

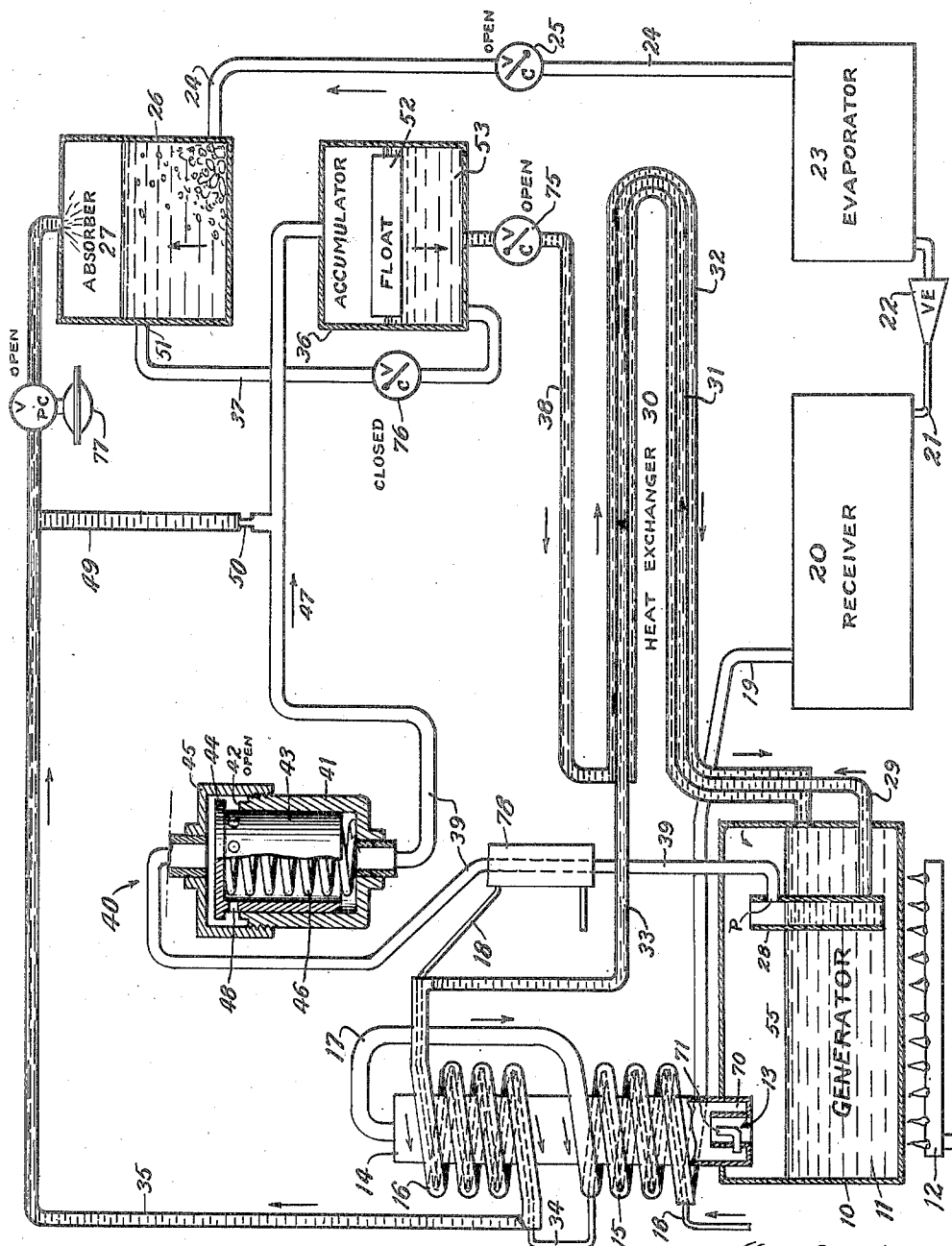
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ABSORPTION REFRIGERATION SYSTEM

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ABSORPTION REFRIGERATION SYSTEM

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19 Claims. (Cl. 62—5)

This invention relates to absorption refrigeration apparatus of the type disclosed in my pending application Serial No. 6,899, filed February 16, 1935, now matured into Patent No. 2,150,369 of which the present application forms a continuation in part. The object of the invention is to provide a continuously operative, fully automatic absorption refrigeration system of improved efficiency, adapted for embodiment in large-capacity installations, wherein the efficiency factor is an important consideration, more so than in the small unit employed in the conventional household refrigerator.

Other objects of the invention will become apparent from the following detailed description, taken in connection with the accompanying drawing, in which:

The figure is a diagram of a refrigeration system embodying the invention.

In the preferred form of the invention, shown in the figure, there is provided a generator 10 in which a body 11 of refrigerant in solution, such as ammonia in water, is heated by a constantly burning gas burner 12. The ammonia vapor driven out of solution, passes upwardly, as indicated by the arrow 13, through a rectifier 14 in the form of a stack secured in the top of the generator 10 and projecting upwardly. The ammonia vapor is initially cooled in the rectifier 14 by the heat absorbing action of the coils 15 and 16 surrounding the rectifier. From the upper end of the rectifier, 14, the ammonia vapor passes through a tube 17 into the coil 15, which constitutes the ammonia vapor condenser of the system.

The ammonia vapor is liquefied in the condenser 15 by the combined effect of pressure which exists in the system and the temperature drop caused by the flowing of cold water through a water tube 18 passing through the coil 15 from one end to the other. After being thus condensed, the liquid ammonia flows from the condenser 15 through a tube 19 into a receiver 20, which is of conventional construction. From the receiver 20 the ammonia vapor flows through a tube 21 and an expansion valve 22 to an evaporator 23, wherein the refrigerant vaporizes and cools whatever refrigerating enclosure is provided in connection with the system.

From the evaporator 23 the ammonia vapor goes through a conduit 24 and a check valve 25 to an absorber 26, in which it bubbles up through a body of weak solution 27.

The weak solution is taken from the lower region of the generator 10 through the lower end of a tube 28, by means of a tube 29 extending out

of the generator. It thence passes to a heat exchanger 30, which comprises an inner tube 31 and a jacket 32, the inner tube 31 forming a continuation of the tube 29. From the heat exchanger 30, the weak liquor passes through a tube 33 to the weak-liquor cooler 16. The latter comprises an outer jacket forming a continuation of the tube 33; and a water tube extending inside of said jacket, said water tube forming a continuation of the tube 18, passing through the condenser 15, and leaving the condenser and entering the weak-liquor cooler at 34.

From the weak-liquor cooler 16, the weak liquor passes through a tube 35 to the absorber 26, where it absorbs the ammonia vapor entering the absorber through the tube 24. The arrangement thus far described is largely a conventional one of the type in which weak liquor and ammonia vapor are driven at relatively high temperature and pressure from a generator through separate channels in which they are cooled, to an absorber in which they reunite at lower temperature and lower pressure caused by such reunion.

The present invention is concerned primarily with the problem of returning the solution thus formed, back to the generator, against the higher pressure of the generator. In the arrangement disclosed in my prior application above identified, this is accomplished by periodically equalizing the pressures between the generator and the absorber, allowing the liquor to drain by gravity into the generator from the absorber, which is located at a higher level than the generator, and allowing sufficient vapor to enter the absorber to displace the liquor drained from the absorber.

One objectionable feature of introducing ammonia vapor directly into the absorber from the generator, is that a portion of the vapor will be absorbed by the weak liquor in the absorber. Obviously, any absorption of this vapor will impair the efficiency of a system of this kind since it will be necessary to by-pass enough additional vapor to replace that which has been absorbed. Also, it will reduce the capacity of the absorber to absorb vapor coming from the evaporator. The present invention eliminates the direct contact between the by-passed vapor and the liquor in the absorber, while retaining the feature of returning the liquor to the generator by gravity under pressure equalization produced by by-passed vapor.

This is accomplished by providing an accumulator which is associated with the absorber in such a manner as to periodically withdraw a portion of the liquor from the absorber, and which in turn periodically returns the liquor to the gen-

erator. The liquor is allowed to flow by gravity from the accumulator to the generator, and a by-pass conduit adapted to by-pass vapor from the generator to the accumulator, is provided with a pressure controlled balancing valve adapted to periodically open so as to allow vapor to by-pass into the accumulator from the generator to displace the liquor which flows by gravity from the accumulator back to the generator. According to this arrangement, the by-passed vapor, instead of being allowed to contact the weak liquor in the absorber as was formerly done, is directed to the accumulator in which the liquor has already reached a state of maximum ammonia absorption.

In attaining the foregoing result, it has been necessary to deal with the problem of transferring the liquor from the absorber, which is ordinarily the region of lowest pressure owing to the absorption process going on therein, to the accumulator, in which the pressure would normally be higher owing to its forming a link in the passage back to the region of maximum pressure—the generator. To accomplish this, an arrangement is provided whereby the pressure in the accumulator is reduced for a short period of time during each cycle of operation, sufficiently to allow excess liquor to flow from the absorber to the accumulator.

Referring again to the drawing, the accumulator 36 is connected to the absorber 26 by a tube 37 through which excess liquor may flow from the absorber to the accumulator when the pressure in the latter is equal to or slightly lower than that in the absorber. The accumulator communicates with the generator 10 through a tube 38 and the jacket 32 of the heat exchanger 30, whereby liquor may return to the generator when the pressures between the accumulator and generator are equalized.

In order to allow the solution to flow by gravity from the accumulator 36 to the generator, I provide a by-pass conduit 39 leading from the upper end of the tube 28 in the generator to the top of the accumulator 36. In the tube 39 is a pressure controlled balancing valve 40, which is normally open.

The valve 40 comprises a casing 41 having at its upper end a valve seat 42, a valve element in the form of a cylindrical skirt 43 having at its upper end a valve head 44 adapted to seat against the valve seat 42, and a cap 45 which closes the casing 41 above the valve head 44.

That end of the conduit 39 which is attached to the generator, communicates with the upper region of the valve casing through the valve cap 45 as shown. That portion of the conduit 39 which attaches to the accumulator, communicates with the bottom of the valve casing 41. Inside of the skirt 43 of the valve element is a coil spring 46 which bears against the bottom of the valve casing 41 and the underside of the valve head 44. The spring 46 normally supports the valve element in an open position in which vapor flowing through the tube 39 in the direction indicated by the arrow 47, may pass through openings 48 in the skirt 43 and thence through the valve. The spring 46 is so balanced against the weight of the valve element 43, 44, and the openings 48 are restricted to such a total area that vapor may flow through the valve with sufficient rapidity to displace the strong liquor flowing by gravity from the accumulator 36 to the generator 10, and so that a sudden reduction in

pressure inside the accumulator will cause the valve element to close.

A secondary by-pass conduit 49 extends from the weak-liquor conduit 35 to the by-pass conduit 39, communicating with the latter through a restricted orifice connection 50, the latter being sufficiently small in diameter to allow a sudden reduction of pressure to occur in the accumulator without substantial reduction of pressure in the generator or absorber.

There are two stages in the return of the liquor to the generator, one in which the accumulated liquor in the accumulator is being drained back into the generator and the other in which the excess liquor is being drained from the absorber into the accumulator. The separation of liquor and vapor in the generator and their reunion in the absorber proceeds continuously during both of these stages, although the rate of absorption will fluctuate to some extent as a result of variations in several factors including the rate of heat absorption in the evaporator and the concentration of the liquor in the absorber. Such fluctuation is under the control of a control valve 77, pressure operated, which closes when the pressure in the absorber drops below a predetermined minimum, and opens when the pressure in the absorber rises sufficiently above said minimum to take up the differential in pressure which is necessary to cause the valve to operate. The control valve 77 thus acts as a governor, holding the operation of the system sufficiently below its normal capacity under light load so that the temperature will not drop below the desired minimum in the space to be refrigerated.

The return of liquor from the accumulator to the generator occurs while the pressures are equalized between the generator and the accumulator—i. e., while the valve 40 remains open. The stage of transfer of excess liquor from the absorber to the accumulator occurs during a period of reduced pressure in the accumulator, which reduced pressure is brought about by injection of weak liquor into the accumulator to absorb the ammonia vapor therein, and the closing of the valve 40 to shut off the communication between the generator and the accumulator through tube 39, so that the reduction of pressure in the accumulator may be maintained until the accumulator has become filled with liquor.

In detail, the operation proceeds as follows:

Starting with the stage of liquor return to the generator, illustrated in the figure, the valve 40 will be open, and the pressures in generator and accumulator will be substantially equal. While the liquor flows by gravity from the accumulator to the generator, liquor will simultaneously be flowing from the generator to the absorber, as long as valve 77 is open, but the return flow from the accumulator to the generator will be sufficiently faster than the flow to the absorber so that by the time the accumulator is emptied, the level of the liquid in the generator will have risen above port P connecting the tube 28 to the tube 39.

As soon as the level in the generator rises above the port P, the pressure in the generator will force weak liquor from the bottom of the generator through the tube 28 and the tube 39 and valve 40 into the accumulator.

The emptying of the accumulator has caused it to be filled with ammonia vapor which has flowed to it through the open valve 40. This vapor will be absorbed by the weak liquor entering the accumulator, which has been cooled by a water jacket 78 so as to have absorbing capacity.

As a result, the pressure in the accumulator will be sharply reduced and the valve 40, which is sensitive to the consequent drop in pressure at its lower end, will close.

When the valve 40 closes, the reduced pressure in the accumulator will cause weak liquor to be drawn from the tube 35 through the auxiliary by-pass 49 and the restricted orifice 50 into the tube 39 and thence into the accumulator, and this flow will continue until all of the vapor in the accumulator has been absorbed and the accumulator is full of liquor.

The reduction of pressure in the accumulator causes the excess liquor in the absorber, standing above the level of the port 51, to be drawn into the lower region of the accumulator while the weak liquor is entering the upper region of the accumulator.

When the accumulator has become filled, the pressures between the accumulator and the generator will be equalized through the orifice connection 50, sufficiently to allow the valve 40 to open. This equalization of pressure causes the pressure in the accumulator to rise above that in the absorber owing to the continued absorptive action in the absorber, and the flow of solution from the absorber to the accumulator will therefore cease and the liquid level in the absorber will commence to rise. At the same time, the opening of the valve 40 allows vapor to be bypassed into the accumulator from the generator, the level of the liquor in the generator having, in the meantime, receded below the port P owing to the generation that has taken place during the stage of transfer from the absorber to the accumulator. The liquor in the accumulator will thence commence to flow by gravity through the tube 38 and jacket 32 of the heat exchanger 30 into the generator, until the point has been reached where the port P is covered by the rising level in the generator, whereupon another cycle of operation, identical with that just described, will take place.

A float 52 is provided, which covers most of the area of the body of liquor 53 in the accumulator. The purpose of this float is to prevent absorption by the body of liquor 53 in the accumulator of the vapor which is by-passed to the accumulator through the balancing valve 40. It also tends to maintain in the upper region of the accumulator the weak liquor which is delivered thereto through the tube 49 during the stage of draw-off of liquor from the absorber into the accumulator. In this connection it will be noted that the weak liquor is delivered into the upper region of the accumulator in direct communication with the vapor that it is to absorb while the strong liquor drawn from the absorber is delivered to the lower region of the accumulator.

The lifting of liquor from the generator to the valve 40 can be accomplished either by arranging the system so that the closing of the port P will cause the pressure in the generator to increase sufficiently to lift the liquor to the height of the accumulator, or by arranging the valve 40 on a level with or below the level of the accumulator and arranging for the port P to close while the column of liquor remains in the pipe 38 so that this column of liquor will balance the column of liquor being forced upwardly to the valve 40, or by a combination of both.

In the operation of the valve 40, the sudden reduction of pressure in the accumulator accelerates the flow of vapor through the openings 48 in the valve skirt 43. The openings 48 are

just large enough to allow the normal flow of vapor sufficient to displace the liquor flowing from the accumulator by gravity and, consequently, the acceleration of vapor flow is insufficient to maintain the equalization of pressure through the valve necessary to allow the valve to remain open, and as a result, the valve will close.

A feature of improvement in the present invention, is the arrangement whereby the relatively cold liquor leaving the accumulator is heated during its passage through the heat exchanger so that the amount of heat that it takes from the generator upon returning thereto, will be kept at a minimum. At the same time, the weak liquor delivered from the generator to the absorber is cooled as it passes through the heat exchanger 30 so that the amount of cooling water required to operate the cooler 16, is kept at a minimum. Stated in another manner, a substantial portion of the heat which is taken from the weak liquor during its passage from the generator to the absorber, is returned to the generator through the medium of the strong liquor returning from the accumulator to the generator.

The check valve 25 allows flow between the evaporator and the absorber only in the direction of the absorber. Should the absorber pressure at any time exceed that of the evaporator, the check valve 25 will close. A check valve 75 is located in the return line 38 between the accumulator and the generator. This valve allows flow between the accumulator and the generator only toward the generator during the stage of equalization between the generator and accumulator, while liquor is being returned. During the stage when the accumulator is at a lower pressure than the generator, the check valve 75 closes to allow the lower pressure to be maintained in the accumulator for the purpose hereinbefore set forth.

A check valve 76 is located in the line 37 between the absorber and the accumulator. This valve allows flow between the absorber and accumulator only in the direction of the accumulator, and is open during the stage when the accumulator pressure is equalized with or lowered below that of the absorber, so as to allow the drawing off of liquor from the absorber to the accumulator as hereinbefore described. During the stage when the pressure in the accumulator is above that in the absorber, the valve 76 is closed, so as to allow the lower pressure in the absorber to be maintained.

Among the advantages of the present invention are the following:

Constant low pressure is maintained in the absorber. As a result, the absorbing cycle, instead of occupying only a fraction of the complete cycle of operation of the system, extends to practically continuous operation. The fluctuation in pressures takes place in the accumulator instead of in the absorber. The absorber may be maintained at a lower temperature owing to the fact that the by-passing of hot liquor from the generator directly to the absorber, is eliminated. The accumulator is maintained at an intermediate temperature and consequently there is less heat loss from this by-passing step.

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 as my invention:

1. In a continuous absorption refrigeration sys-

tem, the combination of a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor respectively from the generator to the absorber, a draw-off connection for conveying strong liquor from the absorber to the accumulator, a return line for returning liquor from the accumulator to the generator, a by-pass connection for by-passing vapor from the generator to the accumulator to displace such returning liquor, and a pressure controlled valve in said by-pass connection adapted to close upon a reduction in pressure in the accumulator, said by-pass connection being arranged to pass a quantity of liquor from the generator to the accumulator when the liquor in the generator has reached a high level and the accumulator is largely filled with vapor, whereby to produce a reduction in pressure in the accumulator by absorption of the vapor therein, and to cause said valve to close, whereby strong liquor will be passed from the absorber into the accumulator as a result of such pressure reduction.

2. In a continuous absorption refrigeration system, the combination of a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor respectively from the generator to the absorber, a draw-off connection for conveying strong liquor from the absorber to the accumulator, a return line for returning liquor from the accumulator to the generator, a by-pass connection for by-passing vapor from the generator to the accumulator to displace such returning liquor, a pressure controlled valve in said by-pass connection adapted to close upon a reduction in pressure in the accumulator, said by-pass connection being arranged to pass a quantity of liquor from the generator to the accumulator when the liquor in the generator has reached a high level and the accumulator is largely filled with vapor, whereby to produce a reduction in pressure in the accumulator by absorption of the vapor therein, and to cause said valve to close, whereby strong liquor will be passed from the absorber into the accumulator as a result of such pressure reduction, and an auxiliary by-pass connection between the weak liquor line and the accumulator, adapted to pass an additional quantity of liquor into accumulator after the closing of said valve, to continue the absorption of the vapor therein and thereby continue the flow of strong liquor from the absorber to the accumulator.

3. In a continuous absorption refrigeration system, the combination of a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor respectively from the generator to the absorber, a draw-off connection for conveying strong liquor from the absorber to the accumulator, a return line for returning liquor from the accumulator to the generator, a by-pass connection for by-passing vapor from the generator to the accumulator to displace such returning liquor, a pressure controlled valve in said by-pass connection adapted to close upon a reduction in pressure in the accumulator, said by-pass connection being arranged to pass a quantity of liquor from the generator to the accumulator when the liquor in the generator has reached a high level and the accumulator is largely filled with vapor, whereby to produce a reduction in pressure in the accumulator by absorption of the vapor therein, and to cause said valve to close, whereby strong liquor will be passed from the absorber into the accumulator as a result of such pressure reduction, and an auxiliary

by-pass connection between the weak liquor line and the accumulator, adapted to pass an additional quantity of liquor into accumulator after the closing of said valve, to continue the absorption of the vapor therein and thereby continue the flow of strong liquor from the absorber to the accumulator, said auxiliary by-pass connection including a restricted orifice for preventing rapid equalization of pressures between the absorber and the accumulator while allowing passage of liquor.

4. In a continuous absorption refrigeration system, the combination of a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor respectively from the generator to the absorber, a draw-off connection for conveying strong liquor from the absorber to the accumulator, a return line for returning liquor from the accumulator to the generator, a by-pass connection for by-passing vapor from the generator to the accumulator to displace such returning liquor, and a pressure controlled valve in said by-pass connection adapted to close upon a reduction in pressure in the accumulator, said by-pass connection being arranged to pass a quantity of weak liquor from the lower region of the generator to the accumulator when the liquor in the generator has reached a high level and the accumulator is largely filled with vapor, whereby to produce a reduction in pressure in the accumulator by absorption of the vapor therein, and to cause said valve to close, whereby strong liquor will be passed from the absorber into the accumulator as a result of such pressure reduction.

5. In a continuous absorption refrigeration system, the combination of a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor respectively from the generator to the absorber, a draw-off connection for conveying strong liquor from the absorber to the accumulator, a return line for returning liquor from the accumulator to the generator, a by-pass connection for by-passing vapor from the generator to the accumulator to displace such returning liquor, and a pressure controlled valve in said by-pass connection adapted to close upon a reduction in pressure in the accumulator, said by-pass connection being arranged to pass a quantity of liquor from the generator to the accumulator when the liquor in the generator has reached a high level and the accumulator is largely filled with vapor, whereby to produce a reduction in pressure in the accumulator by absorption of the vapor therein, and to cause said valve to close, whereby strong liquor will be passed from the absorber into the accumulator as a result of such pressure reduction, said draw-off and by-pass connections communicating respectively with the lower and upper regions of the accumulator, whereby to concentrate the weaker liquor at the top of the body of liquor in the accumulator during the absorption of the vapor therein.

6. In a continuous absorption refrigeration system, the combination of a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor respectively from the generator to the absorber, a draw-off connection for conveying strong liquor from the absorber to the accumulator, a return line for returning liquor from the accumulator to the generator, a by-pass connection for by-passing vapor from the generator to the accumulator to displace such returning liquor, a pressure controlled

valve in said by-pass connection adapted to close upon a reduction in pressure in the accumulator, said by-pass connection being arranged to pass a quantity of liquor from the generator to the accumulator when the liquor in the generator has reached a high level and the accumulator is largely filled with vapor, whereby to produce a reduction in pressure in the accumulator by absorption of the vapor therein, and to cause said valve to close, whereby strong liquor will be passed from the absorber into the accumulator as a result of such pressure reduction, and a float in the accumulator, adapted to minimize contact of by-passed vapor with liquor therein, said draw-off and by-pass connections being so arranged that the weaker liquor will be delivered above the strong liquor, in contact with the vapor in the accumulator.

7. In a continuous absorption refrigeration system, the combination of a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor respectively from the generator to the absorber, a draw-off connection for conveying strong liquor from the absorber to the accumulator, a return line for returning liquor from the accumulator to the generator, a by-pass connection for by-passing vapor from the generator to the accumulator to displace such returning liquor, a pressure controlled valve in said by-pass connection adapted to close upon a reduction in pressure in the accumulator, said by-pass connection being arranged to pass a quantity of liquor from the generator to the accumulator when the liquor in the generator has reached a high level and the accumulator is largely filled with vapor, whereby to produce a reduction in pressure in the accumulator by absorption of the vapor therein, and to cause said valve to close, whereby strong liquor will be passed from the absorber into the accumulator as a result of such pressure reduction, said valve comprising a casing having an upwardly facing valve seat, a valve element vertically movable therein, said element comprising a skirt portion provided with a restricted orifice, means resiliently supporting said valve in a position in which said orifice allows a normal flow of fluid therethrough, the resistance of the orifice being so correlated to that of the resilient supporting means that a sharp increase in the pressure drop across said valve will cause it to close and to seat against said valve seat.

8. In a continuous absorption refrigeration system, the combination of a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor respectively to the absorber, a drawoff connection for conveying strong liquor from the absorber to the accumulator, and a return line for returning strong liquor from the accumulator to the generator, said accumulator being arranged to at times have a pressure substantially equal to that in the generator and greater than that in the absorber, and means adapted by the introduction of weak liquor into the accumulator following the admission of vapor thereto, to periodically reduce the pressure in the accumulator sufficiently to cause liquor to pass from the absorber to the accumulator through said draw-off connection.

9. In a continuous absorption refrigeration system, the combination of a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor respectively to the absorber, a draw-off connection for conveying strong liquor from the absorber to the ac-

cumulator, said accumulator being arranged to at times have a pressure substantially equal to that in the generator and greater than that in the absorber, and means adapted to periodically reduce the pressure in the accumulator sufficiently to cause liquor to pass from the absorber to the accumulator through said draw-off connection, said means being automatically made effective for said purpose by rise of the liquor in the generator to a high level.

10. In a continuous absorption refrigeration system, the combination of a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor respectively to the absorber, a draw-off connection for conveying strong liquor from the absorber to the accumulator, and a return line for returning strong liquor from the accumulator to the generator, said accumulator being arranged to at times have a pressure substantially equal to that in the generator and greater than that in the absorber, and means adapted by the introduction of weak liquor into the accumulator following the admission of vapor thereto, to periodically reduce the pressure in the accumulator sufficiently to cause liquor to pass from the absorber to the accumulator through said draw-off connection, and to thereafter allow the pressure in the accumulator to return to substantially that of the generator and to cause by-passing of vapor from the generator to the accumulator to allow the liquor to return from the accumulator to the generator.

11. In a continuous absorption refrigeration system, the combination of a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor respectively to the absorber, a draw-off connection for conveying strong liquor from the absorber to the accumulator, said accumulator being arranged to at times have a pressure substantially equal to that in the generator and greater than that in the absorber, means adapted to periodically reduce the pressure in the accumulator sufficiently to cause liquor to pass from the absorber to the accumulator through said draw-off connection, and to thereafter allow the pressure in the accumulator to return to substantially that of the generator and to cause by-passing of vapor from the generator to the accumulator to allow the liquor to return from the accumulator to the generator, there being a by-pass connection between the generator and the accumulator and said means including a pressure responsive valve in said by-pass connection adapted to remain open as long as the pressures in generator and accumulator are substantially equal and to close under the reduction of pressure in the accumulator, a restricted orifice connection between the weak liquor line and the accumulator, and a return line for returning strong liquor from the accumulator to the generator.

12. In a continuous absorption refrigeration system, the combination of a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor respectively to the absorber, a draw-off connection for conveying strong liquor from the absorber to the accumulator, a return line for returning strong liquor from the accumulator to the generator, means to periodically cause liquor to flow from the absorber to the accumulator and to thereafter allow the liquor in the accumulator to return by gravity to the generator, a counter-flow heat exchanger forming part of said return line and part of the weak liquor conduit, and a weak

liquor cooler through which the weak liquor flows after passing through said heat exchanger, said cooler comprising a counter-flow water conduit disposed in heat exchange relation to said weak liquor conduit.

13. In a continuous absorption refrigeration system, the combination of a generator, an absorber, weak liquor and vapor conduits for conveying weak liquor and vapor, respectively, from the generator to the absorber, connections for returning strong liquor from the absorber to the generator, a by-pass for passing a quantity of vapor from the generator to displace the liquor returning to the accumulator, and a pressure-controlled valve in said by-pass, adapted to close upon a reduction in pressure in said connections, said valve comprising a casing having an upwardly facing valve seat, a valve element vertically movable therein, said element comprising a skirt portion provided with a restricted orifice, means resiliently supporting said valve in a position in which said orifice allows a normal flow of fluid therethrough, the resistance of the orifice being so correlated to that of the resilient supporting means that a sharp increase in the pressure drop across said valve will cause it to close and to seat against said valve seat.

14. The method of operating an absorption refrigeration system having a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor, respectively, from the generator to the absorber, a draw-off connection for conveying strong liquor from the absorber to the accumulator, and a return line for returning liquor from the accumulator to the generator, comprising the following steps: injecting cooled weak liquor into the accumulator to absorb vapor therein and reduce the pressure therein to a level substantially equal to that of the absorber so as to allow the excess liquor in the absorber to flow into the accumulator, allowing the pressure in the accumulator to raise to that in the generator as it fills with liquor, and then opening a by-pass from the generator to the accumulator as a result of such pressure increase, to displace the liquor from the accumulator back into the generator.

15. The method of operating an absorption refrigeration system having a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor, respectively, from the generator to the absorber, a draw-off connection for conveying strong liquor from the absorber to the accumulator, and a return line for returning liquor from the accumulator to the generator, comprising the following steps: injecting cooled weak liquor into the accumulator to absorb vapor therein and reduce the pressure therein to a level substantially equal to that of the absorber so as to allow the excess liquor in the absorber to flow into the accumulator, allowing the pressure in the accumulator to raise to that in the generator as it fills with liquor, and

causing said return line and by-pass to close as a result of the reduction of pressure during the stage of transfer from the absorber to the accumulator, so as to temporarily maintain the reduction of pressure in the accumulator.

16. In a continuous absorption refrigeration system the combination of a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor, respectively, to the absorber, means controlled by a rise of liquid level in the generator for transferring strong liquor from the absorber to the accumulator, and means for transferring the strong liquor from the accumulator to the generator.

17. In a continuous absorption refrigeration system the combination of a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor, respectively, to the absorber, means for transferring strong liquor from the absorber to the accumulator while the operation of the absorber continues uninterrupted, the pressure in the accumulator being normally higher than that in the absorber and said means including devices for periodically lowering the accumulator pressure to not more than that of the absorber, whereby to effect such transfer, and means for transferring said strong liquor from the accumulator to the generator likewise while the operation of the absorber continues uninterrupted.

18. The method of operating an absorption refrigeration system having a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor, respectively, from the generator to the absorber, a draw-off connection for conveying strong liquor from the absorber to the accumulator, and a conduit for returning liquor from the accumulator to the generator, which comprises maintaining constantly a lower pressure in the absorber than in the generator, the pressure in the absorber being such that absorption may take place therein practically continuously, maintaining at times a higher pressure in said accumulator than in the absorber, periodically reducing the pressure in said accumulator sufficiently to cause transfer of liquor from the absorber to the accumulator, and at other periods increasing the pressure in the accumulator sufficiently to cause transfer of the accumulated liquor therein to the generator.

19. In a continuous absorption refrigeration system the combination of a generator, an absorber, an accumulator, weak liquor and vapor conduits for conveying weak liquor and vapor, respectively, to the absorber, means for transferring strong liquor from the absorber to the accumulator, and means for transferring the strong liquor from the accumulator to the generator, said first mentioned means being controlled by action of the strong liquor after the return thereof from the accumulator to the generator.

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