May 8, 1951 E. B. TERRILL, JR 2,552,071

ABSORPTION REFRIGERATION APPARATUS

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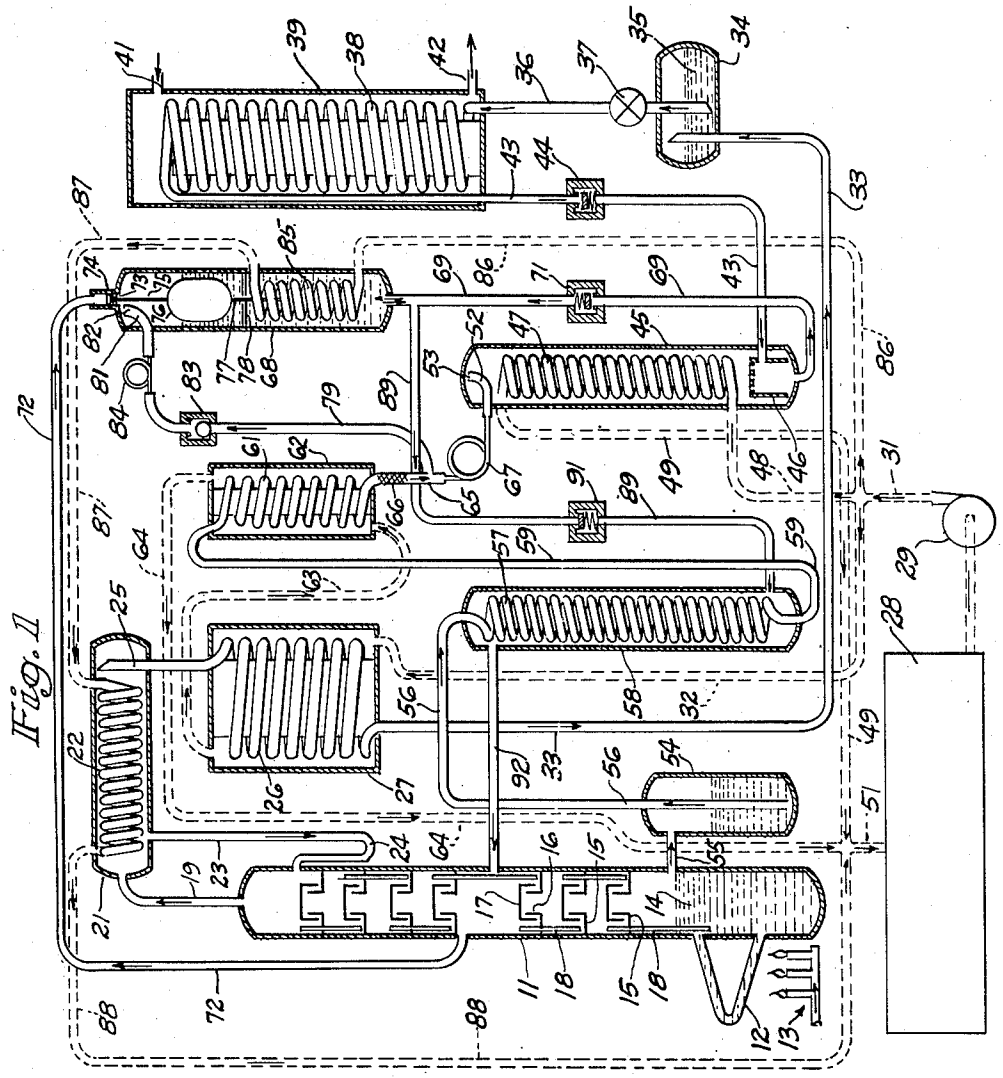


Fig. 1

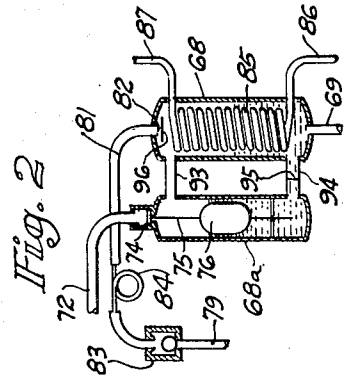


Fig. 2

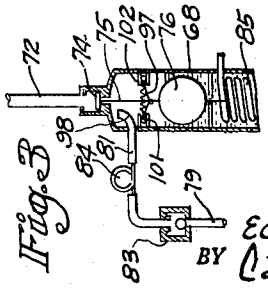


Fig. 3

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ABSORPTION REFRIGERATION APPARATUS

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This invention relates to refrigeration apparatus of the absorption type and more particularly to the part of such apparatus whereby refrigerant solution is returned from the absorber or low pressure side of the apparatus to the generator or high pressure side thereof.

An important object of the invention is to provide a transfer vessel for this purpose which is alternately filled and emptied by pressure control of a valve through which refrigerant vapor is admitted to the vessel from the generator at certain stages in the operation of the apparatus.

A further object is to provide in (or in association with) such a transfer vessel a float valve and control therefor which will operate with such precision and accuracy as to materially improve the efficiency of the system. As will later appear such float valve and control may take one of several different forms, all operating on the same general principle but each having its own particular characteristics and advantages.

Other objects and advantages of the invention will be apparent from the following description taken in connection with the accompanying drawing, in which:

Fig. 1 is a diagrammatic view of an absorption refrigeration system in which my invention is embodied, certain of the elements being shown in section;

Fig. 2 is a fragmentary view showing a modified form of the transfer vessel and associated parts; and

Fig. 3 is a partial view of a transfer vessel as shown in Fig. 1 with a modified form of float valve control.

The system is self-enclosed and contains a charge of refrigerant and solvent such, for example, as ammonia and water. Other refrigerant-solvent combinations could be used, as, for example, methyl chloride with ethylene glycol monobutyl ether (or other similar solvent) or difluorodichloromethane (freon-12) with dimethyl ether of tetraethylene glycol (or other similar solvent).

The apparatus includes a generator 11 having a side arm coil 12 beneath which there is a gas or oil burner 13 by means of which the solution of refrigerant and solvent, indicated by the numeral 14 in Fig. 1, is heated. Pressure created by vaporization of the solution when the latter is thus heated causes the vapor given off by the solution to pass upwardly through a series of bubble cap trays 15.

Each of said trays has a weir 16 thereon above which there is a cap 17 having a peripheral flange

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extending downwardly over the weir 16 but terminating above the horizontal portion of the tray 15. Each tray has a drain tube 18 passing therethrough and extending a predetermined distance above the horizontal portion thereof. A head of solution of depth determined by the height of said drain tube above the tray is carried by each tray when the apparatus is in operation. The vapor given off by the heated solution in the lower part of the generator passes through the central openings in the trays and bubbles up around the caps 17 as the lower end of each drain tube is sealed by the solution on the tray therebeneath. It is to be understood that instead of the series of bubble cap trays other means, such as a sieve plate column, could be used to cause the vapor to bubble through a definite head of solution at a number of points in a column or tower for a purpose which will presently appear.

From the top of the generator 11 the vapor passes through a conduit 19 to a rectifier 21 in which there is a cooling coil 22. In said rectifier 21 the vapor is cooled to a condensing temperature, resulting in the condensation of any water in the vapor as well as some ammonia. This condensate and the uncondensed vapor are separated in the rectifier 21. The liquid condensate returns to the generator through a conduit 23, in which there is a U-trap 24 and the anhydrous ammonia vapor leaves the rectifier through an open-ended conduit 25 leading to a coil 26 in a condenser 27.

The liquid which returns to the generator through the conduit 23 is cool and of very high ammonia concentration. It enters the generator near the top preferably above the uppermost bubble cap tray 15. From the uppermost tray it overflows to the next lower tray and thence to the next one and so on until it has reached the body of solution in the lower part of the generator and in the side arm coil 12. A deposit of solution will be left upon each tray by reason of the construction heretofore described.

During the progress of the solution downwardly from tray to tray it comes in contact with increasingly hotter vapors rising in the generator and is heated progressively so that when it reaches the body 14 of the solution in the lower part of the generator and the coil 12 it is only a few degrees cooler than the hot vapors which are driven off by the heating of the solution in said coil 12. By the time it has reached the solution in the lower part of the generator most of the ammonia will have been driven from the reflux solution and the concentration thereof will closely approach that of the weak liquor at the

bottom of the generator and in the heater coil 12. Conversely, as the vapor travels upwardly from tray to tray, bubbling through the head of solution on each tray, it is cooled and rectified so that when it leaves the generator vessel through the conduit 19 it will be only a few degrees above the condensing temperature and will contain very little water vapor.

The condenser 27, in the form of the invention shown in the drawings, is filled with a cooling liquid, such as water, which may be drawn from a cooling tower 28 or other source by means of a pump 29 from which it flows to the condenser through a conduit 31 and a branch conduit 32.

The ammonia vapor in the coil 26 in the condenser 27 is thus cooled to condensing temperature and condensed and the liquid ammonia passes from said coil through a conduit 33 to a receiver 34 which will normally contain a head of liquid ammonia indicated by the numeral 35. From said receiver 34 the liquid ammonia passes upwardly through a conduit 36, the lower end of which is immersed in the liquid head 35. Said conduit 36 has an expansion valve 37 therein which, in well-known manner, serves the function of reducing the pressure of the liquid ammonia sufficiently to cause evaporation of the ammonia in a coil 38 in an evaporator 39 to which the ammonia is directed by the conduit 36. This evaporation produces the refrigeration effect in the customary manner and it will of course be understood that the evaporator may be located wherever desired and adapted to refrigerate whatever space or apparatus it is desired to cool. Preferably the evaporator will be filled with brine which may enter the same from any suitable source through an inlet pipe 41 and may be drained from the evaporator through an outlet pipe 42.

The vaporized ammonia passes from the evaporator through a conduit 43 in which there is a check valve 44. The conduit 43 leads to the lower part of an absorber 45 in the lower part of which there is preferably provided a cap 46 into which the vapor is directed and from which it passes upwardly along the walls of the absorber vessel. Said cap is, or may be, perforated around the top periphery thereof to properly distribute the vapor stream. The absorber contains a cooling coil 47 which is supplied with cooling water through a branch conduit 48 leading from the conduit 31 through which the water is directed by the pump 29. From the coil 47 the water flows back through a conduit 49 and a conduit 51 to the cooling tower 28.

In said absorber the ammonia vapor is absorbed in the usual manner by weak liquor drawn from the generator and entering the top of the absorber vessel through an inlet pipe 52 having a restricted orifice 53 in the outlet end thereof.

The weak liquor from the generator is drawn from a reserve vessel 54 in open communication with the lower part of the generator by means of a conduit 55. A conduit 56 leads from a point near the bottom of said reserve vessel 54 upwardly through the vessel and communicates with a coil 57 in a heat exchanger 58. From the lower part of said heat exchanger the weak solution passes through a conduit 59 to a coil 61 in a weak solution cooler 62. Said cooler receives cooling water from a conduit 63 leading from the condenser 27 and entering the cooling vessel at the bottom. The water leaves said cooler vessel through a conduit 64 which leads back to the cooling tower 28.

From the coil 61 of the cooler 62 the weak liquor passes through a conduit 65 (in which there is a screen 66) and through a capillary tube 67 which, in the manner characteristic of such tubes, has a very restricted passage therein. In passing through this capillary tube and the orifice 53 the pressure of the weak solution is reduced to a point slightly below the pressure in the evaporator. Said capillary tube communicates with the pipe 52 leading into the upper part of the absorber 45 and the cool weak liquor entering the absorber through the restricted orifice 53 in the end of said pipe 52 absorbs ammonia vapor which is directed to the absorber from the evaporator through the conduit 43, as hereinbefore described. The continuous absorption which takes place in the absorber holds the absorber pressure below the pressure in the evaporator and of course substantially below the pressure which prevails in the generator, as is characteristic of absorption refrigeration systems.

For the purpose of returning the strong solution from the absorber to the generator (which presents certain difficulties because of the much higher pressure in the generator than in the absorber) I employ a transfer vessel 68 to which the strong solution is drawn from the bottom of the absorber 45 through a conduit 69 in which a check valve 71 is provided. Said conduit 69 leads to the bottom of said transfer vessel 68 and a conduit 72 leads from a mid point in the generator 11 to a top opening 73 in said transfer vessel. Said opening 73 is adapted to be closed by means of a valve disc 74 connected by a rod 75 with a float 76 in the transfer vessel. Said float has a rod 77 extending downwardly therefrom through a central aperture in a cross member 78 positioned horizontally at a mid position in the transfer vessel.

A branch conduit 79 leads from the outlet conduit 65 of the weak solution cooler 62 to a pipe 81 extending into the upper part of the transfer vessel 68, the extremity of said pipe being turned upwardly and having a restricted orifice 82 in the end thereof, as in the case of the pipe 52 in the absorber 45. Said conduit 79 has a check valve 83 and a capillary tube 84 therein for purposes which will presently appear.

Said transfer vessel 68 has a cooling coil 85 therein to which cooling water is directed through a branch conduit 86 leading from the conduit 31 through which water is directed from the cooling tower 28 by the pump 29. The water leaves the coil 85 through a conduit 87 which leads to the cooling coil 22 in the rectifier 21 and thence back to the cooling tower through a conduit 88.

A conduit 89 takes off from the conduit 69 at a point just below the bottom of the transfer vessel 68 and leads to the lower part of the heat exchanger 58, a check valve 91 being interposed in said conduit 89 between the transfer vessel and the heat exchanger. A conduit 92 leads from the upper part of the heat exchanger to a mid position in the generator 11 providing an open line of communication between the interior of said heat exchanger 58 and the generator.

The operation of the system in returning the strong solution from the absorber to the generator is as follows: Starting with liquid levels in the system, as shown, the float valve 74 will be open allowing high pressure vapor to flow from the generator through the conduit 72 into the top of the transfer vessel. It will be understood that the various check valves shown are pressure-

controlled and that under the conditions just stated the check valve 71 between the absorber 45 and the transfer vessel 68 will be closed and the check valve 91 between the transfer vessel and the generator will be open. The strong solution from the transfer vessel will therefore be allowed to flow through the conduit 89, heat exchanger 58 and conduit 92 into the generator. This will continue until the liquid level in the transfer vessel has dropped sufficiently to cause the float 76 to close the valve 74, thereby cutting off the flow of vapor from the generator to the transfer vessel through the conduit 72. It will be understood that so long as the valve is open the communication between the generator and the transfer vessel maintains substantially the generator pressure in the transfer vessel, thereby permitting the return flow of the strong solution above described.

After the valve 74 has closed there will be a substantial amount of refrigerant vapor in the transfer vessel 68 above the lowered liquid level and, due to the temperautre and concentration of the remaining solution in the vessel, some of this vapor will tend to be absorbed into the solution at the surface thereof. This will cause a slight reduction in the pressure in the transfer vessel below the generator pressure. At this point weak liquor will commence to flow through the conduit 79, capillary tube 84 and restricted outlet orifice 82. Although the flow at first will be very small the weak liquor will rapidly absorb the ammonia vapor in the transfer vessel causing a further reduction of the pressure therein. As the pressure reduces the flow of weak liquor and, because the capillary tube 84 is sized to admit weak liquor to the transfer vessel at a more rapid rate than it is admitted to the absorber through the capillary tube 67, the pressure in the transfer vessel will be reduced to a point below that in the absorber. The check valve 91 at this time will be closed preventing the solution from backing up from the heat exchanger 58 to the transfer vessel and the latter will then be filled with strong liquor drawn from the absorber by reason of the pressure differential. The difference in pressure on the two sides of the valve 74 will hold the latter closed until the transfer vessel has been filled to a predetermined point with the strong solution.

Continued flow of weak liquor through the orifice 82 will hydraulically raise the pressure in the transfer vessel to generator pressure. The check valve 71 will close at the start of this pressure increase and the moment the pressure in the transfer vessel is equalized with that of the generator the buoyancy of the float 76 will open the float valve and vapor will be admitted from the generator through the conduit 72, thereby starting the flow of strong solution from the transfer vessel to the heat exchanger 58 and thence to the generator. This flow will continue until the valve 74 is closed in the manner hereinbefore described, whereupon the transfer vessel will again be filled and the operation will continue in the cycle which has been set forth.

In Fig. 2 I have shown a modified form of transfer vessel construction in which the float 76 and valve 74 are positioned in an auxiliary vessel 68*a* which is connected with the main transfer vessel 68 by means of upper and lower conduits 93 and 94. In the conduit 94 there is a restricted orifice 95 and in the top of the main transfer vessel 68 a spray plate 96 is preferably provided beneath the restricted orifice 82 in the weak liquor inlet pipe 81 (the latter in this form being shown as opening downwardly instead of upwardly as in the form shown in Fig. 1). The spray plate 96 serves to diffuse the weak liquor when the latter attains sufficient velocity under the conditions which have heretofore been described.

The orifice 95 in the lower connection 94 between the tanks 68 and 68*a* is so sized as to allow the liquid level in the float chamber in the tank 68*a* to drop at a slightly lower rate than the liquid level in the transfer vessel proper 68. This is for the purpose of insuring positive closing of the float valve. If the levels in the two vessels dropped at the same rate there would be a possibility that the float 76 would lower with such speed and to such an extent as to crack the valve 74 open slightly allowing a small amount of high-pressure vapor to continue to enter the vessel 68*a* and be absorbed on the solution's surface. The reduced pressure thereby created might prevent the liquid level from dropping sufficiently to positively close the valve. However, by causing the level in the vessel 68*a* to lag somewhat behind the level in the vessel 68, the equalizing of the levels in the two vessels through a slight drop in the level in the vessel 68*a* and a corresponding rise in the level in the vessel 68 will positively seat the float valve. This delayed lowering of the level in the float chamber thus has the advantage of overcoming the possible difficulty which might otherwise result from the slight unseating of the valve 74 due to the action above mentioned.

A second modification of the float valve is shown in Fig. 3 of the drawings. In this form a spring-actuated toggle mechanism is used to assure positive seating of the valve. Toggle arms 97 and 98 are connected to the float rod 75 and their outer ends are connected by a spring 99. Said ends, which may be in the form of short arms or pins, are slidably positioned in guides 101 and 102 provided on the interior of the vessel 68. As shown, the toggle is in the position in which the valve is closed. This, of course, will be during the filling of the vessel with strong solution from the absorber. When it has been filled and repressured by the flow of weak liquor through the capillary tube 84 and pipe 81 the buoyancy of the float will shift the toggle to the opposite side and open the float valve. High-pressure vapor will then have vented to the transfer vessel and the solution in the vessel will be returned to the generator by gravity as been heretofore described. The liquid level in the vessel will then drop to the point where the float will be floating on the liquid surface and, as the valve 74 will still be open, the level will continue to drop until the weight of the float pulls the toggle mechanism down past its center position. Once it has passed this position the tension of the spring will snap the float and the valve on downwardly to the closed position of the latter. Thus the valve will be positively closed and cannot remain in the slightly open position which would present a restricted passage for the inflow of high-pressure vapor with the result above mentioned. Upon refilling of the vessel the cycle above described will be repeated.

The transfer device of the present invention is independent of variations in the liquid level in the generator and does not depend upon a flow of solution in the liquid phase through the vapor line to the transfer device, which are char-

acteristics of certain prior systems. The transfer device handles the solution only as rapidly, but just as rapidly, as conditions require and the system automatically adjusts itself to variations in operating conditions caused by changes in the ambient cooling temperature or in heat input or by other factors affecting the operation of refrigeration systems of this character.

On each cycle the absorber **45** is emptied of strong solution. Therefore, some refrigerant vapor will be drawn into the transfer vessel **68** from the evaporator **39** without absorption in the absorber. Consequently, in operation the absorber never becomes full of solution and absorption and refrigeration are therefore uninterrupted.

Variations in cooling water temperature and refrigeration load conditions affect the high side and low side pressures, respectively. These pressure variations affect the flow and quantity of solution circulated. However, the flow of weak solution to both the absorber and transfer vessel are affected to the same relative degree thus causing the transfer vessel to handle solution at various rates as fed to the absorber.

The reserve vessel **54** permits variations in solution level just as the receiver **34** permits variation in the liquid refrigerant level both of which will occur under changing operating conditions. The reserve vessel is so located that the liquid level in the generator will remain constant and not flood the lower bubble cap plate **15** or starve the heater coil **12**.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as permissible in view of the prior art.

I claim:

1. In an absorption refrigeration apparatus which includes a generator, a condenser, an evaporator and an absorber: a device for transferring strong refrigerant solution from the absorber (low pressure) side of the apparatus to the generator (high pressure) side thereof, comprising a transfer vessel, a conduit for conveying strong solution from the absorber to said vessel, a conduit for conveying refrigerant vapor from the generator to said vessel, a movable valve member at the inlet to said vessel from said vapor conduit, a conduit for conveying strong solution from the transfer vessel to the generator, a float control for said valve arranged to open the same when the liquid level in said vessel reaches a predetermined height and the pressures on opposite sides of said valve are equalized, and to close said valve when the liquid level in said vessel drops to a predetermined point due to the transfer of the solution from the vessel to the generator, a conduit extending from a point on the high pressure side of the system to the absorber for continuously conveying weak refrigerant solution to said absorber, a flow restrictor in said last-mentioned conduit, and means including a conduit extending from a point on the high pressure side of the system to said transfer vessel and a flow restrictor in such conduit, for introducing weak refrigerant solution into said vessel upon the closing of said valve and subsequent reduction in pressure in the vessel due to absorption of vapor therein by the solution remaining in such vessel, said last-mentioned flow restrictor being of such relative size with respect to said first-mentioned restrictor as to permit flow of vapor therethrough at a more rapid rate than that at which the weak solution is conveyed to said absorber, whereby refrigerant vapor in said vessel will be absorbed more rapidly than in said absorber and the pressure in said vessel will be reduced to a greater extent than in the absorber to cause said strong solution to flow from the absorber into said vessel and to be returned to the generator upon the consequent opening of the valve, the pressure in said transfer vessel being thus caused to alternately correspond to the absorber pressure (at which time strong solution flows into such vessel from the absorber) and to the generator pressure (at which time such solution flows from said vessel to the generator).

2. In an absorption refrigeration apparatus which includes a generator, a condenser, an evaporator and an absorber: a device for transferring strong refrigerant solution from the absorber (low pressure) side of the apparatus to the generator (high pressure) side thereof, comprising a transfer vessel, a conduit for conveying strong solution from the absorber to said vessel, a conduit for conveying refrigerant vapor from the generator to said vessel, a movable valve at the inlet to said vessel from said vapor conduit, a conduit for conveying strong solution from the transfer vessel to the generator, a float control for said valve arranged to open the same when the liquid level in said vessel reaches a predetermined height and the pressures on opposite sides of said valve are equalized, and to close said valve when the liquid level in said vessel drops to a predetermined point due to the transfer of the solution from the vessel to the generator, said control including a float in said vessel, a connection between said float and said valve member, and a guide for centering said valve member and said float in said transfer vessel, a conduit extending from a point on the high pressure side of the system to the absorber for continuously conveying weak refrigerant solution to said absorber, a flow restrictor in said last-mentioned conduit, and means including a conduit extending from a point on the high pressure side of the system to said transfer vessel and a flow restrictor in such conduit, for introducing weak refrigerant solution into said vessel upon the closing of said valve and subsequent reduction in pressure in the vessel due to absorption of vapor therein by the solution remaining in such vessel, said last-mentioned flow restrictor being of such relative size with respect to said first-mentioned restrictor as to permit flow of vapor therethrough at a more rapid rate than that at which the weak solution is conveyed to said absorber, whereby refrigerant vapor in said vessel will be absorbed more rapidly than in said absorber and the pressure in said vessel will be reduced to a greater extent than in the absorber to cause said strong solution to flow from the absorber into said vessel and to be returned to the generator upon the consequent opening of the valve, the pressure in said transfer vessel being thus caused to alternately correspond to the absorber pressure (at which time strong solution flows into such vessel from the absorber) and to the generator pressure (at which time such solution flows from said vessel to the generator).

3. In an absorption refrigeration apparatus which includes a generator, a condenser, an evaporator and an absorber: a device for transferring strong refrigerant solution from the absorber

(low pressure) side of the apparatus to the generator (high pressure) side thereof, comprising a transfer vessel, a conduit for conveying strong solution from the absorber to said vessel, a conduit for conveying refrigerant vapor from the generator to said vessel, a movable valve at the inlet to said vessel from said vapor conduit, a conduit for conveying strong solution from the transfer vessel to the generator, a float control for said valve arranged to open the same when the liquid level in said vessel reaches a predetermined height and the pressures on opposite sides of said valve are equalized, and to close said valve when the liquid level in said vessel drops to a predetermined point due to the transfer of the solution from the vessel to the generator, said control including a float in said vessel, a connection between said float and said valve member, mechanism for causing positive closing of said valve member when the liquid level in said vessel reaches said predetermined low point, a conduit extending from a point on the high pressure side of the system to the absorber for continuously conveying weak refrigerant solution to said absorber, a flow restrictor in said last-mentioned conduit, and means including a conduit extending from a point on the high pressure side of the system to said transfer vessel and a flow restrictor in such conduit, for introducing weak refrigerant solution into said vessel upon the closing of said valve and subsequent reduction in pressure in the vessel due to absorption of vapor therein by the solution remaining in such vessel, said last-mentioned flow restrictor being of such relative size with respect to said first-mentioned restrictor as to permit flow of vapor therethrough at a more rapid rate than that at which the weak solution is conveyed to said absorber, whereby refrigerant vapor in said vessel will be absorbed more rapidly than in said absorber and the pressure in said vessel will be reduced to a greater extent than in the absorber to cause said strong solution to flow from the absorber into said vessel and to be returned to the generator upon the consequent opening of the valve, the pressure in said transfer vessel being thus caused to alternately correspond to the absorber pressure (at which time strong solution flows into such vessel from the absorber) and to the generator pressure (at which time such solution flows from said vessel to the generator).

4. In an absorption refrigeration apparatus which includes a generator, a condenser, an evaporator and an absorber: a device for transferring strong refrigerant solution from the absorber (low pressure) side of the apparatus to the generator (high pressure) side thereof, comprising a transfer vessel, a conduit for conveying strong solution from the absorber to said vessel, a conduit for conveying refrigerant vapor from the generator to said vessel, a movable valve at the inlet to said vessel from said vapor conduit, a conduit for conveying strong solution from the transfer vessel to the generator, and a float control for said valve arranged to open the same when the liquid level in said vessel reaches a predetermined height and the pressures on opposite sides of said valve are equalized, and to close said valve when the liquid level in said vessel drops to a predetermined point due to the transfer of the solution from the vessel to the generator, said control including a float in said vessel, a connection between said float and said valve member, and mechanism for causing positive closing of said valve member when the liquid level in said vessel reaches said predetermined low point, said mechanism comprising an auxiliary chamber in said transfer vessel through which the solution passes to said conduit for conveying the strong solution to the generator, and a conduit between the float chamber and said auxiliary chamber having a restricted passage therein whereby the liquid level in the float chamber lags behind that in the auxiliary chamber and the delay thus caused in the lowering of the float assures positive seating of said valve member.

5. In an absorption refrigeration apparatus which includes a generator, a condenser, an evaporator and an absorber: a device for transferring strong refrigerant solution from the absorber (low pressure) side of the apparatus to the generator (high pressure) side thereof, comprising a transfer vessel, a conduit for conveying strong solution from the absorber to said vessel, a conduit for conveying refrigerant vapor from the generator to said vessel, a movable valve at the inlet to said vessel from said vapor conduit, a conduit for conveying strong solution from the transfer vessel to the generator, a float control for said valve arranged to open the same when the liquid level in said vessel reaches a predetermined height and the pressures on opposite sides of said valve are equalized, and to close said valve when the liquid level in said vessel drops to a predetermined point due to the transfer of the solution from the vessel to the generator, said control including a float in said vessel, a connection between said float and said valve member, mechanism for causing positive closing of said valve member when the liquid level in said vessel reaches said predetermined low point, said mechanism comprising a toggle device connected with said float and actuated thereby when the liquid level in said vessel drops to a predetermined extent to cause positive seating of said valve member, a conduit extending from a point on the high pressure side of the system to the absorber for continuously conveying weak refrigerant solution to said absorber, a flow restrictor in said last-mentioned conduit, and means including a conduit extending from a point on the high pressure side of the system to said transfer vessel and a flow restrictor in such conduit, for introducing weak refrigerant solution into said vessel upon the closing of said valve and subsequent reduction in pressure in the vessel due to absorption of vapor therein by the solution remaining in such vessel, said last-mentioned flow restrictor being of such relative size with respect to said first-mentioned restrictor as to permit flow of vapor therethrough at a more rapid rate than that at which the weak solution is conveyed to said absorber, whereby refrigerant vapor in said vessel will be absorbed more rapidly than in said absorber and the pressure in said vessel will be reduced to a greater extent than in the absorber to cause said strong solution to flow from the absorber into said vessel and to be returned to the generator upon the consequent opening of the valve, the pressure in said transfer vessel being thus caused to alternately correspond to the absorber pressure (at which time strong solution flows into such vessel from the absorber) and to the generator pressure (at which time such solution flows from said vessel to the generator).

6. In an absorption refrigeration apparatus

which includes a generator, a condenser, an evaporator and an absorber: a device for transferring strong refrigerant solution from the absorber (low pressure) side of the apparatus to the generator (high pressure) side thereof, comprising a transfer vessel, a conduit for conveying strong solution from the absorber to said vessel, a conduit for conveying refrigerant vapor from the high pressure side of the apparatus to said vessel, a movable valve at the inlet to said vessel from said vapor conduit, a conduit for conveying strong solution from the transfer vessel to the generator, a float control for said valve arranged to open the same when the liquid level in said vessel reaches a predetermined height and the pressures on opposite sides of said valves are equalized, and to close said valve when the liquid level in said vessel drops to a predetermined point due to the transfer of the solution from the vessel to the generator, said control including a float in said vessel, a connection between said float and said valve member, mechanism for causing positive closing of said valve member when the liquid level in said vessel reaches said predetermined low point, said mechanism comprising a toggle device connected with said float and actuated thereby when the liquid level in said vessel drops to a predetermined extent to cause positive seating of said valve member, a conduit extending from a point on the high pressure side of the system to the absorber for continuously conveying weak refrigerant solution to said absorber, a flow restrictor in said last-mentioned conduit, and means including a conduit extending from a point on the high pressure side of the system to said transfer vessel and a flow restrictor in such conduit, for introducing weak refrigerant solution into said vessel upon the closing of said valve and subsequent reduction in pressure in the vessel due to absorption of vapor therein by the solution remaining in such vessel, said last-mentioned flow restrictor being of such relative size with respect to said first-mentioned restrictor as to permit flow of vapor therethrough at a more rapid rate than that at which the weak solution is conveyed to said absorber, whereby refrigerant vapor in said vessel will be absorbed more rapidly than in said absorber and the pressure in said vessel will be reduced to a greater extent than in the absorber to cause said strong solution to flow from the absorber into said vessel and to be returned to the generator upon the consequent opening of the valve, the pressure in said transfer vessel being thus caused to alternately correspond to the absorber pressure (at which time strong solution flows into such vessel from the absorber) and to the generator pressure (at which time such solution flows from said vessel to the generator).

7. In an absorption refrigeration apparatus which includes a generator, a condenser, an evaporator and an absorber; a device for transferring strong refrigerant solution from the absorber (low pressure) side of the apparatus to the generator (high pressure) side thereof, comprising a transfer vessel, a conduit for conveying strong solution from the absorber to said vessel, a conduit for conveying high pressure refrigerant vapor to said vessel from a point on the high pressure side of the system, a movable valve at the inlet to said vessel from said vapor conduit, a conduit for conveying strong solution from the transfer vessel to the generator, a float control for said valve arranged to open the same when the liquid level in said vessel reaches a predetermined height and the pressures on opposite sides of said valve are equalized, and to close said valve when the liquid level in said vessel drops to a predetermined point due to the transfer of the solution from the vessel to the generator, said control including a float in said vessel, a connection between said float and said valve member, and a guide for centering said valve member and said float in said transfer vessel, a conduit extending from a point on the high pressure side of the system to the absorber for continuously conveying weak refrigerant solution to said absorber, a flow restrictor in said last-mentioned conduit, and means including a conduit extending from a point on the high pressure side of the system to said transfer vessel and a flow restrictor in such conduit, for introducing weak refrigerant solution into said vessel upon the closing of said valve and subsequent reduction in pressure in the vessel due to absorption of vapor therein by the solution remaining in such vessel, said last-mentioned flow restrictor being of such relative size with respect to said first-mentioned restrictor as to permit flow of vapor therethrough at a more rapid rate than that at which the weak solution is conveyed to said absorber, whereby refrigerant vapor in said vessel will be absorbed more rapidly than in said absorber and the pressure in said vessel will be reduced to a greater extent than in the absorber to cause said strong solution to flow from the absorber into said vessel and to be returned to the generator upon the consequent opening of the valve, the pressure in said transfer vessel being thus caused to alternately correspond to the absorber pressure (at which time strong solution flows into such vessel from the absorber) and to the generator pressure (at which time such solution flows from said vessel to the generator).

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