Oct. 24, 1939. H. F. SMITH 2,177,306

REFRIGERATING APPARATUS

Original Filed May 30, 1929 3 Sheets-Sheet 1

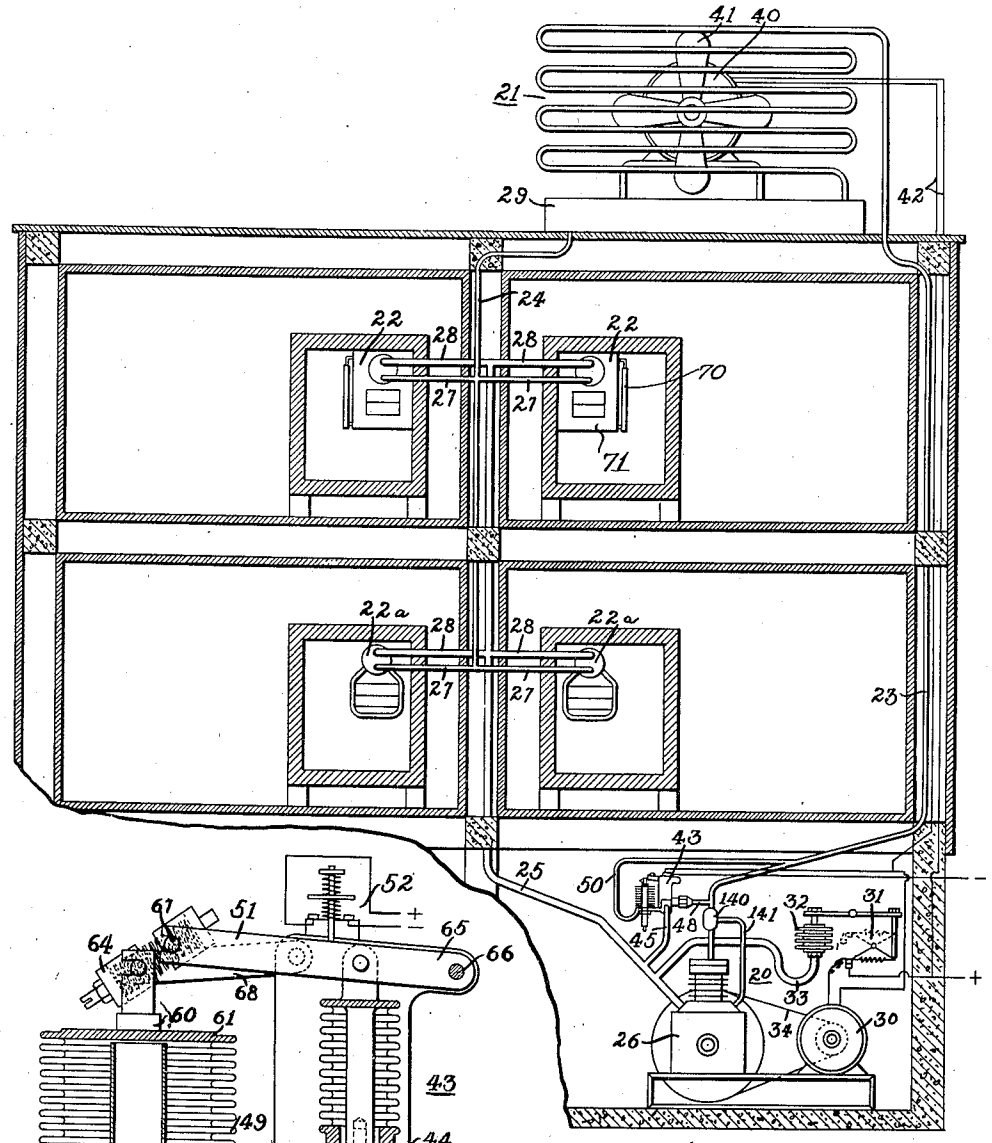


Fig. 1

Fig. 7

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REFRIGERATING APPARATUS

Original Filed May 30, 1929 3 Sheets-Sheet 2

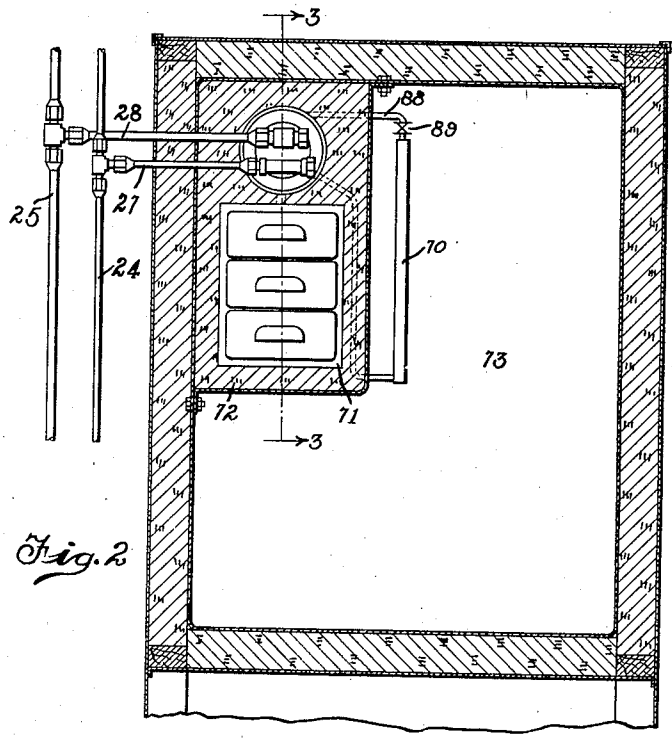


Fig. 2

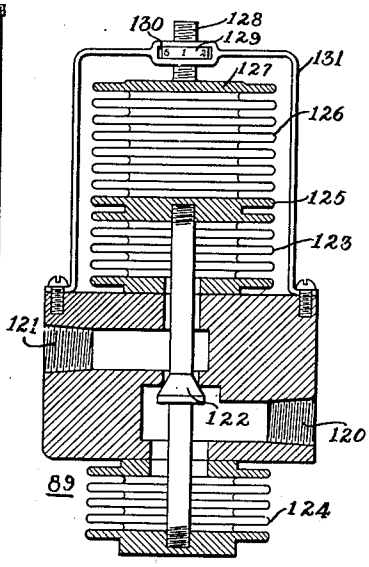


Fig. 6

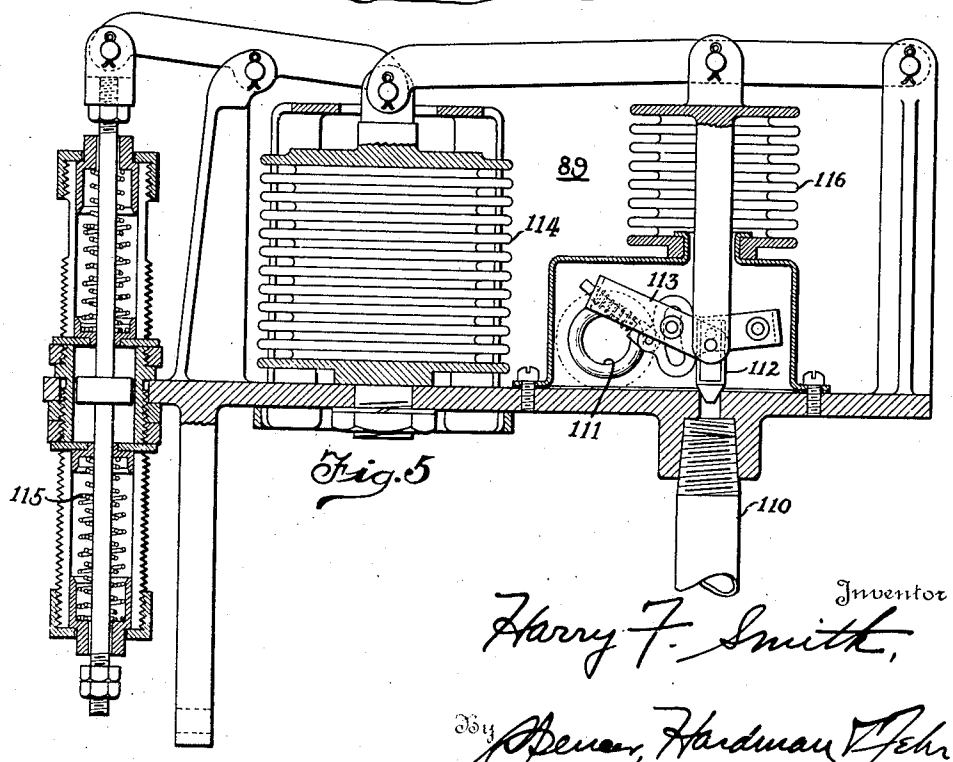


Fig. 5

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REFRIGERATING APPARATUS

Original Filed May 30, 1929 3 Sheets-Sheet 3

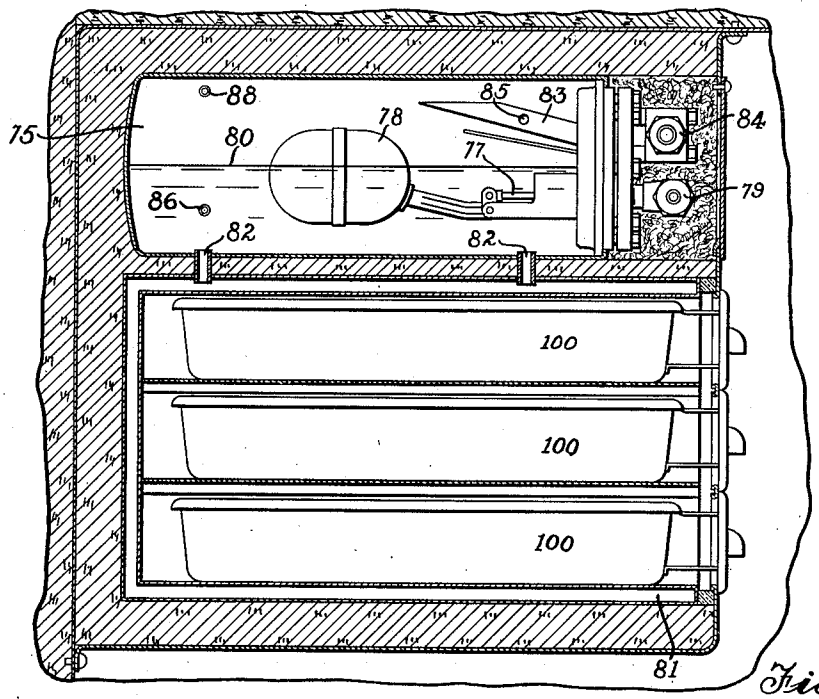


Fig. 3

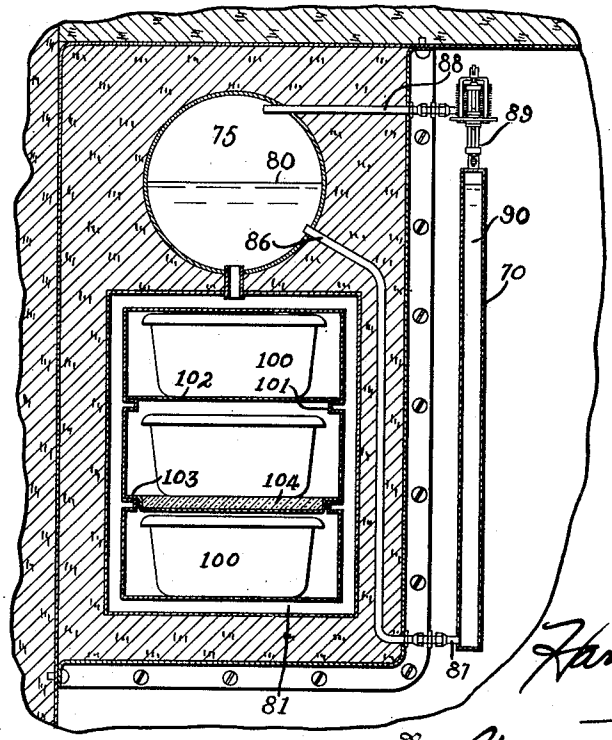


Fig. 4

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UNITED STATES PATENT OFFICE

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REFRIGERATING APPARATUS

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Application May 30, 1929, Serial No. 367,158
Renewed November 15, 1935

32 Claims. (Cl. 62—4)

This invention relates to refrigerating apparatus.

An object of this invention is to provide a refrigerating apparatus capable of furnishing refrigeration at various places in relatively independent and selective temperatures.

Another object of this invention is to provide a refrigerating apparatus with a cooling member having a freezing compartment and a cabinet cooling portion adapted to maintain independent temperatures in the medium with which they contact.

Another object of this invention is to provide a refrigerating system capable of utilizing low temperature weather conditions when the temperature outside of the cabinet to be refrigerated is below the temperature desired in the cabinet.

Another object of this invention is to increase the height to which the refrigerant may be lifted above the compressor.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

Fig. 1 is a view, somewhat diagrammatic, showing a refrigerating system embodying features of this invention;

Fig. 2 is an enlarged cross sectional view of one of the cabinets shown in Fig. 1;

Fig. 3 is an enlarged cross sectional view taken along the line 3—3 of Fig. 2;

Fig. 4 is a cross sectional view taken substantially transversely to Fig. 3;

Fig. 5 is a side elevation, partly in section, of a valve which may be used in the system;

Fig. 6 is a cross sectional view of a slightly different form of valve used in the system, and

Fig. 7 is a cross sectional view of the by-pass valve hereinafter to be described.

A refrigerating apparatus embodying features of this invention may include, in general, means for compressing a refrigerant, generally designated as 20. This means may deliver the compressed refrigerant to a condenser, generally designated as 21. The compressing means and condensing means together form a refrigerant liquefying means. The condenser may deliver the condensed refrigerant to one or more evaporators, generally designated as 22, and which may be below the condenser, if desired. The evaporator delivers the evaporated refrigerant to the means for compressing the refrigerant. The means for compressing the refrigerant may be of the mechanical type; such as an electrically driven mechanical compressor type, or it may be of the quasi chemical type, such as of the refrigerant absorbent type. When the means for compressing the refrigerant is of the mechanical type, a refrigerant line between the various members of the system may be provided. The refrigerant line may include a compressed refrigerant section 23, a liquid refrigerant section 24 and an evaporated refrigerant section 25. Ordinarily the section 23 connects the compressor 26 with the condenser 21. The section 24 ordinarily connects the condenser with one or more evaporators 22. The section 25 connects the one or more evaporators with the compressor 26. When there is more than one evaporator, the section 24 may be provided with branches 27 leading to the evaporators and the section 25 may be provided with branches 28 leading to the evaporators. If desired, the condenser 21 may be provided with a refrigerant receiver 29 adapted to contain a surplus supply of liquid refrigerant.

The refrigerating system may be automatically operated. Thus the compressor 26 may be driven by a motor 30 which is started and stopped in accordance with refrigerating conditions. The motor may be started and stopped by means of a snap switch 31 operated by means of an expansible bellows 32 connected to the section 25 of the refrigerant line, for instance by means of a pipe 33. Thus, if the evaporators are of the automatic inlet control type, the motor starts and stops in accordance with the pressures prevailing inside of the evaporators. The motor may be connected to the compressor by any suitable means such as a belt 34.

When it is desired to make the system so that it takes advantage of atmospheric temperatures, the condenser 21 may be placed where it may be exposed to the temperature outside of the building. Thus the condenser 21 may be placed on the roof, in the attic or at any other convenient place where it is subjected substantially to the outside temperature. As shown in the drawings, the condenser 21 may be placed on the roof of the building, and, if desired, a suitable cover, not shown, may be placed over the condenser. The condenser may be provided with a motor 40 having a fan 41. The motor 40 may be connected with a source of electricity by means of the wires 42 so as to place the motor 40 in parallel relation with the motor 30. Thus when the motor 30 is idle, the motor 40 is also idle and when the motor 30 operates the motor 40 also operates. Ordinarily when the temperatures outside the build-

ing are above the temperatures desired to be maintained in the evaporators the refrigerant is compressed by the compressor 26 and is condensed in the condenser 21. However, when the temperature around the condenser is below that desired to be maintained in the evaporators 22, a by-pass 43 may be provided which permits the evaporated refrigerant to pass from the section 25 to the section 23 without having to pass through the compressor 26. Thus, under these conditions the refrigerant evaporated in the evaporators 22 passes in a gaseous condition through the sections 25 and 23 and is condensed in the condenser 21 by reason of the extremely low temperature prevailing around the condenser. This is possible because the condensing temperature is practically the same as the evaporating temperature when the pressures are the same.

The by-pass 43 may be made automatically responsive to any desired suitable condition in the refrigerating system in order to accomplish the desired objects. Thus the by-pass 43 may include a valve 44 which may have a control responsive to any refrigerant pressure, and preferably to the refrigerant pressure in the section 23 corresponding to the condenser pressure. Thus the section 25 may be connected by means of a pipe 45 to the valve inlet 46, and the valve outlet 47 may be connected by means of a pipe 48 with the section 23. An expansible bellows 49 may operate the valve 44. The bellows 49 may be connected by means of a pipe 50 with the refrigerating system, and preferably with the section 23 as shown in the drawings. A suitable snap acting mechanism 51 is adapted to close the valve 44 when the pressure in the section 23 reaches a certain predetermined limit, and is adapted to open the valve 44 when the pressure in the section 23 lowers below a certain predetermined value. This predetermined value may be such as occurs when the temperature prevailing in the condenser 21 is below the temperature desired in the evaporator 22.

It may be desirable to prevent the operation of the means for compressing the refrigerant while the by-pass 43 is open. A way of accomplishing this is to provide a switch 52 which is in series with the motor 30 and the motor 40. The switch 52 is adapted to be open when the valve 44 is open and is adapted to be closed when the valve 44 is closed. Thus when the valve 44 is open the motor 30 can not operate because the circuit is broken by the switch 52.

Details of the by-pass 43 and its control may be varied to suit conditions. However, if it is desirable to provide suitable adjustments, this may be accomplished by providing a spring tension adjustment. Thus a yoke 60 may be connected to one end 61 of the bellows 49 and a spring 62 is adapted to bear against the yoke 60. The tension of the spring 62 may be adjusted by means of the screw 63. The upper end of the yoke 60 has a connection with the link 64. A lever 65 may be hinged at 66 and may be connected to the link 64 at the point 67. Thus when the link 64 is raised by the yoke 60 to a sufficient height, the lever 65 snaps downwardly and closes the valve 44. The yoke 60 rises when the pressure in the bellows 49 increases and the dimensions are so adjusted as to accomplish the the object herein set forth. A suitable tie-rod 68 may be provided in order to maintain the link 64 in proper alignment.

The evaporator, or evaporators, of this system may be of any suitable construction. However, if desired, the evaporators may be provided with freezing compartment and with cabinet cooling section, which are relatively independent in their actions on the mediums which they cool. Thus the evaporators may be provided with a cabinet cooling section 70 and with a freezing section 71. The freezing section 71, if desired, may be protected by insulation 72 which may surround the entire freezing section, but does not cover the cabinet cooling section. The cabinet cooling section may be provided with a suitable temperature control so that it maintains the temperature of the medium in the cabinet 73 at the desired temperature, which temperature may be relatively independent of the desired freezing temperature of the medium to be frozen in the section 71.

Any suitable construction may be used for accomplishing the immediately foregoing object. Thus the evaporator may be provided with a header 75. The header 75 is adapted to be connected with the section 71 and with the cabinet cooling section 70 in any suitable manner. Preferably the header 75 is provided with means for maintaining a liquid refrigerant level therein. This means may include a valve 77 controlled by any suitable means such as by a float 78. The valve 77 controls the entrance of liquid refrigerant from the fitting 79 which is connected with the branch 27 leading to the section 24. Thus the entrance of liquid refrigerant is controlled to maintain any suitable level, such as the level 80. The section 71 may include a refrigerant jacket 81 which may be connected by means of the passages 82 with the header 75. Thus the jacket 81 is adapted to be maintained in a flooded condition and the gas which boils off rises through the connections 82 and eventually passes out through the funnel 83 which is connected to the fitting 84 leading to the branch 28 and to the section 25. The funnel 83 may be provided with the usual oil return opening 85 and other suitable accessories substantially as disclosed in the patent to R. G. Osborn, No. 1,556,708, patented October 13, 1925.

The cabinet cooling section 70 may also be connected with the header 75. Thus one or more pipes 86 may be connected to the header below the level 80 and may lead to the bottom of the section 70 as shown at 87. The top of the section 70 may be connected by means of the pipe 88, preferably above the level 80 to the header 75. A suitable thermostat control may be provided for the section 70. A way of accomplishing this is to provide a thermostatically operated valve 89 in the section 88. This valve may be constructed so as to open when a predetermined high temperature is reached and to close when a predetermined low temperature is reached. Thus when the cabinet 73 is cooled sufficiently the valve 89 closes and further evaporation of the refrigerant 90 in the section 70 forms a gas in the upper portion of the section 70 and drives the liquid refrigerant up into the header 75 through the pipe 86. When all the liquid refrigerant is thus driven into the header 75 further refrigeration between the section 70 and the food storage compartment of the cabinet ceases. Preferably the pipe 86 is made of a sufficiently small diameter so that there is no tendency for the liquid refrigerant to surge downwardly and into the evaporator 70. The valve 89 has only a small pressure differential acting on it due to the slight hydrostatic head of the liquid refrigerant when some of the liquid from the section 70 has been driven into header 75.

The jacket 81 may be of any suitable construc-

tion, and preferably may be provided with means for receiving the ice trays 100 preferably accessible from the front of the cabinet. This may be accomplished by providing suitable inwardly directing flanges which are adapted to support heat conducting plates 102 for supporting the trays 100. If it is desired to prevent the rapid freezing of one or more of the trays, a suitably insulated plate 103 may be substituted. The plate 103 may be provided with an insulating pad 104 which prevents the rapid heat conduction between the refrigerant and the tray 100. One or more of these plates 103 may be substituted when desired for the normally used plates 102.

The refrigerating system is so adjusted as to maintain the liquid refrigerant in the header 75 at the lowest desired temperature. Ordinarily this temperature is such as to provide the fastest freezing temperature desired for the trays 100. As heretofore constructed the maintenance of an extremely cold temperature in the evaporator so cooled the refrigerator cabinet that articles therein were frozen although it was not desired to freeze them. By this construction it is possible to maintain relatively low temperatures in the section 71 and still maintain any desired higher temperature in the compartment 73 entirely independently of the temperature prevailing in the section 71.

The valve 89 may be of any suitable construction. It may be a snap acting valve as shown in Fig. 5 or it may be a slow closing valve as shown in Fig. 6. As shown in Fig. 5, the pipe 110 is connected with the section 70 and the outlet 111 is connected with the pipe 88. Preferably, the section 70 is a relatively thin porcelain enamel hollow plate which may be placed adjacent to the insulation 72. However, ordinarily only one connection 110 is necessary with such a construction. A valve 112 may be provided to close the pipe 110. A suitable snap acting mechanism included linkage 113, and the bellows 114, and the spring construction 115 may be provided. The construction is such that with the contraction of the bellows 114 due to low temperature in the cabinet 73, the valve 112 is closed. When the bellows 114 expands due to a rising temperature in the cabinet 73, the snap mechanism opens the valve 112 with the well-known snap action. The construction of the various members of this snap acting valve may be of any desired type and preferably is of the type disclosed in the application of Gilbert H. Williams, Serial No. 351,363, filed March 30, 1929 and since matured into Patent No. 2,038,153. The construction herein shown differs slightly from the disclosure in that application, it having been modified in an obvious manner in order to adapt it to the conditions herein disclosed. A suitable packing seal 116 is provided in order to prevent the escape of refrigerant along the valve stem.

In all of the showings in this application the expansible bellows, packing seals and the like may be of any desired construction such as metallic bellows, metallic diaphragms or their equivalents.

In the modification shown in Fig. 6 the section 70 may be connected to the valve inlet 120 and the pipe 88 may be connected to the valve outlet 121. A valve 122 may be connected to the sealing members 123 and 124, which may be metallic bellows for preventing the escape of refrigerant. The plate 125 may be connected to a thermostatic bellows 126, the other end of which is connected to a plate 127. The plate 127 may be provided with a suitable temperature adjustment. This may include a screw-threaded extension 128 having a threaded engagement with the rotary disc 129. The disc 129 is adapted to be held in a slot 130 provided in the yoke 131. Thus it is to be seen that when the desired predetermined low temperature is reached the bellows 126 has been constructed so as to close the valve. When the temperature then begins to rise in the cabinet 73 the bellows 126 expands and opens the valve and thus allows liquid refrigerant to enter the section 70 through connections 86, 87. By adjusting the disc 129 the desired temperature may be obtained in the cabinet 73.

In Fig. 1 the evaporator designated as 22 may be of the construction heretofore described. However, if desired, other cabinets need not be provided with this type of evaporator but may be provided with evaporators 22a of the usual float valve type such as is described in the patent to Osborn heretofore identified. It is to be seen that, depending on the desires of the users the types of evaporators may be varied.

Another advantage of this system is that the refrigerant is lifted to its highest height in the gaseous phase. Thus the liquid hydrostatic head is not on the condenser. Thus low condenser temperatures do not limit the height to which the refrigerant may be lifted, as is the case where the condenser is below the evaporators.

The section 23 may be provided with an oil separator 140 having a liquid float controlled valve which returns the oil to the compressor through line 141, for instance to the crankcase. The section 23 may be insulated to prevent the condensation of any great quantity of refrigerant before it reaches the condenser. If necessary the separator 140 may be provided with an electric oil heater to drive off any condensed refrigerant from the oil before it is returned to the low side of the system.

The evaporators may return the lubricant which may have traveled upwardly to the compressor by gravity. Thus it is possible to return the lubricant by gravity and at the same time prevent a hydrosatic liquid refrigerant head on the condenser.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A refrigerating system comprising means for compressing a refrigerant, a condenser receiving the refrigerant from said means, an evaporator receiving the refrigerant from said condenser and delivering the evaporated refrigerant to the means for compressing the refrigerant, and a by-pass from the evaporator to the condenser around said means operative while the condenser is exposed to a cooling medium colder than the required temperature of the evaporator.

2. A refrigerating system comprising means for compressing a refrigerant, a condenser receiving the refrigerant from said means, an evaporator below said condenser and receiving the refrigerant from said condenser and delivering the evaporated refrigerant to the means for conpressing the refrigerant, and a by-pass from the evaporator to the condenser around said means operative while the condenser is exposed to a cooling

medium colder than the required temperature of the evaporator.

3. A refrigerating system comprising means for compressing a refrigerant, a condenser receiving the refrigerant from said means, an evaporator receiving the refrigerant from said condenser and delivering the evaporated refrigerant to the means for compressing the refrigerant, and a by-pass from the evaporator to the condenser around said means having a control responsive to refrigerant pressure to render said by-pass operative while the condenser is exposed to a cooling medium colder than the required temperature of the evaporator.

4. A refrigerating system comprising means for compressing a refrigerant, a condenser receiving the refrigerant from said means, an evaporator receiving the refrigerant from said condenser and delivering the evaporated refrigerant to the means for compressing the refrigerant, and a by-pass from the evaporator to the condenser around said means having a control responsive to refrigerant pressure in the condenser to render said by-pass operative while the condenser is exposed to a cooling medium colder than the required temperature of the evaporator.

5. A refrigerating system comprising means for compressing a refrigerant, a condenser receiving the refrigerant from said means, an evaporator below said condenser and receiving the refrigerant from said condenser and delivering the evaporated refrigerant to the means for compressing the refrigerant, and a by-pass from the evaporator to the condenser around said means having a control responsive to refrigerant pressure to render said by-pass operative while the condenser is exposed to a cooling medium colder than the required temperature of the evaporator.

6. A refrigerating system comprising means for compressing a refrigerant, a condenser receiving the refrigerant from said means, an evaporator below said condenser and receiving the refrigerant from said condenser and delivering the evaporated refrigerant to the means for compressing the refrigerant, and a by-pass from the evaporator to the condenser around said means having a control responsive to refrigerant pressure in the condenser to render said by-pass operative while the condenser is exposed to a cooling medium colder than the required temperature of the evaporator.

7. A refrigerating system comprising means for compressing a refrigerant, a condenser receiving the refrigerant from said means, an evaporator receiving the refrigerant from said condenser and delivering the evaporated refrigerant to the means for compressing the refrigerant, and a by-pass from the evaporator to the condenser around said means operative while the condenser is exposed to a cooling medium colder than the required temperature of the evaporator, said means for compressing a refrigerant including an electric motor, an electric snap switch for controlling the starting and stopping of said motor responsive to evaporator conditions, a snap action mechanism controlling the by-pass responsive to condenser conditions.

8. A refrigerating system comprising means for compressing a refrigerant, a condenser receiving the refrigerant from said means, an evaporator receiving the refrigerant from said condenser and delivering the evaporated refrigerant to the means for compressing the refrigerant, and a by-pass from the evaporator to the condenser around said means operative while the condenser is exposed to a cooling medium colder than the required temperature of the evaporator, said means for compressing a refrigerant including an electric motor, an electric snap switch for controlling the starting and stopping of said motor responsive to evaporator conditions, a snap action mechanism controlling the by-pass responsive to condenser conditions, a second electric switch operated by said snap action mechanism in series with said first named snap switch whereby said motor cannot operate when said by-pass is opened by said snap action mechanism.

9. A refrigerating system comprising means for compressing a refrigerant, a condenser receiving the refrigerant from said means, an evaporator receiving the refrigerant from said condenser and delivering the evaporated refrigerant to the means for compressing the refrigerant, and means for conducting refrigerant from the evaporator to the condenser while the means for compressing is idle and while the condenser is exposed to a cooling medium colder than the required temperature of the evaporator.

10. A refrigerating system comprising means for liquefying a refrigerant, a cabinet having an insulated food storage compartment and ice-making compartment insulated from said food storage compartment, an evaporator connected to said means, said evaporator having a section located in said food storage compartment and another section located in said ice-making compartment, governing means for governing the discharge of refrigerant to said evaporator from said means for liquefying a refrigerant, said governing means throttling the flow of refrigerant into said evaporator when liquid refrigerant reaches a predetermined level in a portion of said evaporator, a liquid refrigerant connection between said sections, a gas connection between said sections, a valve in said gas connection having a thermostatic control responsive to temperatures in said food storage compartment whereby the closing of said valve causes liquid to flow from one of said sections to the other.

11. A refrigerating system comprising means for liquefying a refrigerant, a cabinet having an insulated food storage compartment and an ice-making compartment insulated from said food storage compartment, an evaporator connected to said means, said evaporator having a section located in said food storage compartment and another section located in said ice-making compartment, tray sleeves in said ice-making compartment accessible from the front of said cabinet, governing means for governing the discharge of refrigerant to said evaporator from said means for liquefying a refrigerant, said governing means throttling the flow of refrigerant into said evaporator when liquid refrigerant reaches a predetermined level in a portion of said evaporator, a liquid refrigerant connection between said sections, a gas connection between said sections, a valve in said gas connection having a thermostatic control responsive to temperatures in said food storage compartment whereby the closing of said valve causes liquid to flow from one of said sections to the other.

12. A mechanical refrigerator of the household type comprising walls enclosing an ice-making compartment and a food storage compartment, an evaporator for cooling said refrigerator, said evaporator having a portion in heat exchange relation with said ice-making compartment and a portion in heat exchange relation with said food storage compartment, and means responsive to

the temperature of said food storage compartment for controlling the rate of refrigeration in that portion of the evaporator which is in heat exchange relation with said food storage compartment.

13. A mechanical refrigerator of the household type comprising walls enclosing an ice-making compartment and a food storage compartment, an evaporator for cooling said refrigerator, said evaporator having a portion in heat exchange relation with said ice-making compartment and a portion in heat exchange relation with said food storage compartment, and a valve actuated in response to the temperature within said food storage compartment for controlling the rate of refrigeration in that portion of the evaporator which is in heat exchange relation with said food storage compartment.

14. The method of maintaining a space at a substantially constant refrigerating temperature which comprises introducing heat from said space into an evaporating zone, circulating a volatile refrigerant between said evaporating zone and a condensing zone, automatically compressing said volatile refrigerant when the temperature of said condenser is above said refrigerating temperature and when said space requires refrigeration, and automatically condensing said refrigerant in said condensing zone at substantially equal or lower pressure with said evaporating zone when the temperature of said condensing zone is lower than the temperature of said space.

15. Refrigerating apparatus including a refrigerator cabinet having a food storage compartment therein, a closed refrigerant circuit having a portion insulated from the food storage compartment of the refrigerator and a portion exposed within the food storage compartment of the refrigerator and means for regulating the temperature within the food storage compartment by forcing a quantity of liquid refrigerant from the exposed portion of the refrigerant circuit automatically in accordance with conditions in said food storage compartment.

16. Refrigerating apparatus including a refrigerator cabinet having a food storage compartment therein, a refrigerant circuit containing liquid refrigerant having a portion exposed within said food storage compartment and a portion insulated from said food storage compartment and means responsive to the temperature within said food storage compartment for forcing liquid refrigerant from the exposed portion of the refrigerant circuit into the portion insulated in the food storage compartment.

17. Refrigerating apparatus including a refrigerator cabinet having a food storage compartment therein and a refrigerant circuit containing liquid refrigerant having a portion insulated from the food storage compartment and a portion exposed within said food storage compartment, a freezing chamber insulated from said food storage compartment, means to supply refrigerant from said refrigerant circuit to the freezing chamber and means to regulate the temperature within the food storage compartment independently of the temperature within the freezing chamber by forcing a quantity of liquid refrigerant from the exposed portion of the refrigerant circuit into the insulated portion automatically in accordance with conditions in said food storage compartment.

18. Refrigerating apparatus comprising a cabinet, a freezing compartment in said cabinet to be maintained below 32° F., a food storage compartment in said cabinet to be maintained at a temperature above said freezing compartment, heat insulation between said compartments, a first evaporator for said food storage compartment, a second evaporator for said freezing compartment, a refrigerant liquefying unit connected to said evaporators in refrigerant flow relationship, an automatic control causing the operation of said liquefying unit upon refrigeration demands to maintain the temperature of refrigerant in said second evaporator below 32° F., and a thermostat for said food storage compartment to maintain refrigerating temperature in said food storage compartment above the temperature of said freezing compartment.

19. Refrigerating apparatus comprising a cabinet, a freezing compartment in said cabinet to be maintained below 32° F., a food storage compartment in said cabinet to be maintained at a temperature above said freezing compartment, heat insulation between said compartments, refrigerant evaporating means for said food storage compartment and for said freezing compartment, a refrigerant liquefying unit connected to said refrigerant evaporating means in refrigerant flow relationship, an automatic control causing operation of said liquefying unit upon refrigeration demand to maintain the temperature of refrigerant in said refrigerant evaporating means below 32° F., and a thermostat for said food storage compartment modifying said refrigerant evaporating means to maintain a refrigerating temperature in said food storage compartment at a temperature above said freezing compartment.

20. Refrigerating apparatus comprising a cabinet, a freezing compartment in said cabinet to be maintained below 32° F., a food storage compartment in said cabinet to be maintained at a temperature above said freezing compartment, heat insulation between said compartments, refrigerant evaporating means for said food storage compartment and for said freezing compartment, a refrigerant liquefying unit connected to said refrigerant evaporating means in refrigerant flow relationship, an automatic control causing operation of said liquefying unit upon refrigeration demand to maintain the temperature of refrigerant in said refrigerant evaporating means below 32° F., and a thermostat for said food storage compartment modifying the condition of refrigerant in said refrigerant evaporating means to maintain a refrigerating temperature in said food storage compartment at a temperature above said freezing compartment.

21. A refrigerating apparatus for household refrigerating purposes or the like in which a freezing temperature is desired for quickly freezing a substance and in which a higher temperature is desired for cooling food products stored therein comprising in combination, a household refrigerator cabinet, an insulated food storage chamber within said cabinet, a closed refrigerating system associated with said cabinet, said closed system including a cooling element mounted within said food storage chamber, said cooling element including a portion exposed to air within said chamber for cooling and causing circulation thereof, said cooling element also including another portion separate from said first named portion thereof and forming a freezing zone within said chamber for receiving a receptacle adapted to contain a substance to be frozen, a float valve responsive to the level of liquid refrigerant within one of said portions of

said cooling element for maintaining a predetermined amount of liquid refrigerant therein, the liquid refrigerant level within the other of said portions of said cooling element being independent of the level thereof in said one portion of said cooling element, said closed refrigerating system also including a unit adapted to circulate refrigerant to and from said cooling element, means for connecting said two portions of said cooling element in parallel circuit relation with said unit and for conducting refrigerant circulated thereby to said cooling element portions, and means for controlling the temperature of one of said portions of said cooling element automatically in response to the refrigerating effect produced thereby.

22. A refrigerating apparatus for household refrigerating purposes or the like in which a freezing temperature is desired for quickly freezing a substance and in which a higher temperature is desired for cooling food products stored therein comprising in combination, a household refrigerator cabinet, an insulated food storage chamber within said cabinet, a closed refrigerating system associated with said cabinet, said closed system including a cooling element mounted within said food storage chamber, said cooling element including a portion exposed to air within said chamber for cooling and causing circulation thereof, said cooling element also including another portion separate from said first named portion thereof and forming a freezing zone within said chamber for receiving a receptacle adapted to contain a substance to be frozen, a float valve responsive to the level of liquid refrigerant within one of said portions of said cooling element for maintaining a predetermined amount of liquid refrigerant therein, the liquid refrigerant level within the other of said portions of said cooling element being independent of the level thereof in said one portion of said cooling element, said closed refrigerating system also including a unit adapted to circulate refrigerant to and from said cooling element, means for connecting said two portions of said cooling element in parallel circuit relation with said unit and for conducting refrigerant circulated thereby to said cooling element portions, and means for controlling the operation of said circulating unit in accordance with the refrigeration conditions in said apparatus.

23. A refrigerating apparatus for household refrigerating purposes or the like in which a freezing temperature is desired for quickly freezing a substance and in which a higher temperature is desired for cooling food products stored therein comprising in combination, a household refrigerator cabinet, an insulated food storage chamber within said cabinet, a closed refrigerating system associated with said cabinet, said closed system including a cooling element mounted within said food storage chamber, said cooling element including a portion exposed to air within said chamber for cooling and causing circulation thereof, said cooling element also including another portion separate from said first named portion thereof and forming a freezing zone within said chamber for receiving a receptacle adapted to contain a substance to be frozen, a float valve responsive to the level of liquid refrigerant within one of said portions of said cooling element for maintaining a predetermined amount of liquid refrigerant therein, another liquid refrigerant level control for the other of said portions of said cooling element, said closed refrigerating system also including a unit adapted to circulate refrigerant to and from said cooling element, means for connecting said two portions of said cooling element in parallel circuit relation with said unit and for conducting refrigerant circulated thereby to said cooling element portions, and means for controlling the temperature of one of said portions of said cooling element automatically in response to the refrigerating effect produced thereby.

24. A refrigerating apparatus for household refrigerating purposes or the like in which a freezing temperature is desired for quickly freezing a substance and in which a higher temperature is desired for cooling food products stored therein comprising in combination, a household refrigerator cabinet, an insulated food storage chamber within said cabinet, a closed refrigerating system associated with said cabinet, said closed system including a cooling element mounted within said food storage chamber, said cooling element including a portion exposed to air within said chamber for cooling and causing circulation thereof, said cooling element also including another portion separate from said first named portion thereof and forming a freezing zone within said chamber for receiving a receptacle adapted to contain a substance to be frozen, insulation between said air cooling and said freezing zone portions of said cooling element for isolating said freezing zone portion thereof from air circulating in said chamber, said closed refrigerating system also including a unit adapted to circulate refrigerant to and from said cooling element, means for connecting said two portions of said cooling element in parallel circuit relation with said unit and for conducting refrigerant circulated thereby to said cooling element portions, and means for controlling the temperature of one of said portions of said cooling element automatically in response to the refrigerating effect produced thereby.

25. A refrigerating apparatus for household refrigerating purposes or the like in which a freezing temperature is desired for quickly freezing a substance and in which a higher temperature is desired for cooling food products stored therein comprising in combination, a household refrigerator cabinet, an insulated food storage chamber within said cabinet, a closed refrigerating system associated with said cabinet, said closed system including a cooling element mounted within said food storage chamber, said cooling element including a portion exposed to air within said chamber for cooling and causing circulation thereof, said cooling element also including another portion separate from said first named portion thereof and forming a freezing zone within said chamber for receiving a receptacle adapted to contain a substance to be frozen, insulation between said air cooling and said freezing zone portions of said cooling element for isolating said freezing zone portion thereof from air circulating in said chamber, said closed refrigerating system also including a unit adapted to circulate refrigerant to and from said cooling element, means for connecting said two portions of said cooling element in parallel circuit relation with said unit and for conducting refrigerant circulated thereby to said cooling element portions, and means for controlling the temperature of said air cooling portion of said cooling element automatically in response to the refrigerating effect produced thereby.

26. A refrigerating apparatus for household

refrigerating purposes or the like in which a freezing temperature is desired for quickly freezing a substance and in which a higher temperature is desired for cooling food products stored therein comprising in combination, a household refrigerator cabinet, an insulated food storage chamber within said cabinet, a closed refrigerating system associated with said cabinet, said closed system including a cooling element mounted within said food storage chamber, said cooling element including a portion exposed to air within said chamber for cooling and causing circulation thereof, said cooling element also including another portion separate from said first named portion thereof and forming a freezing zone within said chamber for receiving a receptacle adapted to contain a substance to be frozen, insulation between said air cooling and said freezing zone portions of said cooling element for isolating said freezing zone portion thereof from air circulating in said chamber, said closed refrigerating system also including a unit adapted to circulate refrigerant to and from said cooling element, means for connecting said two portions of said cooling element in parallel circuit relation with said unit and for conducting refrigerant circulated thereby to said cooling element portions, and means for controlling the operation of said circulating unit in accordance with the refrigeration conditions in said apparatus.

27. Refrigerating apparatus comprising a chamber or compartment to be cooled, a device for cooling air within said chamber or compartment, a unit connected to said air cooling device for circulating a cooling medium thereto and therefrom, a control responsive to conditions of the air in said chamber or compartment for controlling the cooling of air therein by said device, and means responsive to the condition of air outside said chamber or compartment for controlling the operation of at least a part of said apparatus.

28. Refrigerating apparatus comprising a chamber or compartment to be cooled, a device for cooling air within said chamber or compartment, a unit connected to said air cooling device for circulating a cooling medium thereto and therefrom, a control responsive to conditions of the air in said chamber or compartment for controlling the circulation of cooling medium through said device, and means responsive to the condition of air outside said chamber or compartment for modifying the starting and/or stopping of said unit.

29. A refrigerating system including a plurality of flooded evaporators, a single header for said evaporators, means for supplying refrigerant to said evaporators, means connecting said evaporators to said header, means connected to said header for withdrawing gaseous refrigerant from said evaporators, one of said evaporators being in constant open communication with said last named means, and means including a thermostatic valve controlling the withdrawal of gaseous refrigerant from another of said evaporators for maintaining said another evaporator at a predetermined temperature higher than that of said one evaporator.

30. A refrigerating system including a plurality of flooded evaporators, means for supplying liquid refrigerant to said evaporators, means for withdrawing gaseous refrigerant from said evaporators, one of said evaporators being in constant open communication with said last named means, and thermostatically operated means for forcing liquid from another of said evaporators and lowering the level of liquid refrigerant therein for maintaining said another evaporator at a predetermined temperature higher than that of said one evaporator.

31. A refrigerating system including a plurality of flooded evaporators, a header for said evaporators, means for supplying liquid refrigerant to said header and to said evaporators, means connecting said evaporators and said header for withdrawing gaseous refrigerant from said evaporators, one of said evaporators being in constant open communication with said last named means, and means for controlling the flow of gaseous refrigerant from another of said evaporators and causing liquid refrigerant to be forced therefrom into said header for lowering the level of liquid refrigerant in said another evaporator to maintain same at a predetermined temperature higher than that of said one evaporator.

32. A refrigerating system including a plurality of flooded evaporators, a header for said evaporators, means for supplying liquid refrigerant to said header and to said evaporators, means including conduits connecting said evaporators and said header for withdrawing gaseous refrigerant from said evaporators, one of said evaporators being in constant open communication with said last named means, and means including a valve responsive to the temperature of another of said evaporators and arranged in one of said conduits for maintaining said another evaporator at a predetermined temperature higher than that of said one evaporator.

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