduit 15.

The liquid refrigerant discharge conduit 12 opens into the conduit 30 adjacent its point of connection with the gas supply conduit 37. A gas lift pump conduit 39 is connected between the bottom portion of the conduit 12 adjacent the condenser and the vessel 34 on the right hand side of the partition 35. The conduit 39 includes a U-shaped portion extending below the conduit 12. A small gas bleed conduit 40 is connected between the bleed conduit 25 and the gas lift conduit 39 below the level of its point of connection to the liquid conduit 12. A syphon conduit 41 is connected to the conduit 12 between the point of connection of the gas lift pump and the evaporator thereto. The syphon conduit 41 extends upwardly to a level well above the bottom of the vessel 34 and then turns downwardly within the vessel 34 on the left hand side of the partition 35. The free end of the syphon conduit 41 extends to a level adjacent the bottom portion of the vessel 34 and below the bottom portion of the partition 35.

A drain conduit 44 is connected to the conduit 30 adjacent the gas outlet portion thereof and opens into the gas inlet portion of the conduit 32 after extending therebelow to form a U-shaped liquid seal. A small dam 45 is mounted within the gas outlet portion of the conduit 30 to prevent liquid refrigerant from flowing into the conduit 15.

Referring now to Figures 1 and 2, the functions of the various evaporator sections will be described in connection with certain other structures of the apparatus. Each leg of the U-shaped conduit 30 is provided with a plurality of inclined spaced freezing pads 48 which are adapted to receive the tapered bottom portion 49 of a water container 50. The evaporator section 32 is mounted in the top portion of a heavily insulated freezing and low temperature storage compartment 52 which is positioned directly below and spaced from the water tank 50. The evaporator section 32 lies in the top portion of the compartment 52 and is separated from the interior thereof by a suitable partition 53. The compartment 52 is heavily insulated on all sides and is provided with any suitable form of insulated door to provide access thereto.

A drip tray 55 may be mounted on the upper portion of the chamber 52 to underlie the bottom portion of the tank 50 and the U-shaped evaporator 30.

The gas burner G is supplied with fuel from any suitable source by a conduit 57 which includes a valve 56 operated by a solenoid S. The gas burner G is preferably of the type having a suitable safety cut-off mechanism incorporated therein which will discontinue all supply of fuel thereto in the event of complete flame failure at the burner. A small by-pass conduit 58 is provided around the valve 56 in order to obtain a small igniting or pilot flame on the burner G during periods of closure of the valve 56.

Electrical energy is supplied to the apparatus from a suitable source of supply through a pair of wires 60 and 61. The wire 61 connects directly to the circulating motor M and a wire 62 is connected between the wire 61 and the solenoid S for the valve 56. The wire 60 connects directly to one terminal of a suitable thermostatic switch mechanism 64. The mechanism 64 is illustrated diagrammatically herein; it may be any suitable or desired form of thermostatic refrigerating control switch mechanism which is adapted to be mounted within a refrigerating compartment to respond to the temperature condition of that compartment. The other terminal of the control mechanism 64 is connected to a wire 65 which connects to a wire 67 running to the solenoid S. One terminal of a thermostatic switch mechanism indicated generally at 70 and to be described more fully hereinafter is also directly connected to the wire 67. The other terminal of the thermostatic switch mechanism 70 is connected by a wire 71 to a wire 72 which connects directly to the circu-

lating motor M. A suitable resistance element 73 is connected between the wires 67 and 72 in parallel relationship with the thermostatic switch 70.

The thermostatic switch 70 comprises a housing 81 constructed of insulating material and fastened to any suitable portion of the evaporator conduit 30. As illustrated in Figure 1, the housing 81 is shown as being mounted in the bight portion of the U-shaped conduit 30 but any other suitable portion of that conduit may be utilized for mounting the housing if desired. Within the housing 81 a bimetallic thermostatic element 83 is rigidly attached at one end to the conduit 30 in any suitable manner as indicated at 84. A switch contact bridging element 85 is firmly attached to an insulating block 86 which is rigidly mounted on the free end of the bimetallic thermostatic element 83. The contact element 85 is positioned to contact a pair of electrical circuit controlling elements 88 and 89 which are embedded in an enlarged portion 90 of the insulating housing 81. The electrical wires 67 and 71 are connected to the contacts 88 and 89, respectively, whereby the contact strip 85 is adapted to close the circuit between those wires and thereby to short circuit the resistance element 73.

The operation of this invention is as follows: Assuming that the apparatus has been inoperative and that the refrigerating chamber has reached a temperature above that for which the thermostatic control mechanism 64 is set, the thermostatic control 64 will be operated to energize the circulating motor M and the solenoid S to open the valve 56 to circulate the inert gas and to supply fuel to the burner G to generate refrigerant vapor. Refrigerant vapor will then be generated in the boiler, liquified in the condenser and discharged through the conduit 12 into the evaporator conduit 30. The inert gas will be circulated by the fan F and will be discharged into the conduit 21. A small portion of the gas will flow through the conduit 32, which is considerably smaler in diameter than the conduit 30, and may be provided with a restriction, if desired, to limit the flow of gas therethrough. The remainder of the inert gas will flow through the conduit 21, the chamber 34, the conduit 37, and the U-shaped conduit 30 from which it will be returned to the conduit 15. Due to the fact that the evaporator conduit 30 is relatively warm, the thermostatic element 83 within the switch housing 81 will be flexed in a counterclockwise direction, as viewed in Figure 3, to open the circuit between the wires 67 and 71, thereby placing the resistance element 73 in series with the circulating motor M with the result that the speed of the motor will be something less than the maximum.

Under these conditions, the circulating fan F does not develop sufficient pressure to operate the gas lift pump 39 and all liquid refrigerant formed in the condenser flows directly through the conduit 12 into the evaporator conduit 30 through which it flows by gravity in parallel relationship with the inert gas supplied through the conduit 37 as it is evaporating into the inert gas to produce refrigeration. Any liquid refrigerant not evaporated in the conduit 30 flows through the U-shaped trap conduit 44 into the evaporator section 32 through which the liquid refrigerant flows in parallel with the inert gas stream to refrigerate the insulated compartment 52.

The greatest refrigerating load occurs on the conduit 30 and only a small portion of the liquid refrigerant ever reaches the conduit 32. This is justified by reason of the fact that the heavy insulation on the small compartment 52 makes the refrigerating load on that compartment relatively low under all conditions, even though the interior of the chamber 52 is maintained at a very low temperature while it is substantially full of foodstuffs or of material to be frozen.

The above described operation continues until ice blocks have formed on those portions of the inclined bottom 49 of the tank 50 in direct thermal contact with the freezing pads 48. When such ice blocks form to a predetermined thickness, the temperature of the conduit 30 will drop to a very low value which will then cause the thermostat 83 to flex in a clockwise direction, as viewed in Figure 3, to close the circuit between the wires 67 and 71. When this occurs, the resistance element 73 is short-circuited out of the motor circuit and the motor operates at its maximum speed. When the motor is operating at maximum speed, the fan develops sufficient pressure to operate the gas lift pump 39 and all liquid refrigerant flowing through the conduit 12 is elevated into the chamber 34. The increased fan pressure tends to cause an increase in the rate of flow of absorption solution due to the greater quantity of gas discharged from the bleed conduit 25. If this increase approaches objectionable proportions, any suitable form of flow regulating means, such as that disclosed in my copending application Serial No. 220,195, filed July 20, 1938, now Patent No. 2,264,292, may be incorporated in the solution circuit.

The liquid refrigerant discharged through the conduit 39 into the chamber 34 very quickly seals the bottom portion of that tank in conjunction with the partition 35 and prevents the discharge of inert gas into the conduit 37 and hence into the evaporator conduit 30. Under these conditions neither liquid refrigerant nor inert gas is being supplied to the conduit 30 and previously formed ice blocks melt free of the bottom wall of the tank 49 and float to the surface of the water therein contained where they remain until ladled out for use. This operation will continue until the temperature of the conduit 30 again reaches a sufficiently high value to actuate the thermostat 83 to open the circuit between the wires 67 and 71 to again slow down the motor by inserting the resistor 73 in series therewith. During the period when the liquid refrigerant is collecting in the tank 34 there will be no refrigeration produced in the evaporator section 32 except that produced by liquid refrigerant present in the evaporator 30 when the inert gas supply thereto was cut off, by reason of any liquid refrigerant which may flow through the conduit 12 without being diverted into the gas lift pump 39 and by any liquid which may flow through the syphon 41 as explained below.

The chamber 34 is so proportioned that the syphon 41 will always become active at least shortly before the conduit 30 reaches a temperature high enough to cause the thermostat 83 to open the circuit between the wires 67 and 71. Once the syphon 41 has become active, it will syphon out substantially all the liquid refrigerant in the compartment 34 into the liquid refrigerant supply line 12 leading to the evaporator conduit 30. However, the capacity of the syphon 41 is substantially equal to but not greater than the capacity of the gas lift pump 39 so that the syphon 41 is never able to lower the level of the liquid refrigerant in the compartment 34 an amount sufficient to permit inert gas

flow therethrough prior to the time at which the thermostatic mechanism 70 operates to decrease the fan speed. Any liquid refrigerant discharged by the syphon 41 during the high speed cycle of the circulating motor simply flows through the evaporator section 38 and the conduit 44 into the fast-freezing chamber refrigerating coil 32 where it evaporates into the inert gas stream flowing through that coil to produce refrigeration.

After the control mechanism has operated to decrease the speed of the circulating motor, the liquid refrigerant flows directly through the conduit 12 into the evaporator section 38 as before, but it is augmented by a stream of liquid refrigerant discharging through the syphon conduit 41 from the compartment 34. However, refrigeration is not produced in the ice freezing conduit 38 until the syphon 41 has emptied the compartment 34 of a quantity of refrigerant sufficient to permit inert gas to flow therethrough. Liquid refrigerant discharging through the conduits 41 and 12 into the evaporator 38 prior to supply of inert gas to the evaporator 38 is ultimately discharged through the conduit 44 into the fast-freezing evaporator 32. The capacity of the tank 34 is not large wherefore the syphon conduit 41 will empty the same in a short period of time after the control 70 has acted to decrease the speed of the motor M. This period of time will insure that all ice blocks previously formed within the tank 50 have melted free thereof prior to resumption of the refrigerating effect in the conduit 38 and that an adequate amount of refrigerant is supplied to the coil 32. The liquid refrigerant discharged into the horizontal fast-freezing coil 32 spreads throughout the length thereof, which is extensive as shown, and slowly evaporates into the inert gas stream flowing through that coil.

The above described cycles of operation continue so long as the temperature within the main storage compartment of the refrigerator remains above the value for which the thermostatic control mechanism 64 is set to de-energize the refrigerating system. As long as the refrigerating system is operative the air within the main refrigerating storage compartment is refrigerated by flowing over the extensive surface of the tank 50 and over the freezing coil 38. Due to the fact that the coil 38 is only periodically operative and also because of the fact that the temperature of the exposed walls of the water tank 50 never reach a temperature below the freezing point of water, there is very little frost collection on the evaporator. The small amount of frost which does collect on the coil 38 at each cycle thereof is melted off and flows into the receptacle 55 during the ice melting period of the refrigerator. This serves to maintain the humidity within the refrigerating compartment at a high value which effectively increases the food preserving qualities of the refrigerating system.

The particular control herein disclosed automatically regulates the production of ice to seasonal demand therefore for the following reasons. During periods of warm weather when the demand for ice is greatest the loss of heat from the principal refrigerated compartment will be accelerated which will cause the control mechanism 64 to cycle the refrigerating apparatus more frequently and will thereby produce a large quantity of ice. On the other hand during periods of cool weather when the demand for ice is at a minimum, the loss of heat through the walls of the refrigerating cabinet will also be at a minimum which will automatically decrease the active periods of the refrigerating apparatus and hence the production of ice.

The above described apparatus is particularly advantageous by reason of the fact that it may be mounted in any desired type of refrigerator cabinet and will automatically produce a large quantity of ice blocks freely floating in a body of water whereby any desired number of such blocks may conveniently be removed from the refrigerating apparatus simply by ladling them out of the body of water. In addition to the provision of means for freezing ice blocks and for cooling the refrigerating chamber, a low temperature insulated freezing compartment is provided.

The apparatus is particularly efficient by reason of the fact that the ultimate destination of the liquid refrigerant is governed by the speed of the fan for circulating the pressure equalizing medium which in turn is thermostatically controlled by a mechanism entirely without the refrigerating system, whereby complete control of the flow of fluids within the system is achieved without the intervention of moving parts. Additionally, the liquid refrigerant is utilized to allow or prevent the flow of inert gas through certain portions of the evaporator whereby the production of refrigeration within the ice freezing evaporator section is impossible during periods of operation of the gas lift pump 39 by reason of the fact that liquid refrigerant will not evaporate in the conduit 38 unless an inert gas is flowing therethrough.

While I have illustrated and described a particular embodiment of the invention in detail, the invention is not to be limited thereto but may be embodied in other constructional forms and variations without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. Refrigerating apparatus comprising a cooling unit, means for supplying a cooling medium to said cooling unit, means for propelling a pressure equalizing medium through said cooling unit, refrigeration demand responsive means for diverting cooling medium flowing to said cooling unit into a storage vessel in the path of flow of the pressure equalizing medium, means in said vessel adapted to cooperate with cooling medium supplied thereto to block the flow of pressure equalizing medium to said cooling unit, and a syphon connected to drain the cooling medium from said vessel when the liquid level therein reaches a predetermined value.

2. Refrigerating apparatus comprising an evaporator, a liquid refrigerant supply means opening into said evaporator, means for supplying a pressure equalizing medium to said evaporator, a liquid refrigerant storage and gas blocking vessel interposed in said pressure equalizing medium supply means, a temperature responsive means operative to divert liquid refrigerant from the said liquid refrigerant supply means into said vessel in response to a predetermined temperature condition of said evaporator, means within said vessel adapted to cooperate with liquid refrigerant supplied thereto to block the flow of inert gas therethrough, and a syphon connected to discharge liquid refrigerant from said vessel after a predetermined quantity of liquid has been collected therein.

3. Refrigerating apparatus comprising a cooling unit, a cooling medium supply means connect-

ed to said cooling unit, temparature responsive means for intermittently storing liquid refrigerant in a storage vessel, and means for flowing liquid refrigerant from said storage vessel into said cooling unit after a predetermined collecting period.

4. Refrigerating apparatus comprising an evaporator including an ice freezing section and a compartment cooling section, means for supplying inert gas to each of said sections, means for supplying liquid refrigerant to said ice freezing section, means for conveying unevaporated refrigerant from said ice freezing section into said cooling section, a liquid gas seal device in the inert gas supply means for said ice freezing evaporator, means for diverting the liquid refrigerant from said supply means into said gas seal device, means for syphoning liquid refrigerant from said gas seal device into said ice freezing evaporator section, and control means for regulating said diversion means.

5. Absorption refrigeration apparatus comprising a boiler, an absorber, a plurality of evaporating elements, power driven means for propelling a pressure equalizing medium through a circuit including said absorber and said evaporating elements, means for liquefying refrigerant vapor generated in the boiler, means for supplying such liquid refrigerant to one of said evaporating elements, means for draining unevaporated refrigerant from said one evaporating element into another evaporating element, a liquid operated blocking device for preventing the flow of pressure equalizing medium through said first mentioned evaporating element, a gas lift pump operated by pressure equalizing medium supplied from said circuit for diverting liquid refrigerant from said supply means into said blocking device, means for draining liquid refrigerant from said blocking device into said first mentioned evaporating element, and means for controlling the operation of said gas lift pump.

6. Absorption refrigeration apparatus comprising a boiler, an absorber, a plurality of evaporating elements, power driven means for propelling a pressure equalizing medium through a circuit including said absorber and said evaporating elements, means for liquefying refrigerant vapor generated in the boiler, means for supplying such liquid refrigerant to one of said evaporating elements, means for draining unevaporated refrigerant from said one evaporating element into another evaporating element, a liquid operated blocking device for preventing the flow of pressure equalizing medium through said first mentioned evaporating element, a gas lift pump operated by pressure equalizing medium supplied from said circuit for diverting liquid refrigerant from said supply means into said blocking device, means for draining liquid refrigerant from said blocking device into said first mentioned evaporating element, and means responsive to the temperature of said first mentioned evaporating element for varying the pressure at which said power driven means circulates the pressure equalizing medium to render said gas lift pump operative or inoperative in response to refrigeration demands.

7. Absorption refrigeration apparatus comprising a boiler, an absorber, a plurality of evaporating elements, power driven means for propelling a pressure equalizing medium through a circuit including said absorber and said evaporating elements, means for liquefying refrigerant vapor generated in the boiler, means for supplying such liquid refrigerant to one of said evaporating elements, means for draining unevaporated refrigerant from said one evaporating element into another evaporating element, a liquid operated blocking device for preventing the flow of pressure equalizing medium through said first mentioned evaporating element, a gas lift pump operated by pressure equalizing medium supplied from said circuit for diverting liquid refrigerant from said supply means into said blocking device, means for draining liquid refrigerant from said blocking device into said first mentioned evaporating element, a liquid operated blocking device for preventing the flow of pressure equalizing medium through said first mentioned evaporating element, a gas lift pump operated by pressure equalizing medium supplied from said circuit for diverting liquid refrigerant from said supply means into said blocking device, means for draining liquid refrigerant from said blocking device into said first mentioned evaporating element, and means responsive to the temperature of said first mentioned evaporating element for varying the pressure at which the power driven means circulates the pressure equalizing medium to render said gas lift pump operative or inoperative in response to refrigeration demands, said means for draining liquid from said blocking device comprising a syphon having a capacity not greater than the capacity of said gas lift pump and arranged to become operative when the liquid level in said blocking device reaches a predetermined value and to remove sufficient liquid from said blocking device to permit the pressure equalizing medium to flow therethrough.

8. Absorption refrigeration apparatus comprising a boiler, an absorber, a plurality of evaporating elements, power driven means for propelling a pressure equalizing medium through a circuit including said absorber and said evaporating elements, means for liquefying refrigerant vapor generated in the boiler, means for supplying such liquid refrigerant to one of said evaporating elements, means for draining unevaporated refrigerant from said one evaporating element into another evaporating element, said first mentioned evaporating element having a plurality of spaced heat conductors thereon, a water tank resting on said heat conductors, a liquid operated blocking device for preventing the flow of pressure equalizing medium through said first mentioned evaporating element, a gas lift pump operated by pressure equalizing medium supplied from said circuit for diverting liquid refrigerant from said supply means into said blocking device, means for draining liquid refrigerant from said blocking device into said first mentioned evaporating element, means for supplying electrical energy to said power driven means, a resistance element in series with said power driven means adapted to reduce the speed thereof to a value such that said power-driven means does not develop sufficient pressure in said pressure equalizing medium to operate said gas lift pump, a thermostatic switch connected in parallel with said resistance element adapted to respond to the temperature of said first mentioned evaporating element, and means responsive to the formation of ice blocks of a predetermined thickness within those portions of said water tank resting on said heat conductors for increasing the pressure at which the pressure equalizing medium is supplied to said gas lift pump for rendering said pump operative and for decreasing the pressure at which the pressure equalizing medium is supplied to said pump to render the same inoperative when previously formed ice blocks have melted free of those portions of said water tank in heat exchange relationship with said heat conductors.

9. Absorption refrigeration apparatus comprising a boiler, an absorber, a plurality of evaporating elements, power driven means for pro-

pelling a pressure equalizing medium through a circuit including said absorber and said evaporating elements, means for liquefying refrigerant vapor generated in the boiler, means for supplying such liquid refrigerant to one of said evaporating elements, means for draining unevaporated refrigerant from said one evaporating element into another evaporating element, said first mentioned evaporating element having a plurality of spaced heat conductors thereon, a water tank resting on said heat conductors, an insulated low temperature refrigerating chamber in heat exchange relationship with said second mentioned evaporating section, a liquid operated blocking device for preventing the flow of pressure equalizing medium through said first mentioned evaporating element, a gas lift pump operated by pressure equalizing medium supplied from said circuit for diverting liquid refrigerant from said supply means into said blocking device, means for draining liquid refrigerant from said blocking device into said first mentioned evaporating element, and means responsive to the temperature of said first mentioned evaporating element for varying the pressure at which said power driven means circulates the pressure equalizing medium to render said gas lift pump operative or inoperative in response to refrigeration demands.

10. Refrigerating apparatus comprising an ice freezing evaporator, a chamber cooling evaporator, means for propelling a pressure equalizing medium through said evaporators, means connecting said evaporators to said propelling means in parallel relationship, means for supplying liquid refrigerant to said evaporators, and means for discontinuing the supply of liquid refrigerant and pressure equalizing medium to said ice freezing evaporator without discontinuing the circulation of pressure equalizing medium through said chamber cooling evaporator.

11. Refrigerating apparatus comprising an ice freezing evaporator, a chamber cooling evaporator, means for propelling a pressure equalizing medium through said evaporators, means connecting said evaporators to said propelling means in parallel relationship, the arrangement being such that the major portion of the pressure equalizing medium flows through said ice freezing evaporator, means for supplying liquid refrigerant to said evaporators, and means for intermittently discontinuing the supply of liquid refrigerant and pressure equalizing medium to said ice freezing evaporator.

12. That improvement in the art of refrigeration which includes the steps of supplying refrigerant liquid and a pressure equalizing medium to an evaporating zone, intermittently collecting the liquid in the path of supply of the pressure equalizing medium to block flow thereof by a body of refrigerant liquid and then draining the pressure equalizing medium flow blocking body of refrigerant liquid into the evaporating zone.

13. That improvement in the art of refrigeration which includes the steps of supplying refrigerant liquid and a pressure equalizing medium to an evaporating zone, intermittently increasing the pressure of the pressure equalizing medium and introducing a portion of the pressure equalizing medium at the increased pressure into the liquid refrigerant to divert the liquid into the path of the main body of pressure equalizing medium enroute to the evaporating zone, blocking the flow of pressure equalizing medium to the evaporating zone by a body of diverted refrigerant, decreasing the pressure of the pressure equalizing medium and discontinuing introduction of the pressure equalizing medium into the refrigerant liquid, and then draining the pressure equalizing medium flow blocking body of refrigerant liquid into the evaporating zone.

14. Refrigerating apparatus comprising an ice freezing evaporator, a water tank in heat transfer relationship with said evaporator at a plurality of points, a chamber refrigerating evaporator, means for supplying refrigerant to said evaporators, means for supplying pressure equalizing medium to said evaporators at either of two pressures, means operated by pressure equalizing medium at the higher of said two pressures only for conducting liquid refrigerant from said refrigerant supply means to a storage chamber, and means for controlling said pressure equalizing medium supply means to supply pressure equalizing medium at the higher of said two pressures when ice blocks of a predetermined size have formed in said water tank and to supply pressure equalizing medium at the lower of said two pressures when previously formed ice blocks have melted free of said tank.

15. Refrigerating apparatus comprising an ice freezing evaporator, a water tank in heat transfer relationship with said evaporator at a plurality of points, a chamber refrigerating evaporator, means for supplying refrigerant to said evaporators, means for supplying pressure equalizing medium to said evaporators at either of two pressures, means operated by pressure equalizing medium at the higher of said two pressures only for conducting liquid refrigerant from said refrigerant supply means into a storage vessel, and means for syphoning refrigerant from said storage vessel into said ice freezing evaporator when the liquid level therein reaches a predetermined value, and means for controlling said pressure equalizing medium supply means to supply pressure equalizing medium at the higher of said two pressures when ice blocks of a predetermined size have formed in said water tank and to supply pressure equalizing medium at the lower of said two pressures when previously formed ice blocks have melted free of said tank.

16. Absorption refrigerating apparatus comprising a solution circuit including a boiler and an absorber, a pressure equalizing medium circuit including an evaporator and said absorber, means for liquefying refrigerant vapor generated in said boiler, power driven means for circulating the pressure equalizing medium through its circuit, means for heating said boiler, temperature responsive means for controlling the energization of said power driven means and of said heater, means for conveying refrigerant liquid from said liquefying means into said evaporator, means responsive to the pressure at which the pressure equalizing medium is supplied to said evaporator for diverting the refrigerant liquid into the path of the pressure equalizing medium flowing to said evaporator to block such flow when such pressure exceeds a predetermined value, means for draining the blocking liquid into the evaporator after a predetermined quantity of liquid has accumulated in the path of pressure equalizing medium flow, and means responsive to the demand for refrigeration at said evaporator for regulating the pressure at which the pressure equalizing medium is supplied thereto whenever said circulator is energized by said

first mentioned temperature responsive means.

17. Refrigerating apparatus comprising a cooling unit, a water container in heat transfer relationship with said cooling unit whereby to form a body of ice in said container, means for supplying a cooling medium to said cooling unit, and condition responsive means for diverting the cooling medium into a storage vessel in response to a predetermined condition to permit said body of ice blocks frozen in said container to melt free of the wall of said container and to float on the surface of the contents thereof.

18. Refrigerating apparatus comprising a cooling unit, means for producing refrigerant liquid, means for circulating a pressure equalizing medium through said cooling unit, means for conveying refrigerant liquid from said liquid refrigerant producing means to said cooling unit, and refrigeration demand responsive means for intermittently collecting liquid refrigerant from said conveying means and for interposing a body of the collected liquid refrigerant in the path of flow of the pressure equalizing medium to block the flow of pressure equalizing medium through said cooling unit.

19. Absorption refrigeration apparatus comprising a boiler, an absorber, a plurality of evaporating elements, a motor operated pump for propelling a pressure equalizing medium through a circuit including said absorber and said evaporating elements, means for liquefying refrigerant vapor generated in the boiler, means for supplying such liquid refrigerant to one of said evaporating elements, means for draining unevaporated refrigerant from said one evaporating element into another evaporating element, a liquid operated blocking device for preventing the flow of pressure equalizing medium through said first mentioned evaporating element, a gas lift pump operated by pressure equalizing medium supplied from said circuit for diverting liquid refrigerant from said supply means into said blocking device, means for draining liquid refrigerant from said blocking device into said first mentioned evaporating element, means for supplying electrical energy to said motor, a resistance element in series with said motor adapted to reduce the speed thereof to a value such that said pump does not develop sufficient pressure to operate said gas lift pump, and a thermostatic switch connected in parallel with said resistance adapted to respond to the temperature of said first mentioned evaporating element.

20. Refrigerating apparatus comprising a cooling unit, cooling medium supply means, means for intermittently storing cooling medium and for intermittently discharging stored cooling medium into said cooling unit, said last mentioned means including a collecting vessel, a syphon arranged to empty the cooling medium collected in said vessel into said cooling unit, and means for circulating a pressure equalizing medium through said cooling unit, said circulating means including said collecting vessel and being arranged to block flow of said pressure equalizing medium by liquid collected in said collecting vessel.

21. Refrigerating apparatus comprising an evaporator, a water container in heat exchange relationship therewith, means for supplying pressure equalizing medium and refrigerant liquid to said evaporator, means for diverting liquid refrigerant from said supply means into a collecting vessel, means within said collecting vessel for preventing supply of pressure equalizing medium to said evaporator when the liquid therein reaches a predetermined depth, and means for emptying said collecting vessel when a predetermined quantity of refrigerant liquid has been collected therein, said apparatus being so constructed and arranged that ice blocks will be formed in said container when refrigerant is supplied to said evaporator and previously formed ice blocks will melt free of the walls of said container during the period in which refrigerant liquid is supplied to said vessel.

22. Absorption refrigerating apparatus comprising an evaporator, liquid refrigerant producing means, means for intermittently discharging a predetermined quantity of liquid refrigerant into said evaporator comprising a container, means for conveying liquid refrigerant from said producing means to said container, and a syphon connecting said container and said evaporator arranged to become operative when the liquid level in said container reaches a predetermined level and then to drain said container, and means for circulating an inert gas through said evaporator.

23. Absorption refrigerating apparatus comprising an evaporator, liquid refrigerant producing means, means for intermittently discharging a predetermined quantity of liquid refrigerant into said evaporator comprising a container, means for conveying liquid refrigerant from said producing means to said container, and a syphon connecting said container and said evaporator arranged to become operative when the liquid level in said container reaches a predetermined level and then to drain said container, and means for circulating an inert gas through said evaporator, said container being serially connected to said evaporator for flow of inert gas therethrough and arranged to block such flow when a predetermined quantity of liquid has collected therein.

24. That improvement in the art of refrigeration which includes the steps of continuously generating liquid refrigerant, collecting the refrigerant in a storage zone, intermittently discharging collected refrigerant into an evaporating zone in heat transfer relationship with a body of material to be frozen at a plurality of freezing zones, evaporating the refrigerant to produce bodies of frozen material, and discontinuing the discharge of refrigerant into the evaporating zone while collecting a fresh body thereof to allow the previously frozen bodies to leave the proximity of the evaporating zone.

25. An absorption refrigerating system comprising an inert gas circuit including an evaporator and an absorber, a boiler, liquid conveying means connecting said boiler and said absorber for flow of absorbing liquid therethrough, means for liquefying refrigerant vapor generated in said boiler, liquid conveying means for conducting refrigerant liquid from said liquefying means to said evaporator, and means in said liquid refrigerant conducting means for intermittently collecting the refrigerant liquid supplied thereto to alter the operation of the system and for thereafter discharging the collected liquid to allow normal operation of the system to be resumed, said collecting means being included in said inert gas circuit, the arrangement being such that collection of a predetermined quantity of liquid refrigerant will block the flow of inert gas until such collected liquid is discharged.

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