May 8, 1928. 1,669,141

C. ORR

REFRIGERATING MACHINE

Filed Feb. 2, 1926

Fig. 1.

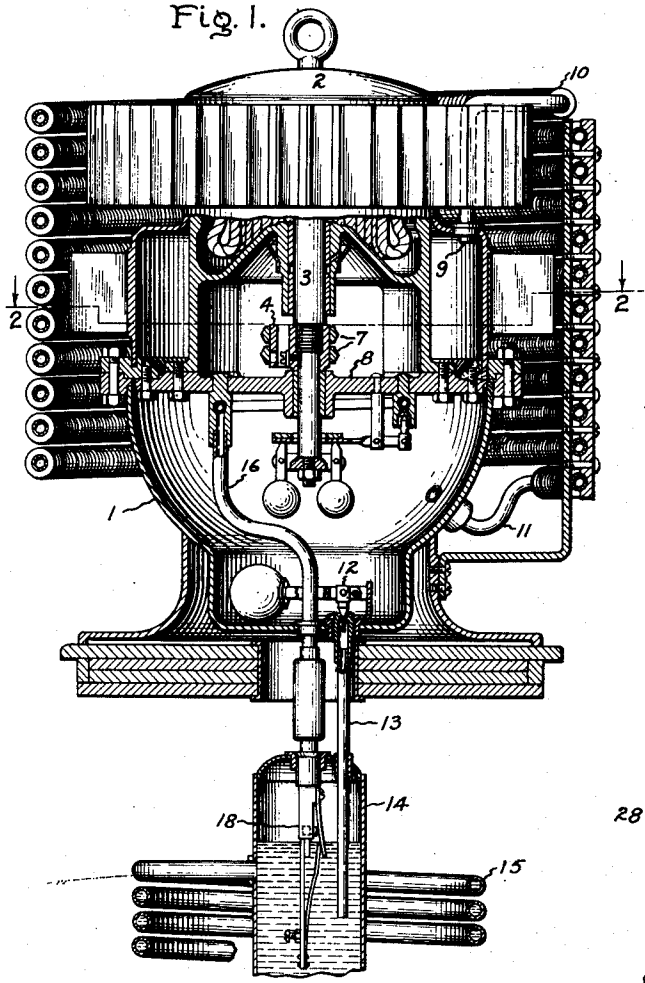



Fig. 3.

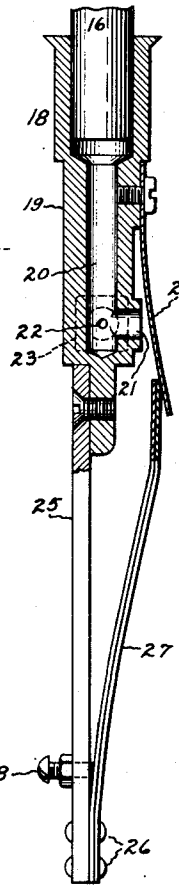



Fig. 4.

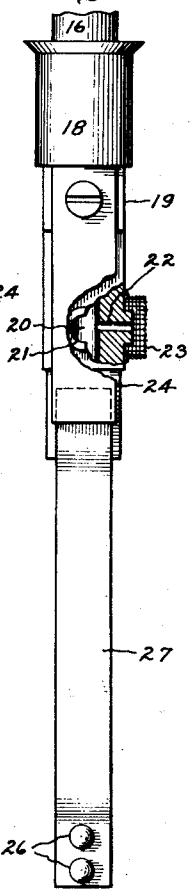
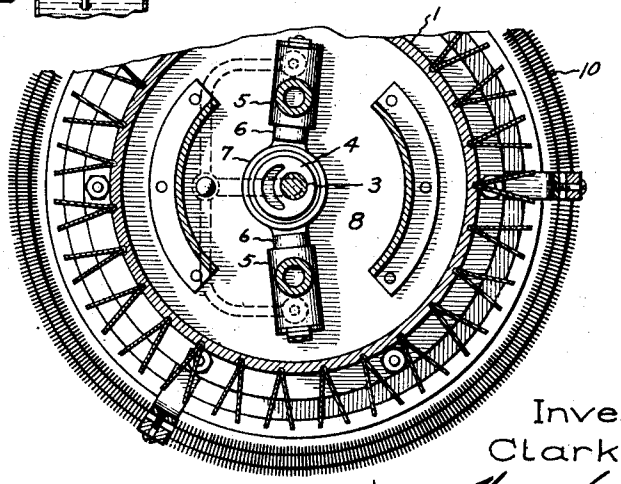



Fig. 2.




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# UNITED STATES PATENT OFFICE.

CLARK ORR, OF FORT WAYNE, INDIANA, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## REFRIGERATING MACHINE.

Application filed February 2, 1926. Serial No. 85,536.

My invention relates to refrigerating machines and particularly to that type of machine wherein a suitable refrigerant is caused to pass through a cycle comprising a compression of the refrigerant in the gaseous or vaporized condition, a condensation of the compressed refrigerant by the removal of heat therefrom, and an evaporation of the liquid refrigerant accompanied by the absorption of heat from the surrounding medium and objects which it is desired to maintain at a reduced temperature.

With a machine of this type, particularly one having a motor driven compressor, constructed to operate satisfactorily under normal low temperature running conditions, it has been found that when the machine is initially started or is started after a prolonged period of idleness during which the evaporator has become comparatively warm, difficulties sometimes occur due to the abnormally heavy duty thrown upon the compressor. The refrigerant in the evaporator being warmer than under normal cooperating conditions has a correspondingly higher density and the amount of refrigerant compressed at each stroke of the compressor in the case of a reciprocating compressor as well as the pressure in the compressor is accordingly greater. This greater load must be carried by the driving motor. Also because of the increased pressure in the compressor the loads thrown on some of the bearings may increase to values which cause lubrication troubles therein, particularly if the compressor and the lubricating oil are at a relatively low temperature.

An object of my invention therefore is the provision of simple, effective and inexpensive means for reducing, if not entirely eliminating effects, such as those mentioned above, resulting from an abnormally high temperature of the vaporized refrigerant received by the compressor. In accordance with my invention I provide a connection between the compressor and the evaporator which under normal operating conditions allows the vaporized refrigerant to flow substantially unrestricted, but which under conditions of abnormally high temperature of the vaporized refrigerant when its density is correspondingly high, allows only a restricted flow thereof. The compressor and its driving motor are thereby automatically relieved of an excessive duty which otherwise would be thrown upon them when the machine is first started or is started after a prolonged period of idleness.

My invention will be better understood from the following description taken in connection with the accompanying drawing, and its scope will be pointed out in the appended claims.

Referring to the drawing, Fig. 1 is a vertical section of a refrigerating machine embodying my invention; Fig. 2 is a horizontal section taken on the line 2—2 of Fig. 1; and Figs. 3 and 4 are detail elevations in partial section and on a larger scale of the thermostatic valve shown in Fig. 1.

In the drawing, Figs. 1 and 2 show a refrigeration machine of the form disclosed in my copending application, Serial No. 756,336, filed December 16, 1924, and assigned to the same assignee as the present application. This machine comprises the enclosing casing 1 having in its upper portion the electric motor 2 driving the shaft 3 on which is the eccentric 4. The two reciprocably mounted cylinders 5 comprising the compressor have their pistons 6 operated by straps 7 on the eccentric 4. The cylinders exhaust into the casing 1 above the partition 8 whence the compressed vaporized refrigerant enters the intake 9 of the condensing coil 10 from which liquid refrigerant flows into the lower portion of the casing 1 through pipe 11. The float valve 12 governs the flow of the liquid refrigerant through pipe 13 to the evaporator 14, in the coil 15 of which it is vaporized by the absorption of heat from the surrounding medium. The intake ports of the compressor cylinders 5 are connected with the evaporator 14 by the pipe 16 whereby the vaporized refrigerant is drawn up into the compressor.

In the upper portion of the evaporator 14 above the liquid level is the thermostatic valve 18. As shown in Figs. 3 and 4 this valve comprises a tubular body portion 19 to the upper part of which the pipe 16 connects and which makes a tight connection with the end head of the evaporator. The opening 20 in the body portion 19 communicates with a short lateral opening 21 of substantially the same size and with a small opening 22, the mouth of which is covered with a gauze cap 23. The mouth of the

larger opening 21 forms a seat upon which the flat spring valve 24 is adapted to rest and when in this position the valve spring closes the passage 21. The body portion 19 has an extension 25 secured to it and to the lower end of this extension there is shown fastened by rivets 26 one end of the temperature responsive device 27 which may be a bi-metallic strip comprising two metals having radically different co-efficients of thermal expansion. The upper end of this strip is arranged between the free end of the valve spring 24 and the body portion 19 and near the lower end is shown an adjusting screw 28. The strip 27 is so adjusted that under conditions of normal operating temperature in the evaporator it holds open the valve 24 allowing a substantially unrestricted flow of vaporized refrigerant from the evaporator to the compressor, but should the refrigerant in the evaporator become warmed due to inactivity of the machine or to other causes to such an extent that the resulting increase in density of the vapor reaches a point where the duty imposed upon the compressor and the driving motor becomes excessive when the machine is started, it allows the valve 24 to close whence the compressor can draw vapor only so fast as it can pass the restricted opening 22. This condition will continue until the machine has run long enough to cool the refrigerant down to the point where a greater quantity of vapor can be safely compressed than that which is able to pass the restricted opening. The thermostat will then begin to open the valve 24, which at the normal operating temperature will allow a free passage of vapor.

While I have described only one embodiment of my invention, I do not wish to be limited to the particular form shown and described as it will be apparent that many modifications therein may be made without departing from the scope of my invention as set forth in the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. A refrigerating machine comprising an evaporator, a condenser, a motor driven compressor, a connection between the evaporator and the compressor, a valve for controlling the flow of vaporized refrigerant therethrough, and a thermostat arranged in the evaporator for actuating the valve to close the same when the refrigerant in said evaporator becomes warm and to open the same when the refrigerant in said evaporator becomes cool.

2. A refrigerating machine comprising an evaporator, a condenser, a motor driven compressor connected therewith, a valve in the evaporator controlling the flow of vaporized refrigerant therefrom to the compressor, and a bi-metallic thermostat in the evaporator for actuating the valve to close the same when the refrigerant in said evaporator becomes warm and to open the same when the refrigerant in said evaporator becomes cool.

3. A refrigerating machine comprising an evaporator, a condenser, a compressor having a connection therewith, a valve body arranged in said evaporator having a seat, a valve adapted to engage said seat, and a thermostat in the evaporator for moving the valve relative to its seat to close the same when the refrigerant in the evaporator becomes warm and to open the same when the refrigerant in the evaporator becomes cool, said valve body having a small by-pass opening therein.

In witness whereof, I have hereunto set my hand this 29 day of January, 1926.

CLARK ORR.