Dec. 5, 1933. L. BUEHLER, JR 1,937,809

REFRIGERATING MACHINE

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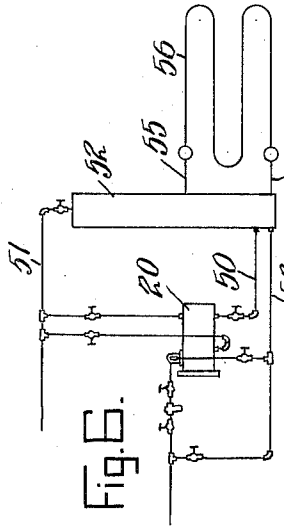


Fig. 6.

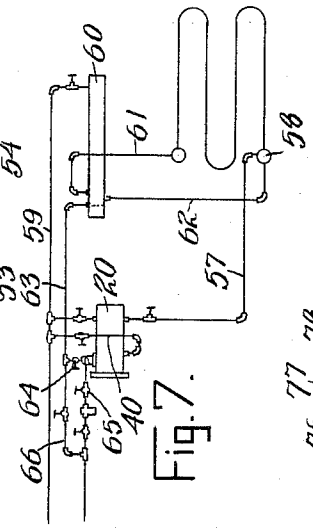


Fig. 7.

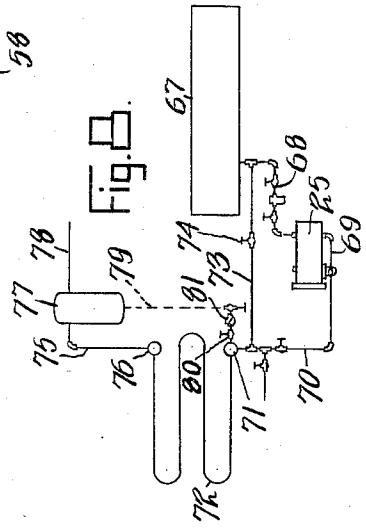


Fig. 8.

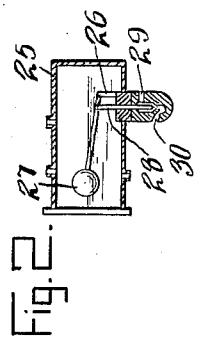


Fig. 2.

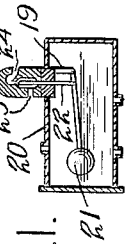


Fig. 1.

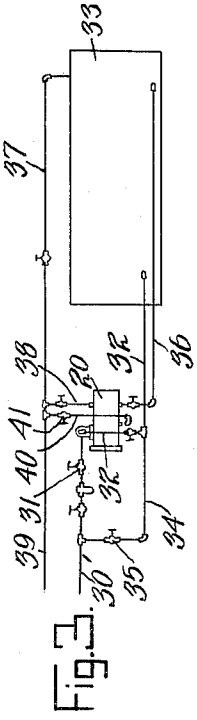


Fig. 3.

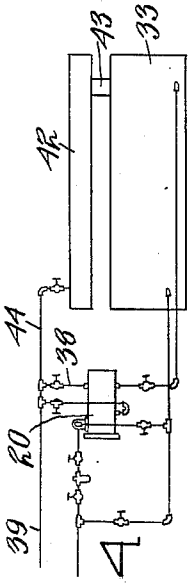


Fig. 4.

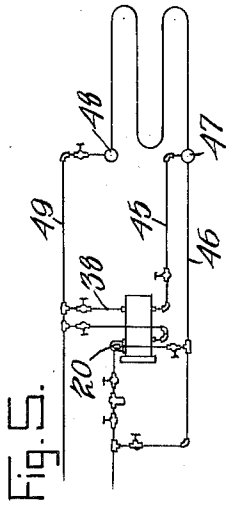


Fig. 5.

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Fig. 9.

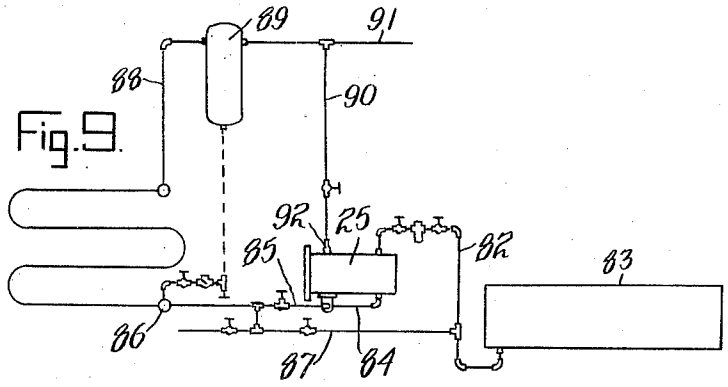


Fig. 10.

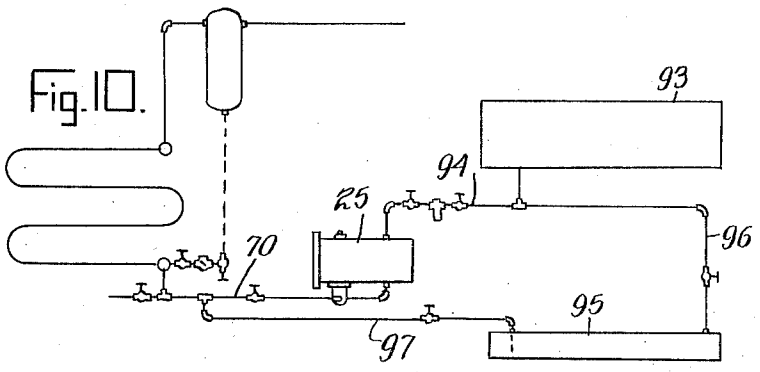


Fig. 11.

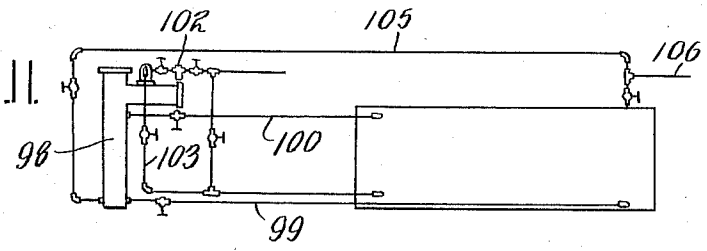
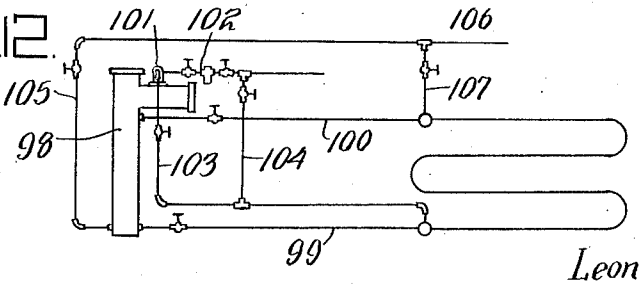


Fig. 12.



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Fig. 13.

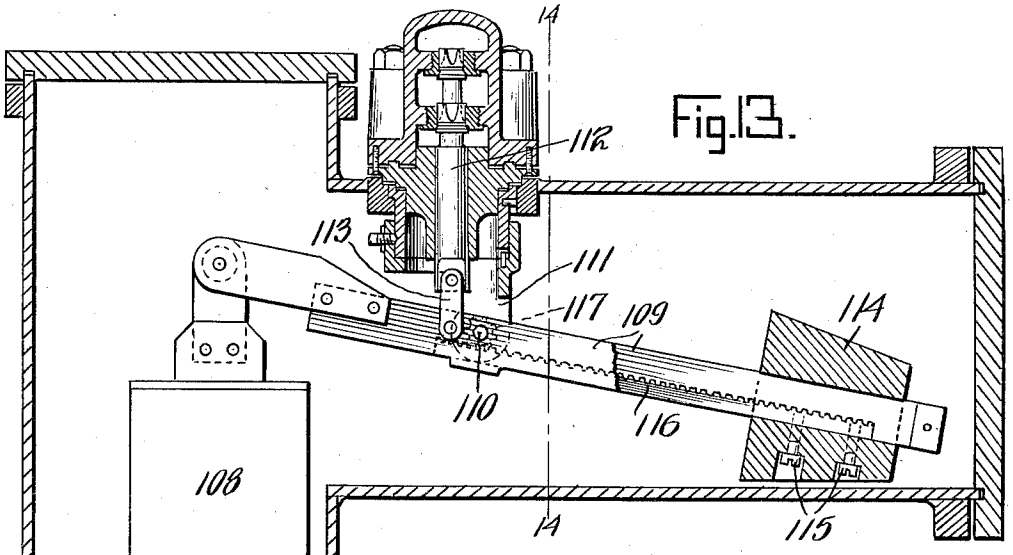
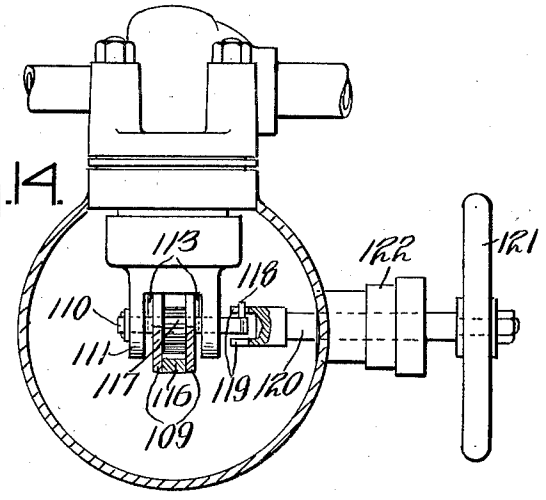


Fig. 14.



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UNITED STATES PATENT OFFICE

1,937,809

REFRIGERATING MACHINE

Leon Buehler, Jr., Waynesboro, Pa., assignor to Frick Company, Waynesboro, Pa., a corporation of Pennsylvania

Application July 28, 1930. Serial No. 471,373

4 Claims. (Cl. 62—126)

This invention relates to means for controlling the flow of refrigerant to the evaporating coils of refrigerating machines and an object of the invention is to provide float control means for maintaining a predetermined liquid level in the evaporator.

A further object is to provide control means to insure a flow of liquid refrigerant from the condenser to the evaporating coils and to prevent passage of gaseous refrigerant from the condenser to the evaporator.

A further object is to provide a new float controlled valve for controlling the flow of refrigerant to the evaporator.

Referring to the accompanying drawings, which are made a part hereof and on which similar reference characters indicate similar parts,

Figure 1 is a vertical section of one form of float controlled valve,

Figure 2, a vertical section of a different form of float controlled valve,

Figures 3 to 7, inclusive, 11 and 12 are views in elevation of various forms of refrigerating systems embodying my invention, in which the float control shown in Figure 1 is used, the drawings being a somewhat diagrammatic.

Figures 8, 9 and 10 are views in elevation of systems in which the float control shown in Figure 2 is used.

Figure 13 is a fragmentary vertical section of the float chamber and associated parts of the form shown in Figures 11 and 12, and

Figure 14 is a section on line 14—14 of Figure 13.

In Figure 1 numeral 20 indicates a float chamber having a bracket 19 depending therein to which bracket is pivotally mounted a float 21. A valve 22 is pivotally attached to the arm of the float, this valve controlling flow of refrigerant through the ports 23 and 24 to which ports refrigerant lines, later to be described, are connected. The valve shown in Figure 1, as will be seen, is adapted to be closed when liquid in the chamber 20 rises to a predetermined level and is opened when the liquid falls below a predetermined level. The device shown in Figure 2 consists of a casing 25 into which extends a bracket 26 having a float 27 pivotally mounted thereon, the float carrying a valve 28 which controls flow of liquid through the ports 29 and 30. The valve shown in Figure 2 is similar in all respects to the valve shown in Figure 1, except that it is closed when the liquid in the chamber 25 drops to a predetermined low level and is opened when the liquid rises to a predetermined high level. The form of valve shown in Figure 1 is used in the hook-ups illustrated in Figures 3 to 7 inclusive and 11 and 12. The valve shown in Figure 2 is used in Figures 8, 9 and 10. In Figure 3 numeral 30′ indicates a refrigerant supply line which is connected to the port 23. The flow of refrigerant through this line is controlled by valves 31. A pipe 32 connects the port 24, to the bottom of an evaporator 33. A by-pass pipe 34 having a valve 35 therein passes directly from the line 30′ to the evaporator. An equalizing pipe 36 is connected to the lower side of the chamber 20 at one end and connected at its other end to the lower end of the evaporator. The upper portion of the evaporator is connected by means of a pipe 37 and a pipe 38 with the upper side of the chamber 20. Pipe 37 is also connected to a suction line 39 which leads to the compressors of the system. A pump-out pipe connection 40 controlled by a valve 41 is connected at its lower end to the underside of the chamber 20 and at its upper end into the suction line 39.

From the description so far given it should be clear that the float 21 will operate to maintain a predetermined liquid level in the chamber 20 and a level in relation thereto in the brine cooler or evaporator 33, since the pipes 36 and 37 maintain the same pressure in the chamber 20 as is maintained in the evaporator. All fluid pipes shown in Figure 3 have the necessary manually operable valves for shutting them off whenever necessary.

The system shown in Figure 4 has fluid connections similar in all respects to those shown in Figure 3, but is provided further with a separating drum 42 mounted above the brine cooler or evaporator 33, being connected with the upper side of the evaporator by means of a pipe 43. The pipe 44 is connected to the upper side of the separating drum and to the suction line 39 and is connected into the chamber 20 in the same way in which it is connected in Figure 3. In Figure 5, the equalizing line 45 and the refrigerant flow line 46 connect into a lower header 47 of the evaporator coil and the upper header 48 is connected by means of line 49 to the suction line of the compressor and to the equalizing line 38 in the same way as that shown in Figure 3.

In Figure 6 equalizing lines 50 and 51 are connected respectively to the lower and upper ends of an accumulator 52. The refrigerant supply line 53 connects into the lower end of the accumulator 52. The accumulator is connected

by pipes 54 and 55 with the lower and upper headers of the evaporator coil 56. In Figure 7 equalizing line 57 is connected to the lower side of the tank 20 and to the lower header 58 of the evaporator coil. Equalizing line 59 is connected to the top of a separating drum 60. A pipe 61 connects the top of the evaporator coil with the top of the separating drum 60. The underside of the separating drum 60 is connected by means of a pipe 62 with the lower header 58 of the evaporator coil. A pipe 63 is connected to the top or bottom of the separating drum and connects through a valve 64 with port 24 on the float chamber 20. The supply line 65 as in the other constructions is connected to the port 23 of the float control valve. A valve controlled by-pass 66 is provided as in the other constructions. Pump-out connection 40 is provided in this form as also in forms 4, 5 and 6. In this form a predetermined liquid level is maintained in the separating drum which drum may be mounted above the evaporating coils.

In the system shown in Figures 3, 4, 5, 6 and 7 which have just been described the flow of refrigerant is controlled in response to predetermined liquid levels in the chamber 20, the valve opening when the liquid falls below a predetermined level so as to maintain the desired liquid level in the evaporator or in the drums or accumulator as described.

In the form shown in Figures 8, 9 and 10, about to be described, the float chamber 25 is used in which the valve opens when the liquid rises to a predetermined level so as to insure only liquid passing through the valve ports 29 and 30 to the evaporator.

In Figure 8 numeral 67 indicates a condenser which is connected through a pipe 68 with the top of the chamber 25. The bottom of the chamber 25 has a pipe 69 which pipe connects with the port 29 of the valve. A pipe 70 connected to the port 30 of the valve is connected to the lower header 71 of the evaporator 72. A pipe 73 controlled by a valve 74 connects the pipe 68 directly with the pipe 70 which passes to the header 71 of the evaporator coil. A pipe 75 is connected at one end to an upper header 76 of the evaporator coil and connected at its other end to an accumulator or liquid storage tank 77 which tank is connected to the suction line 78 leading to the compressors. A pipe 79 may be connected to the lower side of the accumulator 77 and connected through valve 80 and check valve 81 with the lower header 71 of the evaporator coils.

In this form refrigerant passes from the condenser 67 through the line 68 into the float chamber 25. From this chamber refrigerant passes through the line 69 through ports 29 and 30 to the line 70, thence to the lower end 71 of the evaporator. So long as there is sufficient liquid in the tank 25 to maintain the float 27 in an elevated position as shown in Figure 2, the valve 28 is raised to permit fluid to flow through port 29 and port 30. In the form shown in Figure 9 a pipe 82 is connected to the lower side of a condenser 83 and connects through the control valves with the upper side of the float chamber 25. A pipe 84 connects through the valve to a pipe 85 which passes to the lower header 86 on the evaporator coil. A by-pass pipe 87 passes directly from the pipe 82 to lower header 86. The upper header of the coil is connected by a pipe 88 with an accumulator 89 similar to that shown in Figure 8. In this form an equalizing pipe 90 connects with the upper side of the chamber 25 and is connected into the suction line 91 leading to the compressor. The line 90 connects through a vent connection 92 with the top of the tank 25. This form is similar to that shown in Figure 8 with the exception that the tank 25 is elevated above the condenser 83, this being made possible because of the line 90 which reduces the pressure in the chamber 25 to permit the fluid to rise into it. In the form shown in Figure 10 the condenser 93 is placed at a greater elevation than the chamber 25. A pipe 94 connects the lower side of the condenser with the chamber 25. The connections from the lower side of the chamber 25 with the lower side of the evaporator are similar in all respects to the form shown in Figure 8. Beneath the condenser 93 is a receiver 95, the receiver being connected by means of a pipe 96 with the lower side of the condenser 93. A valve controlled line 97 is connected with the upper side of the receiver through a syphon pipe to the bottom and connected into the line 70 which leads to the lower side of the evaporator coil.

In the form shown in Figures 11 and 12 a chamber 98 somewhat different from the chamber 20 is provided. Equalizing lines 99 and 100 connect the bottom and top of the tanks 98 with the bottom and top of the brine cooler or evaporator coil. A float controlled valve 101 controls passage of fluid from the line 102 to the line 103 in the same way in which the flow of fluid is controlled from line 30 to line 32, as described with respect to Figure 3. A by-pass line 104 is connected between the lines 102 and 103, this by-pass line being controlled by manually operable valve as usual. A pump-out line 105 is connected with the lower side of the chamber 98 and connected into the suction line 106 leading to the compressors. The evaporator coil is connected through pipe 107 with the suction line to the compressors.

In this form a fluid level is maintained in the evaporator coil in response to the fluid level in the chamber 98. The float is shown in detail in Figures 13 and 14. The float 108 is attached to a lever 109 which is pivoted on a shaft 110 to a depending bracket 111. The valve 112 is attached by means of a link 113 to this lever as in the other constructions. On the end of the lever opposite the float is slidably mounted a weight 114. This weight is secured by screws 115 to a rack 116. A pinion 117 on the shaft 110 engages with the rack. The end of the shaft 110 has a pin 118, which is engageable by the fingers 119 on the inner end of a shaft 120. The outer end of the shaft 120 has a wheel 121 for manually operating it. The shaft 120 of course is provided with the necessary packing glands indicated at 122. When it is desired to adjust the weight 114, the shaft 120 is pushed in and rotated. The float 108 is made heavy enough so that it will not float in the liquid refrigerant unless counterbalanced. By adjusting the weight, therefore, the level at which the float will operate the valve 112 may be regulated. From the foregoing description it will be seen that in Figures 3 to 7 inclusive and Figures 11 to 14, inclusive, a fluid level is maintained in the evaporator coils in response to fluid level in the fluid chamber so that a predetermined fluid level may be maintained in the evaporator. In the form shown in Figures 8, 9 and 10 it is de-

sired to insure that only liquid refrigerant will pass from the condenser to the evaporator coils. The float control, therefore, is arranged so that the valve opens only when there is a supply of liquid refrigerant within the chamber.

It will be obvious to those skilled in the art that various changes may be made in my device without departing from the spirit of the invention and therefore I do not limit myself to what is shown in the drawings and described in the specification, but only as indicated in the appended claims.

Having thus fully described my said invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a refrigerating system an evaporator cooler, a float chamber, a refrigerant supply line, a valve in said line for controlling the flow of refrigerant to the cooler, a float in the said chamber for controlling the said valve in response to the liquid level in the chamber, pipes connecting the said chamber with the lower part of the said cooler and connecting the upper part of said chamber with the upper part of said cooler to equalize liquid levels in the chamber and cooler, the said valve opening on a lowering of the liquid in the chamber and closing upon rising of the liquid in the chamber, a suction line from the said cooler to the compressors in the system, and a pump-out connection between said suction line and the lower part of the said chamber, said last-named line having a valve therein, substantially as set forth.

2. In a refrigerating system, an evaporator, a float chamber, a refrigerant supply line, a valve in said line for controlling the flow of refrigerant to the evaporator, a lever in said chamber, a float on said lever in said chamber for controlling the said valve in response to the liquid level in the chamber, a balancing device on the lever adjustable from the outside of said chamber to permit varying the liquid level in the chamber at will, pipes connecting the lower part of said chamber with the lower part of the evaporator and connecting the upper part of said chamber with the upper part of said evaporator to adjustably control the liquid levels in the chamber and evaporator, the said valve opening on a lowering of the liquid in the chamber and closing upon rising of the liquid in the chamber, substantially as set forth.

3. In a refrigerating system the combination with an evaporator of a float chamber, connections from the top of the chamber to the top of the evaporator, then from the bottom of the chamber to the bottom of the evaporator to equalize pressure in the evaporator and in the chamber, a refrigerant supply line, a valve in said line, a float in the said chamber operatively connected to the said valve to control flow of refrigerant from the said line to the evaporator in response to the change of the liquid level in the said chamber, and means for selectively counterbalancing the float to vary the height of the liquid at which the said control means operate, substantially as set forth.

4. In a refrigerating system the combination with an evaporator of a float chamber, connections from the top of the chamber to the top of the evaporator, then from the bottom of the chamber to the bottom of the evaporator to equalize pressure in the evaporator and in the chamber, a refrigerant supply line, a valve in said line, a float in the said chamber operatively connected to the said valve to control flow of refrigerant from the said line to the evaporator in response to the change of the liquid level in the said chamber, means for varying the height of the liquid at which the said control means operate, and a pump-out connection connected through the bottom of the said chamber with the said evaporator, and manually operable means for connecting and disconnecting the pump-out line, substantially as set forth.

LEON BUEHLER JR. [L. S.]