Jan. 22, 1935. J L. GIBSON 1,988,549

REFRIGERATING APPARATUS

Filed Sept. 30, 1930 3 Sheets-Sheet 1

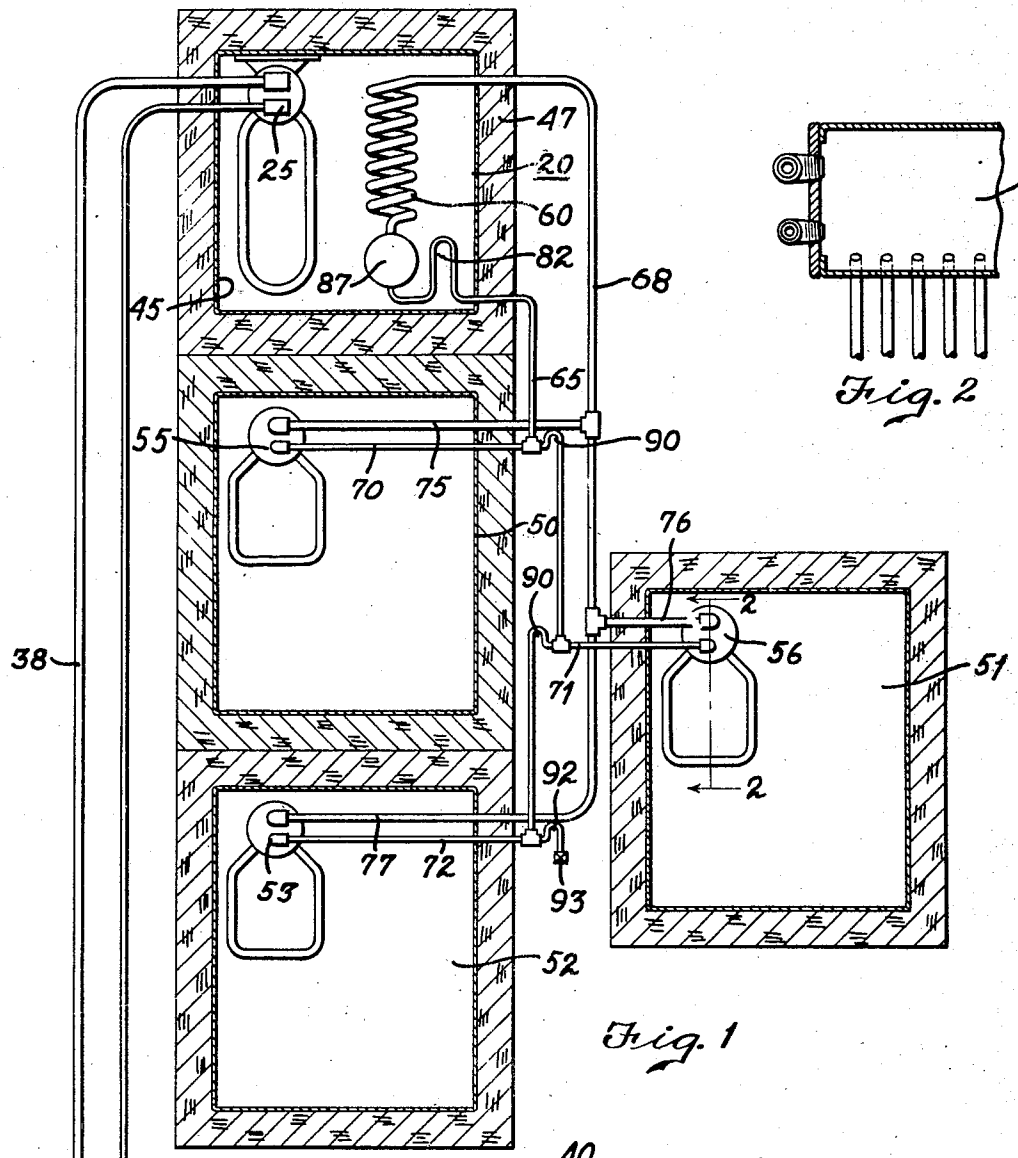


Fig. 1

Fig. 2

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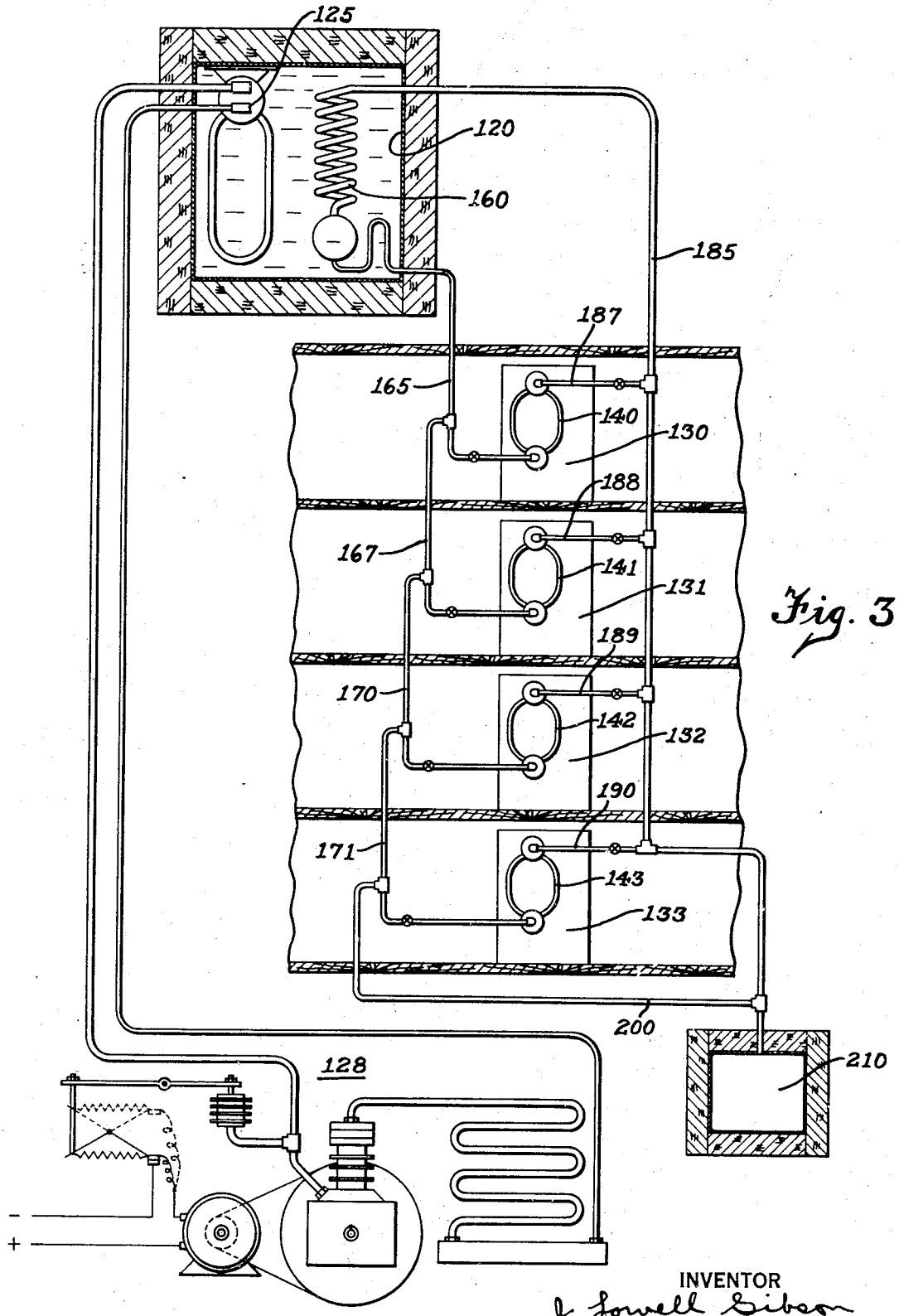


Fig. 3

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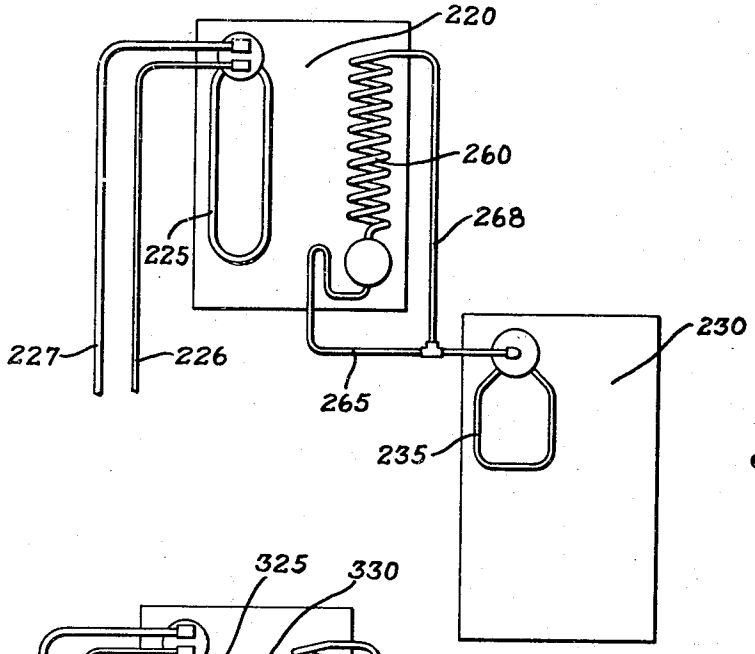


Fig. 4

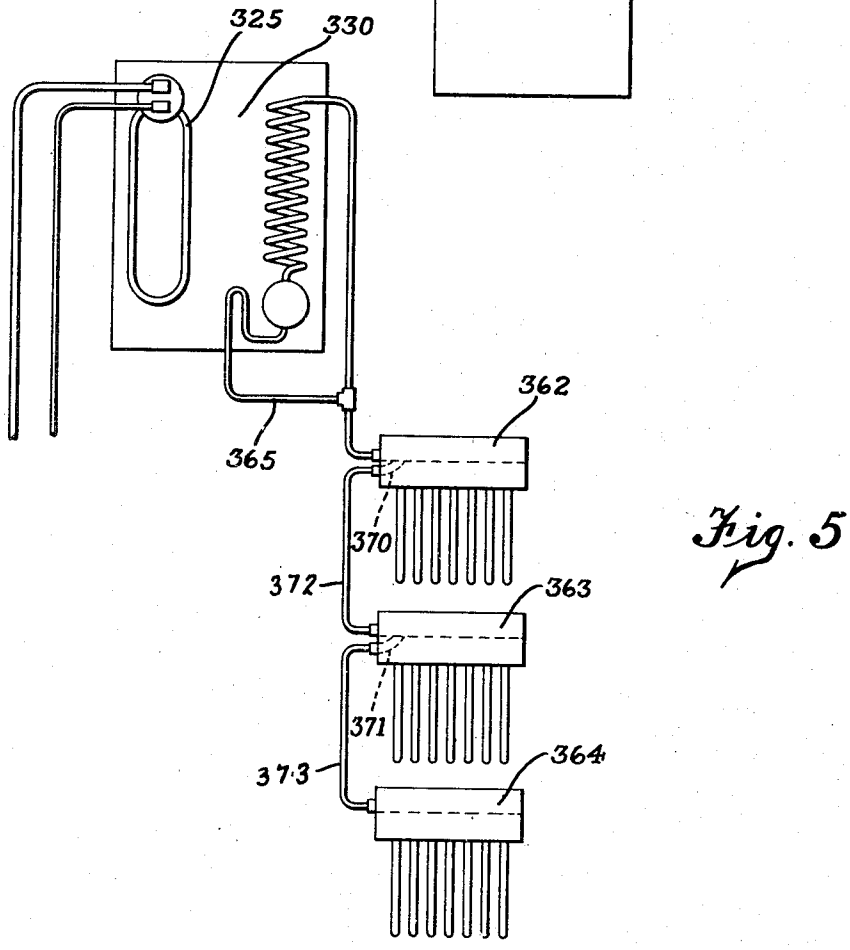


Fig. 5

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UNITED STATES PATENT OFFICE

1,988,549

REFRIGERATING APPARATUS

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Application September 30, 1930, Serial No. 485,445

7 Claims. (Cl. 62—125)

This invention relates to refrigerating apparatus.

An object of this invention is to provide an improved refrigerating apparatus adapted to refrigerate a plurality of cabinets or the like.

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 form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a diagrammatic view of a system embodying features of this invention;

Fig. 2 is a fragmentary view in cross-section of a portion of the apparatus shown in Fig. 1, the view being taken in the direction of the arrows 2—2;

Fig. 3 is a view similar to Fig. 1 of a modified form of apparatus embodying features of this invention; and

Figs. 4 and 5 are views showing diagrammatically modified forms of refrigerating systems embodying features of the invention.

A refrigerating system embodying features of this invention includes a heat transfer receptacle designated by the numeral 20. A refrigerating system is connected to the receptacle 20 in order to maintain the receptacle below a predetermined temperature limit. In the chosen illustration the system includes a liquid refrigerant cooling member or evaporator 25 of the flooded, float controlled type similar to that shown in the patent to R. G. Osborn, No. 1,556,708 issued October 13, 1925, and a refrigerant liquefying unit 28. The unit 28 includes compressor 30, motor 32, condenser 34 and receiver 35. The compressor 30 withdraws the gaseous refrigerant from the evaporator 25 through vapor conduit 38, compresses the gaseous refrigerant and delivers it to the condenser 34 wherein it is liquefied and from which it is delivered to the receiver 35 which has a supply conduit 40 connected therewith and leading to said evaporator. An automatic switch 42, responsive to pressure in the conduit 38, is adapted to control the starting and stopping of the motor 32.

The heat transfer receptacle 20 may be any suitable means for promoting the transfer of heat. As shown, the receptacle 20 includes a tank 45 adapted to be filled with any suitable non-freezing liquid such as calcium chloride brine or a solution of alcohol. The brine tank 45 is provided with suitable insulation 47 which extends along all sides, top and bottom walls thereof.

The heat transfer receptacle 20 is provided with a heat transfer system leading to one or a plurality of spaces to be refrigerated, which may be, for instance, cabinets 50, 51 and 52. The heat transfer system includes evaporators 55, 56 and 57 located in the cabinets 50, 51 and 52 respectively. A suitable connection is provided between the evaporators 50, 51 and 52 and the heat transfer receptacle. This includes a condenser 60. The evaporators 55, 56 and 57 are constructed as shown in Fig. 2, similar to the evaporator shown in the said patent to R. G. Osborn, but omitting the float control mechanism which is not required in the secondary system of the type herein described.

The condenser 60 is connected to the evaporators 55, 56 and 57 by a liquid refrigerant supply conduit 65 and vapor conduit 68. The supply conduit 65 is provided with branches 70, 71 and 72 leading to the evaporators 55, 56 and 57 respectively. The exhaust conduit 68 is provided with branches 75, 76 and 77 connected with the gas spaces of the evaporators 55, 56 and 57 respectively.

The condenser 60 is provided with a liquid refrigerant receiver portion 87 adapted to maintain therein a quantity of liquid refrigerant. This is accomplished by a liquid refrigerant trap 82 formed in the supply conduit 65.

In order to control the amount of liquid refrigerant which is being supplied to each of the evaporators 55, 56 and 57, a plurality of liquid refrigerant goose-neck traps 90, 91 and 92 are formed in the supply conduit 65. The traps 90, 91 and 92 are arranged to permit a predetermined amount of liquid refrigerant to flow from the condenser 60 to evaporator 55 and when said predetermined amount is supplied to said evaporator any additional liquid refrigerant in the supply conduit 65 will spill over the trap 90 and by gravity flow into evaporator 56, the traps 91 and 92 limiting the amount of refrigerant flowing into the evaporators 56 and 57. The end 93 of supply conduit 65 may be connected to any suitable over-flow tank or another evaporator. Obviously any number of evaporators could be supplied with refrigerant by this arrangement.

Thus it will be noted that I have provided a primary refrigerating system for extracting heat from a secondary system of the overflow type and that said secondary system cools the cabinets 50, 51 and 52. Any suitable volatile re-

frigerant may be used in either system. If desired, a gas such as air, noncondensable at temperatures prevailing in the secondary system may be injected into the secondary system for maintaining a temperature differential between the primary and secondary systems.

Referring to Fig. 3, there is shown a heat transfer receptacle 120 which corresponds to the receptacle 20. A refrigerating system is connected to the receptacle 120 in order to maintain the receptacle below a predetermined temperature limit. The system comprises, preferably, an evaporator 125 which corresponds to the evaporator 25, and a refrigerant liquefying unit 128 which corresponds to the unit 28. The heat transfer receptacle 120 is provided with a heat transfer system leading to one or a plurality of spaces to be refrigerated, which may be, for instance, cabinets 130, 131, 132 and 133. The heat transfer system includes evaporators 140, 141, 142 and 143 for cooling the cabinets 130, 131, 132 and 133 respectively. A suitable connection is provided between the evaporators and the heat transfer receptacle 120. This includes a condenser 160 which corresponds to the condenser 60. The evaporators and condenser are connected by a liquid refrigerant supply conduit and a vapor conduit. The liquid refrigerant supply conduit includes sections 165, 167, 170 and 171. The evaporator 140 is connected to the condenser 160 by a liquid refrigerant supply conduit section 165. Evaporator 141 is connected to the condenser 160 by liquid supply conduit section 167 joined to conduit 165. Evaporators 142 and 143 are connected to the condenser by liquid supply conduit sections 170 and 171, the conduit section 170 being joined to conduit section 167 and the conduit section 171 being joined to conduit section 170. The evaporators 140, 141, 142 and 143 are provided with the vapor conduit 185 having branches 187, 188, 189 and 190 leading to the evaporators 140, 141, 142 and 143 respectively. The conduit 185 is also connected to condenser 160. The liquid refrigerant which is being supplied from the condenser 160 to the evaporator 140 passes through conduit 165 until a predetermined level of liquid refrigerant is attained in the evaporator 140 and then any additional refrigerant overflows through conduit section 167 to evaporator 141. Likewise conduit section 170 receives the overflow of evaporator 141 and the conduit section 171 receives the overflow of evaporator 142. To the conduit section 171 is connected a conduit 200 leading to an insulated overflow tank 210. Thus the conduits 167, 170, 171 and 200 control the amount of liquid refrigerant flowing to the evaporators 140, 141, 142 and 143.

In Fig. 4 there is shown a heat transfer receptacle 220 adapted to be cooled by a liquid refrigerant evaporator 225 which corresponds to the evaporator 25. The evaporator 225 is provided with a liquid supply conduit 226 and a vapor conduit 227. The conduits 226 and 227 are adapted to be connected to a refrigerant liquefying unit, which may be, for instance, like the liquefying unit 28.

The heat transfer receptacle 220 is provided with a heat transfer system leading to a space or cabinet 230. The heat transfer system includes evaporator 235. A suitable connection is provided between the evaporator and the receptacle. This includes a condenser 260 which corresponds to condensers 60 and 160. The condenser is connected to the evaporator 235 by a liquid refrigerant conduit 265. A vapor conduit 268 is connected on the one end thereof to the condenser 260 and on its other end to the liquid conduit 265 between the evaporator 235 and condenser 260. In this system only one conduit need be directed to the evaporator.

Fig. 5 shows a system similar to that shown in Fig. 4. In this system a liquid refrigerant evaporator 325 is adapted to cool a heat transfer receptacle 330. A condenser 360 which corresponds to condensers 60, 160 and 260 is placed in the receptacle 330. The condenser is adapted to supply liquid refrigerant to a plurality of liquid refrigerant evaporators 362, 363 and 364 through a liquid refrigerant conduit 365. The condenser first supplies liquid refrigerant to evaporator 362 which is provided with overflow means 370 which permits refrigerant to flow to evaporator 363 through a section 372 of the liquid refrigerant conduit 365 when a predetermined amount of liquid refrigerant is received in the evaporator 362. The evaporator 363 is provided with overflow means 371 which permits liquid refrigerant to flow to evaporator 364 through section 373 of the liquid refrigerant conduit 365 when a predetermined amount of liquid refrigerant is received in evaporator 363.

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 including a volatile refrigerant condenser, a refrigerant evaporator below said condenser, a second refrigerant evaporator below said first named evaporator, a connecting means for said condenser and evaporators, means for preventing liquid refrigerant from rising above a predetermined level in said first named evaporator by permitting refrigerant to flow from said condenser to said second named evaporator, and a primary refrigerating means in heat exchange relation with the condenser for cooling the condenser and condensing evaporated refrigerant therein.

2. A refrigerating system, including a volatile refrigerant condenser, a refrigerant evaporator below said condenser, a second refrigerant evaporator below said first named evaporator, refrigerant conveying means connecting said evaporators and said condenser, said refrigerant conveying means including a liquid refrigerant trap which permits liquid refrigerant to flow from said condenser to said second named evaporator after the liquid refrigerant in the first named evaporator has attained a predetermined level, and a primary refrigerating means in heat exchange relation with the condenser for cooling the condenser and condensing evaporated refrigerant therein.

3. A refrigeration system including a volatile refrigerant condenser, a refrigerant evaporator below said condenser, a second refrigerant evaporator below said first named evaporator, a refrigerant conveying means connecting said first named evaporator and said condenser, means connecting said refrigerant conveying means and said second evaporator, said connecting means including a trap outside of said first named evaporator for maintaining a predetermined level of liquid within said first named evaporator, and a primary refrigerating means in heat exchange relation with the con-

denser for cooling the condenser and condensing evaporated refrigerant therein.

4. Refrigerating apparatus including a closed secondary refrigerant circuit comprising a refrigerant evaporator and a condenser, said evaporator and condenser being connected by separate liquid and vapor conduits, said liquid conduit being connected to the lower portion of the condenser forming the outlet of the condenser, said secondary circuit being provided with a liquid trap providing a liquid seal for the outlet of the condenser for preventing the flow of evaporated refrigerant from the evaporator through the liquid conduit into the condenser, and a primary refrigerating means in heat exchange relation with the condenser for cooling the condenser and condensing evaporated refrigerant therein.

5. Refrigerating apparatus including a closed secondary refrigerant circuit comprising a refrigerant evaporator and a condenser, said evaporator and condenser being connected by separate liquid and vapor conduits, said liquid conduit being connected to the lower portion of the condenser forming the outlet of the condenser, said secondary circuit being provided with a liquid trap in the liquid line adjacent the outlet of the condenser for preventing the flow of evaporated refrigerant from the evaporator through the liquid conduit into the condenser, and a primary refrigerating means in heat exchange relation with the condenser for cooling the condenser and condensing evaporated refrigerant therein.

6. A refrigerating system, including a volatile refrigerant condenser, a refrigerant evaporator below said condenser, a second refrigerant evaporator below said first named evaporator, refrigerant conveying means connecting said evaporators and said condenser, said refrigerant conveying means including a liquid refrigerant trap which permits liquid refrigerant to flow from said condenser to said second named evaporator after the liquid refrigerant in the first named evaporator has attained a predetermined level.

7. A refrigerating system including a volatile refrigerant condenser, a refrigerant evaporator below said condenser, a second refrigerant evaporator below said first named evaporator, connecting means for said condenser and evaporators including but a single liquid refrigerant connection to each evaporator, means for preventing liquid refrigerant from rising above a predetermined level in said first named evaporator and causing refrigerant to flow from said condenser to said second named evaporator.

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