Jan. 5, 1943. A. D. SIEDLE 2,307,165

REFRIGERATION

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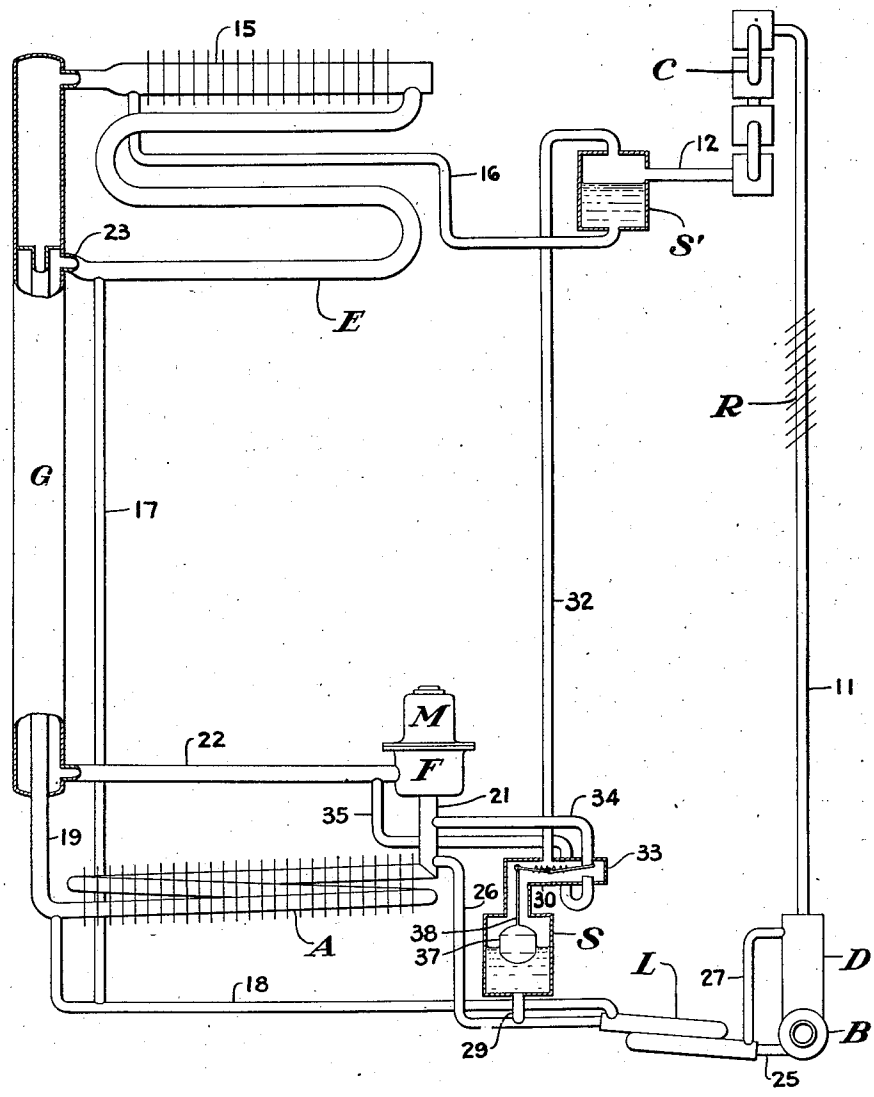


Fig. 1

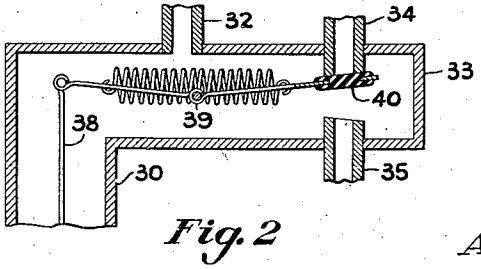


Fig. 2

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REFRIGERATION

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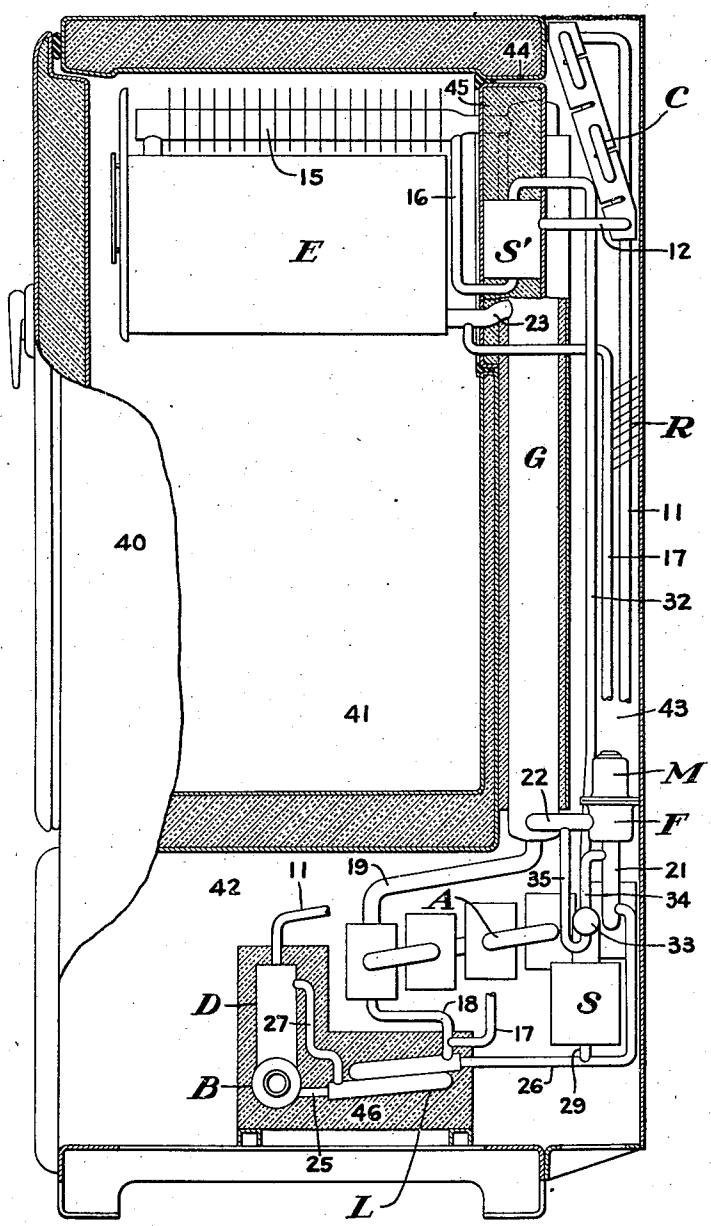


Fig. 3

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REFRIGERATION

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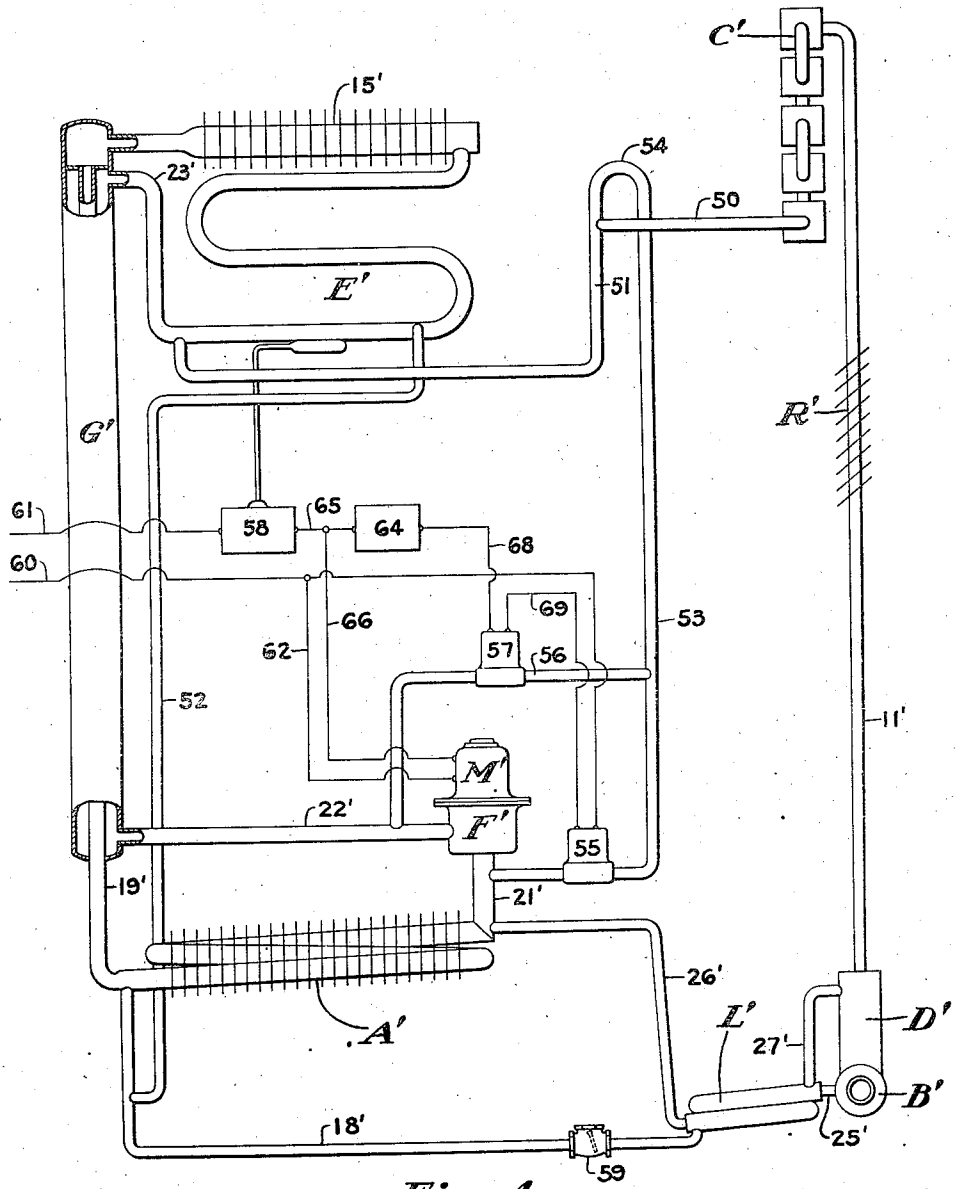


Fig. 4

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REFRIGERATION

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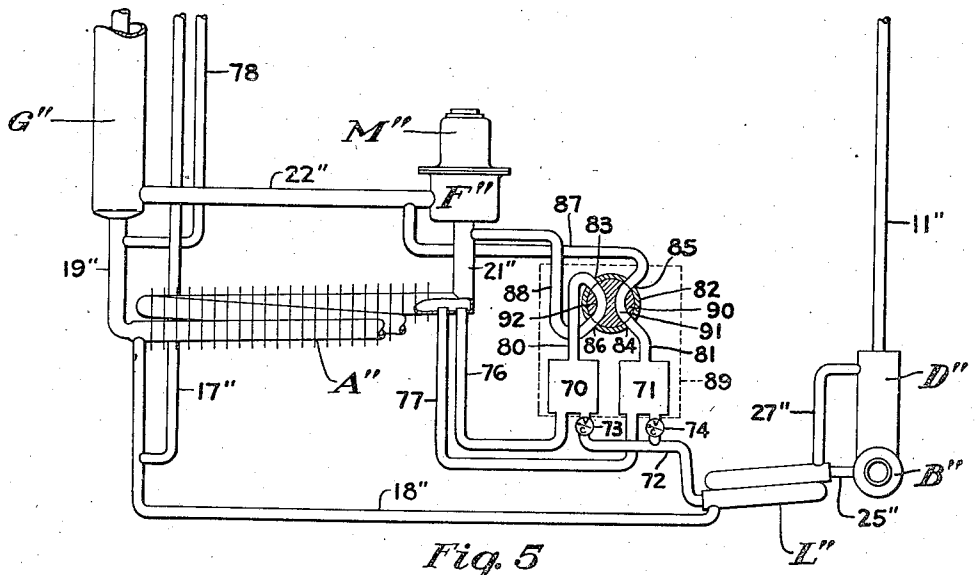


Fig. 5

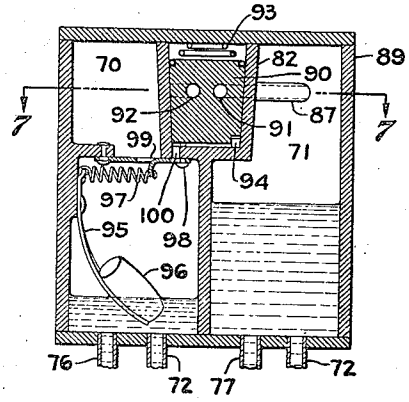


Fig. 6

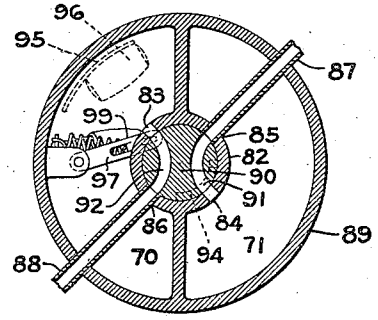


Fig. 7

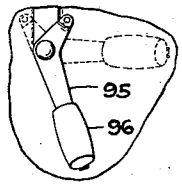


Fig. 8

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Patented Jan. 5, 1943 2,307,165

UNITED STATES PATENT OFFICE

2,307,165

REFRIGERATION

Arnold D. Siedle, Canton, Ohio, assignor to The Hoover Company, North Canton, Ohio, a corporation of Ohio

Application July 8, 1939, Serial No. 283,351

17 Claims. (Cl. 62—5)

The present invention relates to the art of refrigeration and more particularly to a novel absorption refrigerating system including an improved method of circulating various fluids therethrough.

It is a principal object of this invention to provide an absorption refrigerating system of the three-fluid type in which circulation of fluids through the various circuits thereof is achieved by utilization of the static pressure differentials extinguish in various portions of the apparatus.

It is another object of the present invention to provide an absorption refrigerating apparatus of the three-fluid type in which circulation of the fluids is achieved by alternately connecting various portions of the apparatus to high and low pressure areas therein.

It is still another object of the present invention to provide a three-fluid absorption refrigerating system of the type utilizing a power driven inert gas circulator to circulate the inert gas from which circulation of the liquid is achieved by means of static pressure differentials produced by the power driven inert gas circulator.

It is a still further object of the present invention to provide a three-fluid absorption refrigerating apparatus of the type utilizing a power driven circulator for the inert gas circuit in which circulation of liquid is achieved by alternately connecting various portions of the apparatus to the suction and discharge sides of the circulator.

It is a further object of the present invention to provide a three-fluid absorption refrigerating apparatus in which circulation of the absorption solution is achieved by periodically varying the pressures to which certain portions thereof are subjected.

It is another object of the present invention to provide an absorption refrigerating system in which the liquid refrigerant is elevated from the bottom portion of the condenser into the upper portion of the evaporator by periodically subjecting the condenser evaporator line to high and low pressures.

It is a further object of the present invention to provide an absorption refrigerating system in which substantially continuous circulation of absorption solution between the boiler and absorber is achieved by periodically subjecting a plurality of portions of the absorption solution circuit to the pressure differentials normally existing in various parts of the apparatus.

Other objects and advantages 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 an absorption refrigerating apparatus embodying the present invention.

Figure 2 is a view of a detail drawn on an enlarged scale.

Figure 3 represents the apparatus of Figures 1 and 2 assembled in a domestic refrigerator cabinet.

Figure 4 is a diagrammatic representation of a modified form of the invention.

Figure 5 is a partial diagrammatic representation of another modification of the invention.

Figure 6 is a vertical sectional view on an enlarged scale of a valve assembly.

Figure 7 is a view taken substantially on the line 7—7 of Figure 6.

Figure 8 is a view of a detail of Figure 6.

Referring now to the drawings in detail and first to Figures 1 and 2 thereof, there is disclosed a three-fluid absorption refrigerating system comprising a boiler B, an analyzer D, an air-cooled rectifier R, a tubular air-cooled condenser C, a liquid refrigerant reservoir S', an evaporator E, a gas heat exchanger G, an air-cooled tubular inclined absorber A, a liquid heat exchanger L, a solution reservoir S, and a circulating fan F which is driven by an electrical motor M. The above mentioned elements are connected by suitable conduits to form a plurality of gas and liquid circuits, to which reference will be made in more detail hereinafter, constituting a complete refrigerating system.

The above described system will be charged with a suitable refrigerant, such as ammonia, a suitable absorbent therefor, such as water, and an inert pressure equalizing medium preferably a dense inert gas like nitrogen.

The boiler B may be suitably heated as by an electrical cartridge heater or a combustible fuel burner.

The control mechanism for the circulating motor M and for the boiler heater, not shown, may be of any desired or preferred type. A preferred construction is disclosed and claimed in the co-pending application of Curtis C. Coons, Serial No. 148,424, filed June 16, 1937, now Patent No. 2,228,343, dated January 14, 1941.

The application of heat to the boiler B generates refrigerant vapor from the solution of refrigerant vapor and absorption solution normally therein contained. The vapor so generated passes upwardly through the analyzer D in counterflow relationship to strong solution flow-

ing downwardly therethrough. After passing through the analyzer the refrigerant vapor is conveyed therefrom to the upper portion of the condenser C by means of the conduit 11 which includes the rectifier R. The refrigerant vapor is liquefied in the condenser by heat exchange with cooling air and is discharged from the bottom portion thereof into the liquid refrigerant reservoir S' by means of a conduit 12.

The liquid refrigerant collecting in the reservoir S' is conveyed therefrom to the finned box-cooling conduit 15 of the evaporator E by means of a conduit 16. The motive force to be applied to the fluid in order to convey the same from the reservoir to the evaporator will be explained in more detail hereinafter.

The liquid refrigerant flows downwardly through the evaporator by gravity in counterflow to a lean inert gas flowing upwardly therethrough. The refrigerant liquid evaporates into the inert gas stream to produce the refrigerating effect. Any unevaporated material which is supplied to the evaporator is removed from the bottom portion thereof by means of a drain conduit 17 which connects to a strong solution return conduit 18. The evaporator E may be of any desired form of construction and is only diagrammatically illustrated herein.

The evaporation of the liquid refrigerant into the inert gas produces rich gas which is discharged from the lefthand end of the conduit 15, as viewed in Figure 1, into the gas heat exchanger G from which it is conveyed by means of a conduit 19 into the bottom portion of the absorber A.

The upper portion of the absorber A is supplied with lean absorbent solution from the boiler in a manner to be described more fully hereinafter. The absorbing solution supplied to the upper portion of the absorber A flows downwardly therethrough by gravity in counterflow relationship with the rich gas flowing upwardly therethrough. The absorbing solution absorbs refrigerant vapor from the rich gas and the heat of absorption is rejected to cooling air flowing over the exterior walls of the absorber vessel and of the air-cooling fins mounted thereon.

The lean gas thus formed in the absorber is conveyed from the upper portion thereof into the suction eye of the circulating fan F by means of a conduit 21. The circulating fan F then places the lean gas under pressure and discharges the same into the gas heat exchanger G through a conduit 22. After traversing the gas heat exchanger the lean gas is supplied to the bottom portion of the evaporator E by means of a conduit 23, thus completing the inert gas circuit.

The lean solution formed in the boiler by the generation of refrigerant vapor therefrom is conveyed from the boiler to the upper portion of the absorber A by means of the conduit 25, the liquid heat exchanger L, and the conduit 26. After passing through the absorber the resulting rich solution is conveyed from the bottom portion of the absorber to the upper portion of the analyzer D by means of the conduit 18, the liquid heat exchanger L, and the conduit 27.

It is apparent that the upper portion of the absorber is at an elevation appreciably above the liquid level normally maintained in the boiler-analyzer system and that some means must be provided to elevate the lean solution from the level of the boiler into the upper portion of the absorber. For this purpose a solution reservoir S is connected to the conduit 26 by means of a short conduit 29.

As is more clearly seen in Figure 2, the upper portion of the reservoir S is provided with an L-shaped extension indicated generally at 30. The L-shaped extension 30 communicates with the upper portion of the reservoir S' by means of a conduit 32 which is always in open communication with the reservoirs S and S'. The horizontal leg portion 33 of the L-shaped extension 30 of the reservoir S is connected to the suction conduit 21 of the inert gas fan F by means of a conduit 34 which opens into the upper portion of the leg 33. A conduit 35 is connected to the discharge conduit 22 of the circulating fan F and opens into the bottom portion of the extension 33.

A suitable float 37 is mounted in the reservoir S and is connected by means of a link 38 to a snap-acting toggle actuating mechanism 39 which carries a valve plate element 40 on its right-hand end, as viewed in Figure 2, in position to seal one or the other of the conduits 34 and 35 and thus interrupt communication between such conduits and the reservoirs S and S'. Though the apparatus has been shown in considerable detail, it will be appreciated that no attempt has been made in these patent drawings to show exact proportions, as the proportions are matters which will be apparent to those skilled in the art to which this invention relates.

The operation of the apparatus is as follows: When the control mechanism energizes the circulating motor M and the heater for the boiler B in response to a demand for refrigeration, refrigerant vapor is generated from the solution contained in the boiler and a pressure differential of a few inches of water is developed between the conduits 21 and 22 by the circulating fan. Assuming that the apparatus is in the position illustrated in Figures 1 and 2, the reservoirs S and S' will be subjected to the discharge pressure of the circulating fan by reason of the fact that the sealing plate 40 is out of contact with the conduit 35. As a consequence, the static pressure developed by the circulating fan will be applied to the contents of the reservoirs S and S' and will lower the liquid levels therein. As a result of this action the static pressure applied to the reservoir S' will discharge liquid refrigerant through the conduit 16 into the evaporator or, more specifically, the box-cooling portion 15 thereof. The static pressure applied to the reservoir S will lower the level of the contents thereof and will discharge absorption solution through the conduits 29 and 26 into the absorber A.

As the liquid level in the reservoir S drops, the float 37 lowers therewith until it actuates the toggle mechanism 39 which will snap the sealing plate 40 from contact with the conduit 34 into sealing contact with the conduit 35. The reservoirs S and S' will now be subjected to the suction pressure of the circulating fan F as will the boiler-analyzer, condenser, rectifier system. Under these conditions absorption solution will flow from the boiler into the reservoir S in sufficient quantity to raise the float 37 substantially to the position shown at which time the toggle mechanism will be actuated back to the position shown and further refrigerant and absorption solution will be discharged into the evaporator and absorber respectively in the manner described heretofore.

It is preferred that the toggle mechanism and the solution reservoirs S and S' shall be designed in such manner that circulation of absorption solution will take place in small quantities and at

very frequent intervals in order that there may be a body of absorption solution in the absorber at all times and that liquid refrigerant may be flowing through the evaporator at all times. If desired, suitable baffling means or the like may be inserted in the absorber A to slow up the flow of solution therethrough and to form pools of solution.

The conduit 32 also serves as the usual purge vent to relieve the condenser of non-condensible gases. Such non-condensible products consist principally of very small quantities of inert gas carried over into the boiler from the absorber by the strong absorbing solution. The conduits 34 and 35 serve to vent the reservoir assembly S, and consequently the condenser and reservoir S', to the inert gas circuit.

In Figure 3 there is illustrated a suitable cabinet 40 which includes an insulated storage compartment 41, a lower mechanism compartment 42, and a rear air flue 43. The refrigerating apparatus per se is suitably mounted upon a frame (not shown) and is inserted into the cabinet as a unit. The evaporator passes through a rear window 44 formed in the rear wall of the storage compartment 41. As the apparatus is assembled with the cabinet the opening 44 is closed by a suitable insulated closure element 45 which is constructed as a unit with the refrigerating apparatus per se.

As can readily be seen from Figure 3, the refrigerant solution reservoir S' is mounted within the insulated window 45 whereby the contents of the reservoir S' may not be heated with consequent loss of refrigerant capacity and vaporization of the material liquefied in the condenser.

The boiler-analyzer liquid heat exchanger assembly is encased in a suitable block of insulating material 46 and is positioned in the rear central portion of the compartment 42 with the boiler extending transversely thereof and parallel to the rear wall of the apparatus. Cooling air is admitted to the compartment 42 and to the bottom portion of the flue 43 and flows upwardly over the absorber, rectifier and condenser to cool the heat rejecting portions of the apparatus.

It is readily apparent from a perusal of Figures 1 and 3 that the condenser extends to an elevation appreciably below the upper portion of the evaporator and substantially to the lower portion thereof. This permits the evaporator to be placed in the very highest portion of the chamber 41 and permits the condenser to be made of adequate size without extending the same above the top wall of the compartment 41, all of which are highly desirable in systems of this type. Because of the fact that the refrigerant is elevated into the evaporator by the static pressure of the fan, the relative position of the condenser and evaporator may be varied within a wide range without interfering with the operation and normal design of the system. Similar latitude is allowed in the positioning of the absorber and boiler assembly.

If desired, the reservoir S' and its connections may be eliminated. In this event the condenser will be positioned above the box-cooling evaporator conduit 15 to provide gravity flow of the refrigerant from the condenser to the conduit. Another variation would be to eliminate the reservoir S' and its connections and to provide an evaporator of the type described hereinafter in connection with Figure 4.

Though the apparatus works satisfactorily as described a check valve may be installed in the rich solution conduit 18 to prevent the minor surging which occurs therein when the reservoir S is subjected to the high pressure side of the fan. Such a valve would be installed to permit flow only in the direction of the analyzer.

Referring now to Figure 4, there is disclosed a modified form of the invention. Certain portions of the apparatus illustrated in Figure 4 are identical with corresponding parts described in connection with Figures 1 to 3 and are therefore given the same reference characters primed.

In this form of the invention the evaporator is of the type in which the inert gas is propelled at a high velocity so that it will circulate the liquid refrigerant through the evaporator as the refrigerant is evaporating to produce the refrigerating effect. In this type of evaporator it is customary to supply the liquid refrigerant to the very lowest portion thereof adjacent the point at which the inert gas is supplied to the evaporator. For this purpose the condensate is led from the bottom portion of the condenser C' to the bottom portion of the evaporator E' adjacent its point of connection with the lean gas supply conduit 23' by means of the conduits 50 and 51. The bottom portion of the evaporator is provided with an overflow and anti-blockage drain indicated at 52 which connects to the strong solution return line 18'. While any desired construction of evaporator of the type in which the inert gas circulates the liquid refrigerant may be utilized, a preferred construction is disclosed and claimed in the co-pending application of Curtis C. Coons and William H. Kitto, Serial No. 386,395, filed April 2nd, 1941.

A non-return check valve 59 is inserted in the strong solution return conduit 18' and is arranged to permit flow of solution to the analyzer but to prevent return flow of solution from the analyzer conduit into the bottom portion of the absorber A'.

The suction conduit 21' of the circulating fan F'' is connected to the condenser discharge conduit 50 by means of a conduit 53 which includes an upstanding inverted U-shaped portion 54 extending appreciably above the level of the bottom portion of the condenser to prevent flooding of the conduit 53 with condensate. A solenoid valve 55 is also included in the conduit 53. The conduit 53 is connected to the discharge conduit 22' of the circulating fan F'' by means of a conduit 56 which includes a solenoid valve 57.

The operation of the apparatus is controlled by a suitable thermostatic switch mechanism indicated generally at 58 which is responsive to the temperature of the evaporator or of the refrigerated space. The thermostatic mechanism 58 will include an electrical switch and it may act directly upon a fuel valve to control the operation of the boiler B' or the fuel supply for the heater for the boiler may include a solenoid valve directly under the control of the thermostatic mechanism 58.

Energy is supplied to the apparatus from a pair of electrical conductors 60 and 61. The conductor 60 connects directly to the valve 55 and is connected to the motor M by means of a conductor 62. The conductor 61 is connected to the thermostatic control 58. The thermostatic control 58 is then connected to a motor driven timing device 64 by means of a conductor 65. The other side of the motor is connected to the conductor 65 by means of a conductor 66.

The exact construction of the timing device 64

is not illustrated or described in detail herein as such motor driven periodically interrupting switches are common and well known.

The timing device 64 is connected to the solenoid valve 57 by means of a conductor 68 and the solenoid valves 55 and 57 are connected by means of a conductor 69.

The valve 57 is of the type which is normally maintained in closed position and is opened when the solenoid is energized whereas the valve 55 is of the type which is normally maintained in open position but is moved to closed position when the solenoid is energized.

The operation of this form of the invention is as follows: When temperature conditions in the evaporator are such as to indicate a demand for refrigeration, the thermostatic mechanism 58 will energize the boiler heater and will complete the circuit between the conductors 61 and 65. This will energize the circulating motor M' and the timing device 64.

The timing device 64 will alternately energize and deenergize the solenoid valves 55 and 57 at short intervals of time. When the valves are energized the valve 55 will be moved to closed position and the valve 57 will be moved to open position. Under these conditions the full discharge pressure of the circulating fan F' will be applied to the conduit 53 and will be passed back through the conduit 50, condenser C' and conduit 11' onto the surface of the liquid in the boiler-analyzer system. This pressure will cause the liquid to back through the conduits 25' and 27'. However, the check valve 59 will prevent flow of fluids through the conduit 27' and liquid will be forced from the boiler through the conduit 25', the liquid heat exchanger L' and the conduit 26' into the absorber A' through which it will flow by gravity in counterflow relationship with rich gas discharged from the evaporator. The operation of the absorber and its possible variations are identical with those mentioned previously in connection with the form of the invention illustrated in Figures 1 to 3.

When the timing device 64 de-energizes the valves 55 and 57 the valve 57 will move to closed position and the valve 55 will move to open position whereupon the boiler-analyzer system will be subjected to the suction pressure of the fan and absorption solution will flow into the analyzer by way of conduit 18', check valve 59, liquid heat exchanger L' and the conduit 27'. This sequence of operation will continue for so long as the control 58 energizes the timing device 64 and the circulating motor M'.

Due to the fact that the bottom portion of the conduit 23' of the evaporator is subjected to the discharge pressure of the fan diminished by the resistance of the lean gas side of the gas exchanger, there will be a column of liquid in the conduit 51 of sufficient height to balance the pressure differential between the conduits 23' and 21' whenever the valve 55 is in open position. This will also serve to shield the boiler analyzer condenser system from the high pressure prevailing in the conduit 23'. However, when the valve 55 is closed and the valve 57 is open, the high pressure applied to the conduit 53 will cause a momentary excessive discharge of liquid refrigerant into the bottom portion of the evaporator. This, however, does not materially interfere with the operation of the system as the greater quantity of liquid thus discharged into the evaporator does not tend to circulate therethrough at so rapid a rate and to all practical purposes the evaporator operates as though it were supplied continuously with liquid refrigerant.

It will be understood that this form of the invention may also be provided with a refrigerant elevating arrangement such as that disclosed in connection with Figures 1 and 2 if it is desired to utilize a gravity type evaporator in place of the forced circulation evaporator disclosed in Figure 4.

Referring now to Figures 5 to 8 there is disclosed a third modification of the invention. Certain portions of the apparatus disclosed in Figure 5 are identical with elements previously described in connection with Figures 1 and 2 and are given the same reference characters double primed. The upper part of the apparatus illustrated in Figure 5 has not been illustrated in detail as the same may be conventional; it may incorporate the features such as those illustrated in Figure 1 or those illustrated in connection with Figure 4. If the Figure 1 apparatus is utilized, a conduit corresponding to the conduit 32 of Figure 1 will be connected with either of the vessels 70 or 71 in order to subject the liquid refrigerant reservoir alternately to the suction and discharge side of the circulator fan as the reservoir is subjected to one or the other thereof. On the other hand, if it is desired to use an evaporator of the type in which the liquid refrigerant flows therethrough by gravity as is illustrated in Figure 4, that type evaporator may be incorporated in the mechanism illustrated in Figure 5 exactly in the manner shown in Figure 4 except that the vent conduit 53 will be permanently connected to the suction conduit 21'' of the circulating fan F'' as is taught in the co-pending application of Justice H. Beach, Serial No. 220,204, filed July 20, 1938.

In this form of the invention the lean solution side of the liquid heat exchanger L'' is connected to a pair of reservoirs 70 and 71 by means of a conduit 72. Check valves 73 and 74 are provided in the connections to the reservoirs 70 and 71, respectively. The reservoirs 70 and 71 are each connected to the upper end of the absorber A by means of conduits 76 and 77, respectively.

The condenser is vented by a vent conduit 78 to the rich gas conduit 19'' to relieve the condenser of non-condensible products.

The reservoirs 70 and 71 are connected by means of conduits 80 and 81, respectively, to opposite ports 83 and 84 of a four-ported valve casing 82. The other opposite ports 85 and 86 of the casing 82 are connected to the discharge conduit 22'' of the circulating fan by means of the conduit 87 and to the suction conduit 21'' by means of the conduit 88, respectively. A valve plug 90 is mounted within the valve casing 82 and is provided with a pair of 90° valve passageways 91 and 92.

As is seen in Figures 6 and 7, the valve casing 82 is suspended from the top wall of a housing 89 which includes the reservoirs 70 and 71. The valve ports 83 and 84 actually open directly into the reservoirs 70 and 71, respectively, though the ducts 80 and 81 are shown in the diagrammatic representation of Figure 5 in order to illustrate the construction clearly.

The valve plug 90 is seated in the valve casing 82 by means of a coil spring 93. Movement of the valve plug is limited to 90° by means of a stop lug and channel mechanism indicated generally at 94.

The valve is actuated by means of a float mechanism which comprises a curved float arm 95 which is pivotally mounted within the chamber 70 and carries a float 96 on its lower end. The arm 95 is shaped like a bell crank, as indicated in Figure 8. The short leg of the arm 95 is connected to a snap acting mechanism 97 which engages a pin 98 in a seat on the outer end of its actuating arm 99. The pin 98 is attached to the valve plug 90 and extends through an arcuate slot 100 in the bottom wall of casing 82.

It will be seen from this that the entire mechanism for operating the valve as well as the valve itself is suitably housed within the casing 89 and that the only connections which need be attached to the walls thereof are conduits.

The operation of this form of the invention is as follows: Assume that the float is in the position illustrated in Figure 6, the conduit 87 will be connected to the reservoir 71 through the valve port 84 which will subject the fluid in that reservoir to the discharge pressure of the fan and will force the liquid through the conduit 77 into the absorber. The check valve 74 prevents the liquid from flowing backwardly through the conduit 72 into the reservoir 70 and into the boiler-analyzer system. In the meantime liquid is being supplied to the reservoir 70 from the boiler-analyzer assembly and gradually raises the float 96. When the liquid reaches a predetermined level in the reservoir 70, the float 96 will actuate the snap acting toggle mechanism 97 and the valve will operate rapidly through an arc of 90° in a counterclockwise direction, as viewed in Figure 7. Under these conditions the valve ports 83 and 85 will be connected by the valve passageway 91 and the valve ports 84 and 86 will be connected by the valve passageway 92. The reservoir 70 will now be subjected to the high pressure side of the fan and liquid will be forced therefrom into the absorber through the conduits 76, whereas the reservoir 71 will be subjected to the pressure prevailing in the suction conduit 21'' and liquid will flow from the boiler-analyzer system past the check valve 74 into the reservoir 71. The liquid level in the reservoir 70 will lower sufficiently to bring the float substantially to the position indicated in Figure 6 at which time the toggle mechanism will move over center and snap the valve to the position indicated in Figures 6 and 7 whereby the reservoir 71 may again be discharged into the absorber.

This operation continues as long as the control mechanism energizes the circulating fan.

In this form of the invention the flow of the solution into the absorber is to all intents and purposes steady and continuous with only very minor momentary interruptions at the time that the valve operates. The period of operation of the snap mechanism can be suitably regulated if desired by restricting the conduits 76 and 77 to prevent too rapid a discharge therethrough. This form of the invention is also advantageous because liquid may flow from the boiler and through the boiler-analyzer in a substantially continuous stream and is not affected in any way by the reservoirs 70 and 71 when the same are subjected to the high pressure side of the fan because of closure of the check valves 73 and 74.

It will be understood that the reservoirs 70 and 71 will be designed with reference to the size of the system with which they are to be utilized and that the illustration herein is not drawn to scale, but has been drawn to a scale believed to illustrate best the construction and operation of the apparatus. The reservoirs for domestic units will be small as they will operate frequently and will handle only small quantities of liquid per unit of time.

In accordance with the present invention there is provided a three-fluid absorption refrigerating system of the type in which the inert gas is circulated by a pressure differential developed in a portion of its circuit and in which this pressure differential is efficiently utilized to circulate the various liquids which are normally present in the system.

Though the invention has been illustrated and described in appreciable detail, various changes may be made in the construction, arrangement and proportion of parts without departing from the spirit of the invention or the scope of the appended claims.

I claim:

1. Absorption refrigerating apparatus comprising an absorber, an evaporator, a condenser and a generator connected in circuit, means for creating and maintaining a pressure differential in an inert gas circuit and for circulating the inert gas between said absorber and said evaporator, and means for intermittently subjecting other portions of said apparatus to such pressure differential to propel liquids therethrough.

2. Absorption refrigerating apparatus comprising an absorber, an evaporator, a condenser and a generator connected in circuit, a power driven circulator for circulating inert gas through a circuit including said absorber and said evaporator, and means for alternately subjecting a portion of a solution circuit including said absorber and said generator to the suction and discharge sides of said circulator to circulate absorption solution therethrough.

3. Absorption refrigerating apparatus comprising an absorber, an evaporator, a condenser and a generator connected in circuit, said condenser extending downwardly below the upper portion of said evaporator, a power driven circulator for circulating inert gas through a circuit including said evaporator and said absorber, means for conveying refrigerant liquid upwardly from the discharge portion of said condenser to the upper portion of said evaporator, and means for alternately applying the inlet and outlet pressures of said circulator to said last mentioned means to elevate liquid refrigerant into said evaporator.

4. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and an absorber, a solution circuit including a generator and said absorber, means for liquefying refrigerant vapor produced in said generator and for supplying the liquid to said evaporator, means for creating and sustaining a pressure differential in said inert gas circuit to propel the inert gas therethrough, a reservoir in said solution circuit, and means for alternately connecting said reservoir to high and low pressure areas of said inert gas circuit to propel solution through said solution circuit.

5. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and an absorber, a solution circuit including a generator and said absorber, means for liquefying refrigerant vapor produced in said generator and for supplying the liquid to said evaporator, means for creating and sustaining a pressure differential in said inert gas circuit to propel the

inert gas therethrough, a reservoir in said solution circuit, means for alternately connecting said reservoir to high and low pressure areas of said inert gas circuit to propel solution through said solution circuit, and a check valve in a portion of said solution circuit to permit flow of solution thereby only in a given direction.

6. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and an absorber, a solution circuit including a generator and said absorber, means for liquefying refrigerant vapor produced in said generator and for supplying the liquid to said evaporator, means for maintaining a substantially steady constant pressure differential in said inert gas circuit to propel the inert gas therethrough, a reservoir in said solution circuit, means connecting said reservoir to high and low pressure areas of said inert gas circuit, and means responsive to the level of the solution in said reservoir for controlling the communication between said reservoir and said connecting means.

7. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and an absorber, a solution circuit including a generator and said absorber, means for liquefying refrigerant vapor produced in said generator and for supplying the liquid to said evaporator, means for creating a pressure differential in said inert gas circuit to propel the inert gas therethrough, and means for alternately applying the pressure prevailing in high and low pressure areas of said inert gas circuit to said generator and said condenser to circulate liquids through portions of said apparatus.

8. Absorption refrigerating apparatus comprising a cabinet including an insulated storage chamber, a mechanism compartment, an inert gas circuit including an evaporator in said chamber and an absorber in said compartment, an absorption liquid circuit including a generator in said compartment and said absorber, means for creating a pressure differential in said inert gas circuit to propel inert gas therethrough, means for liquefying refrigerant vapor produced in said generator and for supplying the liquid to said evaporator, a reservoir embedded in the insulation of said chamber and communicating with a portion of the apparatus normally containing liquid, and means for periodically subjecting said reservoir to the effects of a high pressure area of said inert gas circuit to circulate liquid through that portion of the apparatus which is connected to said reservoir.

9. Absorption refrigerating apparatus comprising a cabinet including an insulated storage chamber, a mechanism compartment, an inert gas circuit including an evaporator in said chamber and an absorber in said compartment, an absorption liquid circuit including a generator in said compartment and said absorber, means for creating a pressure differential in said inert gas circuit to propel inert gas therethrough, a condenser in said compartment extending to an elevation below the upper portion of said evaporator and connected to receive refrigerant vapor from said generator, means for conveying refrigerant liquid from said condenser to said evaporator, a reservoir embedded in the insulation of said chamber and communicating with said liquid refrigerant conveying means, and means for periodically subjecting said reservoir to the effects of a high pressure area of said inert gas circuit to circulate liquid refrigerant from said condenser to said evaporator.

10. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and an absorber, a solution circuit including a generator and said absorber, means for liquefying refrigerant vapor produced in said generator and for supplying the liquid to said evaporator, means for creating a pressure differential in said inert gas circuit to propel the inert gas therethrough, a reservoir in said solution circuit, means connecting said reservoir to high and low pressure areas of said inert gas circuit, snap-acting means for controlling the communication of said reservoir with said connecting means, a float operated by changes in the liquid level in said reservoir for actuating said snap-acting means.

11. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and an absorber, a solution circuit including a generator and said absorber, means for liquefying refrigerant vapor produced in said generator and for supplying the liquid to said evaporator, means for creating a pressure differential in said inert gas circuit to propel the inert gas therethrough, a control chamber including a plurality of reservoirs and a control valve, means in said solution circuit, means connecting said valve means to high and low pressure areas of said inert gas circuit, said valve means being constructed and arranged to provide communication between each of said reservoirs and said connecting means serially whereby each reservoir is alternately subjected to high and low pressures, means providing each of said reservoirs with one way flow inlet connections, a discharge connection to each of said reservoirs, and means for actuating said valve means.

12. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and an absorber, a solution circuit including a generator and said absorber, means for liquefying refrigerant vapor produced in said generator and for supplying the liquid to said evaporator, electrically operated means for creating a pressure differential in said inert gas circuit to propel the inert gas therethrough, means for alternately applying the pressure prevailing in high and low pressure areas of said inert gas circuit to said generator and said condenser to circulate liquids through portions of said apparatus, said last mentioned means including solenoid valves in control of said high and low pressure connections, electrically operated means in control of said valves, and refrigeration demand responsive means in control of both of said electrically operated means.

13. That method of circulating liquids in absorption refrigerating systems of the type utilizing a refrigerant, an absorbent and a pressure equalizing medium inert with respect to the refrigerant and the absorbent which includes the steps of circulating the pressure equalizing medium between a refrigerating zone in which vapor is added thereto and an absorbing zone in which vapor is removed therefrom, circulating the absorbent between a generating zone in which refrigerant vapor is expelled therefrom and the absorbing zone in which refrigerant vapor is absorbed thereby by intermittently subjecting the absorbent in a selected zone to the effect of a continuous static pressure differential normally produced in the operation of the system.

14. That improvement in the art of refrigeration which includes the steps of expelling refrigerant vapor from solution by the application

of heat to the solution, liquefying the refrigerant vapor, producing a refrigerating effect by evaporating the refrigerant liquid into a pressure equalizing medium, absorbing the refrigerant vapor from the pressure equalizing medium by contacting the refrigerant vapor pressure equalizing medium mixture with solution previously weakened by the expulsion of vapor and intermittently transferring bodies of solution into contact with said mixture by applying thereto the static pressure of an area of the system normally maintained at a higher static pressure than the area of the system in which the solution contacts said mixture.

15. Absorption refrigerating apparatus comprising an inert gas circuit including an evaporator and an absorber, a solution circuit including a generator and said absorber, means for liquefying refrigerant vapor produced in said generator and for supplying the liquid to said evaporator, means for continuously maintaining a portion of said apparatus at a pressure higher than that normally prevailing in said solution circuit, and means for intermittently subjecting a portion of said solution circuit to the pressure prevailing in said high pressure portion of said apparatus to cause the solution to flow from said first mentioned part of said solution circuit to another part thereof.

16. Absorption refrigerating apparatus comprising an absorber, an evaporator, a condenser and a generator connected in circuit, a power driven circulator for circulating inert gas through a circuit including said absorber and said evaporator, and means for alternately connecting a liquid containing portion of said apparatus to the suction and discharge sides of said circulator to circulate liquid through said portion of said apparatus.

17. Absorption refrigerating apparatus comprising a generator, an absorber having a liquid inlet above said generator, an evaporator, a condenser connected to receive refrigerant vapor from said generator and to supply refrigerant liquid to said evaporator, means including a power driven circulator for circulating an inert gas through said evaporator and said absorber, said absorber being connected to the suction side of said circulator, means forming a connection including a U-shaped part for conducting absorption solution from said generator to said absorber liquid inlet, means for conveying absorption solution from said absorber to said generator, and means for intermittently subjecting the surface of the absorption solution in said U-shaped part remote from said absorber inlet to the discharge pressure of said circulator to displace the absorption solution through said U-shaped part into said absorber.

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