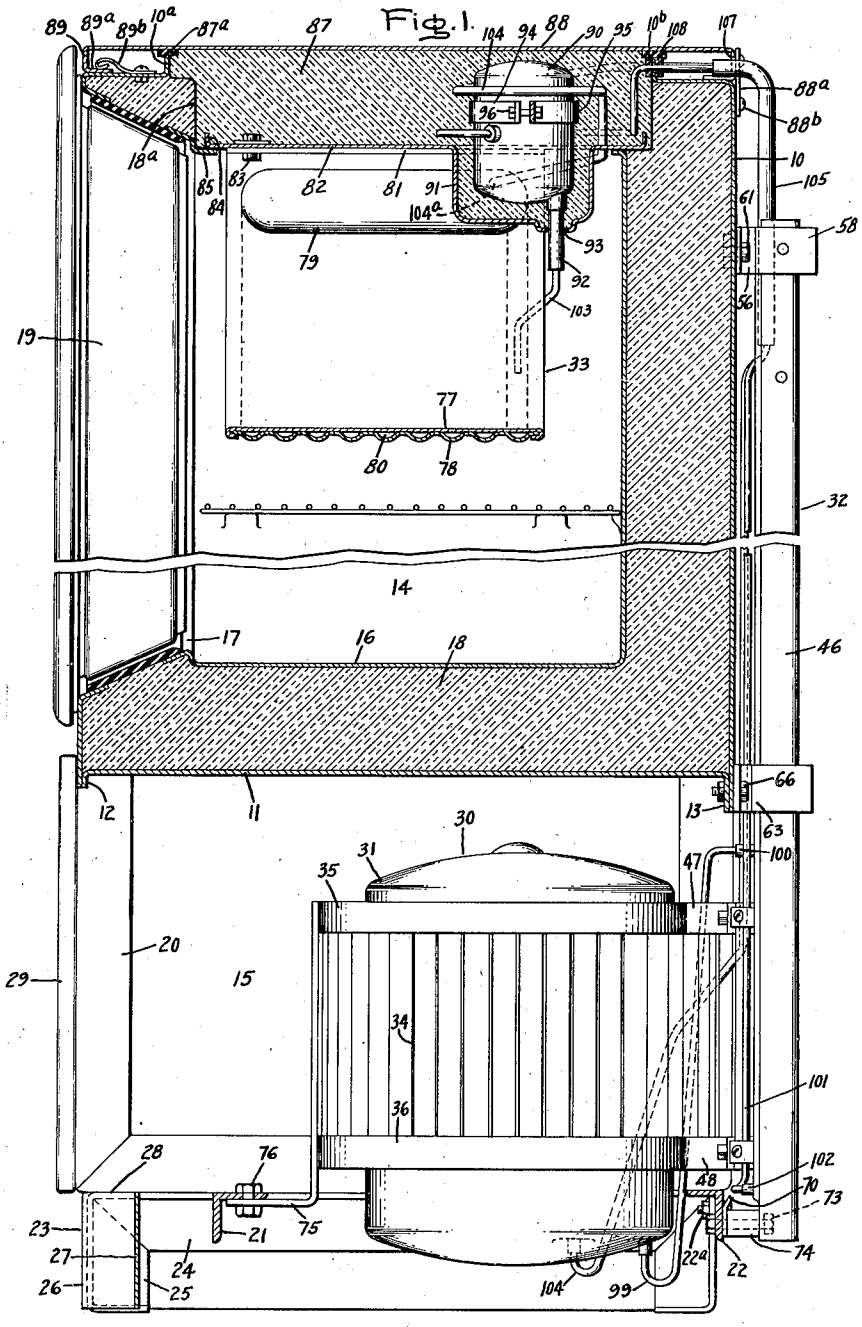
Feb. 16, 1937. C. STEENSTRUP 2,071,183

REFRIGERATOR

Filed Jan. 26, 1935 3 Sheets-Sheet 1

Fig. 1.



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REFRIGERATOR

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Fig. 2.

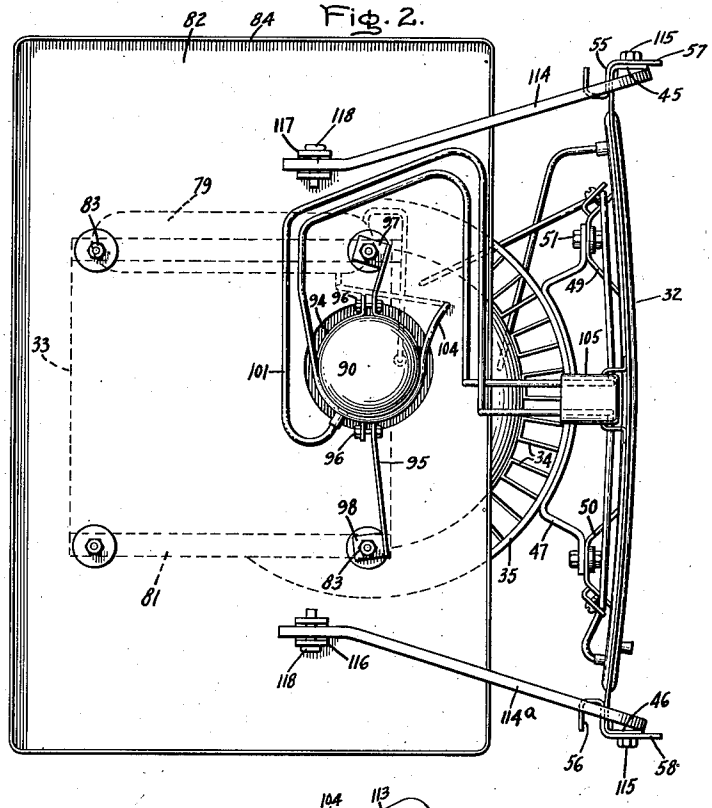
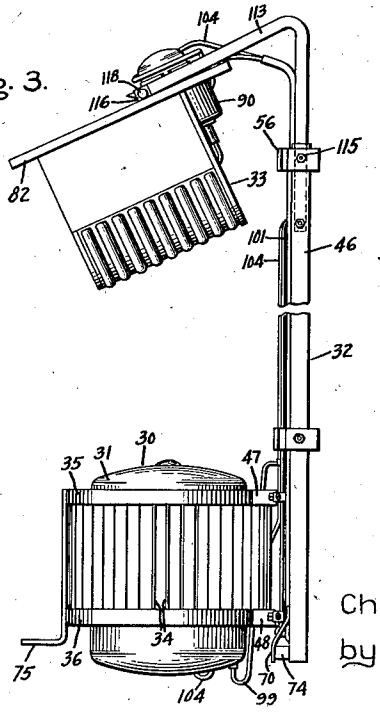


Fig. 3.



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REFRIGERATOR

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Fig. 4.

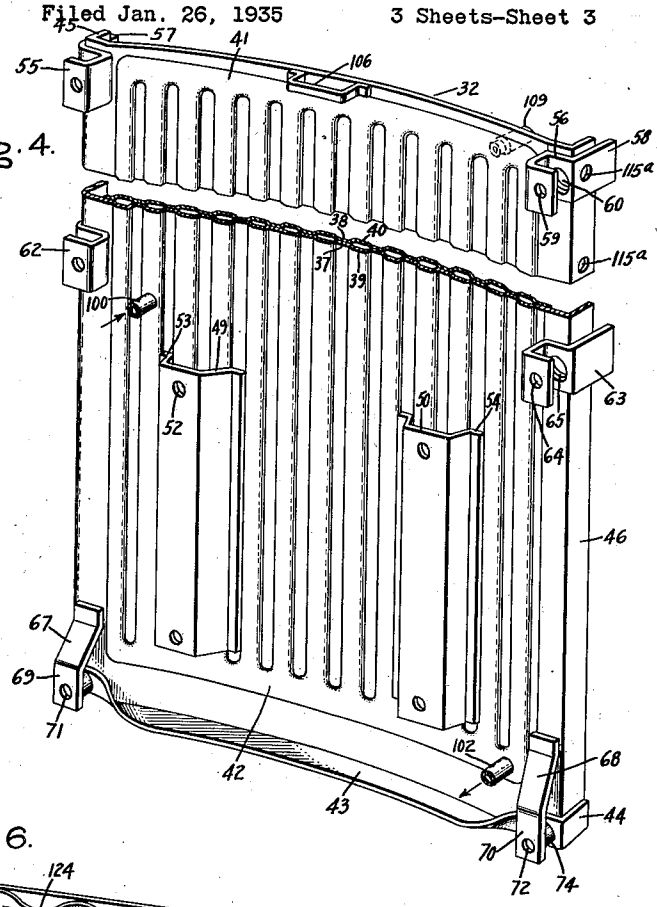


Fig. 5.

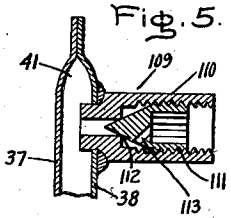
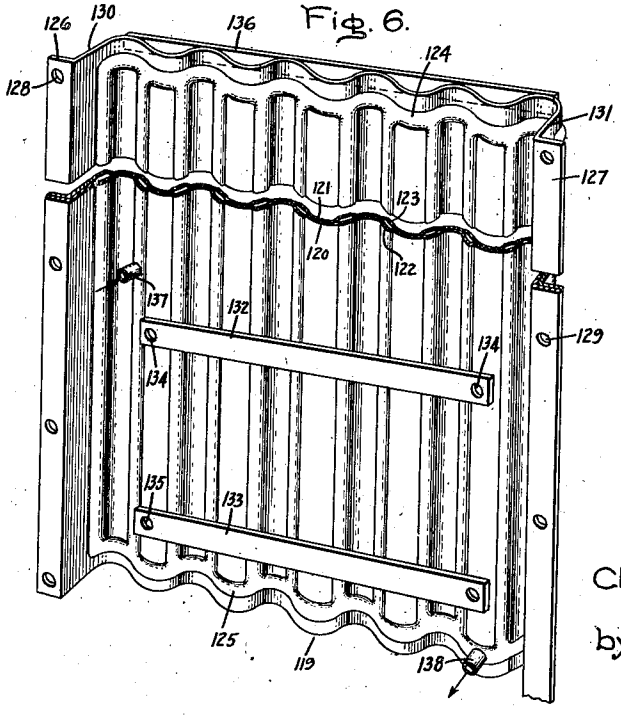


Fig. 6.



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Patented Feb. 16, 1937 2,071,183

UNITED STATES PATENT OFFICE

2,071,183

REFRIGERATOR

Christian Steenstrup, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York

Application January 26, 1935, Serial No. 3,624

18 Claims. (Cl. 62—116)

My invention relates to refrigerators.

Refrigerators usually include a refrigerating machine associated with a heat insulated cabinet. Such a machine may be a refrigerating machine of the compression type comprising a refrigerant compressor driven by an electric motor or the like, and a condenser in which the compressed refrigerant is liquefied. The liquefied refrigerant is then supplied to an evaporator, in which it is vaporized by heat abstracted from a cooling compartment in which the evaporator is located. When such refrigerators are designed for household use, they may utilize a cabinet having a machinery compartment in which the motor driven compressor unit is located and a cooling compartment in which the evaporator is located. The condenser is preferably cooled by air in order to simplify the apparatus, and hence should be located in a position in which a relatively large supply of cooling air may readily pass thereover. The refrigerating machine for such a refrigerator includes all of the moving parts therefor, and hence it is desirable that it be readily separable from the cabinet in order to facilitate the assembly and repair thereof. This separable refrigerating machine should be arranged in such a manner that it may be charged with refrigerant at the factory, and the refrigerant connections between the various elements made in a permanent form, which need not be altered when the machine is mounted on the cabinet or dismounted therefrom.

It is an object of my invention to provide a refrigerator of the type described, having an improved arrangement of the elements of the refrigerating machine therefor, in order to simplify the assembly thereof and to increase the efficiency of operation thereof.

It is a further object of my invention to provide an improved separable refrigerating machine for a refrigerator, of the type described, in order that the machine may be charged with refrigerant and placed in the cabinet at the place of installation without the necessity of altering any of the refrigerant connections, or the like, thereof.

Further objects and advantages of my invention will become apparent as the following description proceeds, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

A better understanding of my invention may be had by reference to the accompanying drawings, in which, Fig. 1 is a side elevation, partly in section, of a refrigerator embodying my invention; Fig. 2 is a plan view of a separable refrigerating machine included in the refrigerator shown in Fig. 1; Fig. 3 is a side elevation of the refrigerating machine shown in Fig. 2, the machine being arranged in a convenient position for shipment; Fig. 4 is a perspective view of the condenser included in the refrigerator shown in Fig. 1, the central portion of the condenser being broken away; Fig. 5 is a detail sectional view of the purging valve provided on the condenser shown in Fig. 4; and Fig. 6 is a perspective view of a modified form of condenser which may be substituted for the condenser included in the refrigerator shown in Fig. 1, the central portion of the condenser being broken away.

Referring to the drawings, in Fig. 1, I have shown a refrigerator embodying my invention including a cabinet and a refrigerating machine. The cabinet includes a rectangular outer sheet metal shell 10 having a rectangular opening in the top thereof and provided with an imperforate horizontal sheet metal partition 11 therein, which extends entirely across the interior of the lower portion of the cabinet. The front and rear edges of the partition 11 are provided with downwardly extending flanges 12 and 13, respectively, which are welded, or otherwise secured, to the front and rear walls of the shell 10. The partition 11 divides the space within the rectangular shell 10 into an upper cooling compartment 14 and a lower machinery compartment 15, respectively. The cooling or food storage compartment 14 is provided with an open top inner liner 16, which covers the bottom and side walls thereof, and is provided with an aperture 17 in the front wall thereof. The liner 16 is surrounded by a heat insulation 18, and the aperture 17 in the front wall thereof is closed by a heat insulated door 19. The edge of the heat insulation 18 surrounding the opening in the top of the liner 16 is covered by a cloth band 18a. The front and rear walls of the shell 10 extend downwardly only to the bottoms of the flanges 12 and 13, respectively, of the horizontal partition 11. The lower edges 20 of the sides of the shell 10 are folded back on themselves, thus reinforcing the lower side walls of the shell 10. The lower edges of the shell 10 are joined by horizontal angle irons 21 and 22. The ends of the angle iron 21 are welded, or otherwise secured, to horizontal angle irons 24, on opposite sides of the cabinet, and the angle iron 22 is bolted to vertical legs 25 by bolts 22a. The cabinet thus formed is supported upon and reinforced by a base 23. The base 23 is made of a rectangular

frame formed by the horizontal angle irons 24 supported on the legs 25, the base 23 being surrounded on the front and sides by a metal mop board 26, the rear of the base 23 being open. The mop board 26 has an inset portion 27 in the front thereof, which permits cooling air to enter the compartment 15 at 28. The front, rear, and bottom of the compartment 15 are thus open. The front wall of the compartment 15 is covered by a removable, rectangular panel 29, which extends entirely across the same. When the door 19 and panel 29 are closed, the front of the cabinet thus presents a smooth surface, which may be easily cleaned.

The cabinet base construction, described above, is not my invention, but is the invention of Ralph E. King and is described and claimed in his application Serial No. 747,879, filed October 11, 1934, and assigned to the General Electric Company, the assignee of my present invention.

The cabinet described above, is provided with a separable refrigerating machine, including as its principal elements a refrigerant circulatory unit, or compressor, a condenser, and a refrigerant expansion unit. In the present embodiment of my invention, the machine is of the compression type. This machine includes as an element, a refrigerant liquefaction apparatus comprising a compressor unit 30 having a motor driven compressor contained in a cylindrical hermetically sealed steel casing 31, and also comprising an air cooled condenser 32 arranged at the back of the cabinet. The other principal element of the machine is an evaporator 33 within the cooling compartment 14. Gaseous refrigerant is compressed by the compressor unit 30, liquefied in the condenser 32, and vaporized in the evaporator 33 by the absorption of heat from articles contained in the cooling compartment 14. The vaporized refrigerant is then returned to the compressor unit 30, and the cycle repeated. The operation of the apparatus is described more in detail below.

The compressor casing 31 is surrounded by an annulus of U-shaped heat conducting fins 34, the base of each of the U-shaped fins being welded, or otherwise secured, to the periphery of the casing 31 in good heat conducting contact therewith. The fins 34 are reinforced by a pair of upper and lower metallic rings 35 and 36, surrounding the fins which are welded, or otherwise rigidly secured, thereto, thus serving to strengthen the fins 34 and providing surfaces to which supports may be conveniently attached.

The air cooled condenser 32 extends over a major portion of the exterior side of the rear wall of the cabinet. I prefer to locate the condenser 32 on the rear wall of the cabinet, as it is usually out of sight there and at the same time receives an adequate supply of cooling air. The condenser 32 is made up of inner and outer portions or sheets of metal 37 and 38, which are provided with a series of complementary vertical indentations therein, such as the indentations 39 and 40, best shown in Fig. 4. These vertical indentations form a series of vertical refrigerant circulatory passages, which are connected in parallel relationship at their upper and lower ends by manifolds 41 and 42, respectively. The manifolds 41 and 42 are formed by complementary horizontal indentations in the inner and outer sheets 37 and 38, the sheets 37 and 38 being joined together in face engagement by line welding or by a series of closely spaced spot-welds extending about the peripheral edges thereof and along the contacting portions thereof between the indentations formed therein. These sheets 37 and 38 may be joined together by brazing or in some similar manner. The lower edge of the condenser 32 is bent inwardly, forming a horizontal lower strengthening flange 43. The center of the condenser 32 is bowed outwardly, thus giving the cross section of the central portion thereof, an arcuate shape, as best shown in Fig. 2. The ends of the flange 43, such as the end 44, shown in Fig. 4, are bent upwardly against the adjacent portion of the condenser 32, and the vertical edges of the condenser are then bent outwardly, forming flanges 45 and 46, which constitute transversely extending reinforcing sections therein. The condenser 32 is thus formed of a channel-shaped cross section, the central portion thereof being slightly arcuate in shape. The reinforcing flanges 43, 45, and 46, as well as the arcuate central portion of the condenser 32, insure a strong rugged construction, which is particularly rigid with respect to lateral bending, even though the metal sheets 37 and 38 be made from comparatively light sheet metal stock. Consequently, it is unnecessary to provide the conventional strengthening frame for the condenser 32, and a substantial saving in material and weight is effected. The condenser is provided with a gaseous refrigerant inlet 100 communicating with one of the vertical passages therein in the lower portion of the condenser, and a liquid refrigerant supply connection 102 communicating with the lower manifold 42. A purge valve 109 is provided in the upper manifold 41. The construction of the condenser 32 itself is described and claimed in my divisional application Serial No. 41,929, filed September 24, 1935, and assigned to the General Electric Company, the assignee of my present invention.

The compressor unit 30 extends laterally from, and is supported by the lower end of the condenser 32, and is rigidly secured thereto by a pair of upper and lower straps 47 and 48. These straps 47 and 48 each have a central arcuate portion which conforms to, and is rigidly secured by welding, or otherwise, to the rings 35 and 36, respectively. The rearwardly extending feet of the straps 47 and 48 are secured to a pair of vertical channel irons 49 and 50, by bolts 51, which pass through holes 52 formed near the upper and lower ends of the channel irons 49 and 50. The feet 53 and 54 of the channel irons 49 and 50, respectively, are welded, or otherwise secured, to the front face of the condenser 32.

The condenser 32 is supported on the exterior side of the rear wall of the cabinet shell 10 in spaced relation thereto, by a series of supports which includes a pair of U-shaped brackets 55 and 56, located adjacent the top of the condenser and on each side thereof. The inner legs of the brackets 55 and 56 are welded, or otherwise secured, to the adjacent portion of the condenser 32. These brackets are provided with rearwardly extending portions 57 and 58, respectively, which act as bumpers and aid the flanges 45 and 46 in protecting the condenser 32 and spacing it from an adjacent wall, or the like. As shown in Fig. 4, the bracket 56 is provided with a relatively small hole 59 in the outer leg thereof, and a larger hole 60 in the inner leg thereof, the latter hole registering with a hole of the same size in the condenser 32. A machine screw 61, shown in Fig. 1, having a head of a smaller diameter than the hole 60, but larger in diameter than the hole 59, is inserted through the hole 60 and engages the rear wall of the shell 10, thus holding the upper

end of the condenser 32 firmly in position. A second pair of brackets 62 and 63 are welded, or otherwise secured, to the sides of the condenser 32 intermediate its ends. The bracket 63 is provided with holes 64 and 65, which are similar to the holes 59 and 60 provided in the bracket 56, and a bolt 66 is inserted through the hole 65, passes through the hole 64, and the head of the bolt engages the rear wall of the shell 10 and the rear flange 13 of the partition 11, as shown in Fig. 1. The brackets 55 and 62 are provided with holes and bolts or machine screws therefor, similar to the brackets 56 and 63. The lower end of the condenser 32 is provided with a pair of brackets 67 and 68, having lower vertical offset portions 69 and 70, respectively. These offset portions 69 and 70 are provided with bolt holes 71 and 72, respectively. A bolt 73 passes through the condenser 32, a cylindrical spacer 74, the hole 72, and is secured to the angle iron 22. The condenser 32 is thus firmly secured to the exterior side of the rear wall of the cabinet and assists in supporting the laterally extending compressor unit 30, within the machinery compartment 15. The front of the compressor unit 30 is supported by an L-shaped bracket 75, which is welded, or otherwise secured, to the rings 35 and 36, the lower end of the bracket 75 being secured to the angle iron 21, by a bolt 76.

The refrigerant evaporator 33 is arranged in the cooling compartment 14, and in the illustrative form of my invention, the evaporator is of the flooded type and is made of sheet metal. This evaporator includes complementary inner and outer sheet metal portions 77 and 78, respectively. A horizontal header 79, formed by indentations in the sheets 77 and 78, is formed near the top of one side wall of the evaporator 33, and a series of refrigerant circulatory passages 80, communicating with the header 79, are formed by corrugations in the outer sheet 78 and the cooperating smooth inner sheet 77. The upper edges of the evaporator 33 are provided with inturned flanges 81, which are secured by bolts 83 to a removable rectangular top liner 82, of the compartment 14. The removable top liner 82 is provided with an upturned peripheral flange 84 and extends entirely across the open top of the liner 16. The liner 16 is provided with an inturned flange 85, adjacent the top thereof and extending about all four vertical sides of the same, which forms a horizontal shoulder on which the top liner 82 is supported. A layer or pad of loosely packed heat insulation 87 is placed above the top liner 82, and the rectangular opening in the top of the shell 10 surrounded by the flange 10a is closed by a flat sheet metal cover 88, the sheet metal cover 88 is provided with a downwardly extending peripheral flange 89, having an inturned portion 89a along the front edge thereof which is engaged by the spring clip 89b, the latter being screwed to the top of the shell 10. The rear edge of the cover 88 is held in place by a clip 88a which is secured to the flange 89 of the cover 88 and to the rear wall of the shell 10 by screws 88b. A rubber gasket 87a extending entirely about the flange 10a is provided between this flange and the cover 88.

A flow controlling float valve contained in a casing 90 is supported beneath the cover 88 in a cylindrical depression 91 formed in the rear portion of the top liner 82. The float valve casing 90 has an outlet extension 92 secured to the bottom thereof which extends through a hole 93 formed in the bottom of the cylindrical depression 91 in the top liner 82. The float valve casing 90 is supported by a pair of straps 94 and 95 which are tightly clamped thereabout and held together by bolts 96 passing therethrough. The ends of a longer strap 95 are provided with extensions 97 and 98 which are secured to the top liner 82 by the bolts 83.

The refrigerant circuit of the refrigerating machine described, includes a conduit 99, which connects the discharge side of the compressor contained in the casing 31 with the inlet 100 of the condenser 32. A flexible conduit 101, made of copper tubing, or the like, connects the outlet 102 of the condenser 32 with the float valve casing 90 for supplying liquid refrigerant thereto. A liquid line 103 connects the outlet 92 of the float valve casing 90 with the refrigerant circulatory passages 80 of the evaporator 33. A flexible exhaust conduit 104, made of copper tubing or the like, communicates with the header 79 of the evaporator 33 at 104a above the normal liquid level therein and with the inlet of the compressor contained in the casing 31. It will be noted that the conduit 104 extends about the float valve casing 90 in heat conducting relationship therewith. The conduits 101 and 104 thus provide a flexible connection between the evaporator 33 and the rigidly connected compressor and condenser. A flexible rubber sleeve 105 is arranged on the conduits 101 and 104, and extends from the upper portion of the condenser over the upper rear edge of the shell 10, in order to protect the conduits. A bracket 106, welded, or otherwise secured, to the upper edge of the condenser 32, serves to secure the sleeve 105 and the upper portions of the conduits 101 and 104 in position with respect to the condenser. It will be noted that the conduits 101 and 104 pass through a notch 107 formed in the flange 89 of the cover 88 and through a notch formed in the rear portion of the flange 10a on the shell 10. A rubber bushing 108 is provided in the notch, in order to protect the conduits 101 and 104 from the sharp edges thereof.

It is desirable to locate the inlet 100 of the condenser 32 in the lower portion thereof, as illustrated, in order to minimize the length of the conduit 99, connecting the compressor in the casing 31 thereto. Since both the inlet 100 and the outlet 102 of the condenser 32 are located near the bottom thereof, and since the circulatory passages communicating therewith are connected in parallel relationship, there is danger that air, or other gas which is non-condensable at the operating pressures and temperatures prevailing in the machine will be trapped in the condenser 32. A purging valve 109 is therefore connected to the upper manifold 41 of the condenser 32. The purging valve 109 is of conventional design and, as shown in Fig. 5, includes a hollow cylindrical body 110, which is welded to the outer sheet 38 of the condenser 32. A tapered valve element 111 is threaded to the interior of the valve body 110, and the tapered portion of the valve element 111 is seated firmly against the seat 112 formed in the valve body 110. When the valve element 111 is unscrewed, gas may escape to the atmosphere past the valve seat 112 and through a passage 113 formed in the valve element 111. The passages of the condenser 32 may thus be purged of air, or the like, by opening the valve 109.

In the operation of the refrigerating machine, described above, gaseous refrigerant is compressed

by the motor driven compressor contained in the casing 31, is discharged therefrom through the conduit 99 and enters the condenser 32 at the inlet 100. The compressed gaseous refrigerant, in the condenser 32, is liquefied by the transfer of heat therefrom, to the cooling air which passes over the surfaces of the condenser 32. It will be noted that the condenser 32 is mounted in spaced relation with respect to the rear wall of the cabinet, in order that cooling air may readily pass over both the inner and outer surfaces of the condenser. Cooling air enters the machinery compartment 15, through the bottom thereof and the opening 28 formed in front of the inset portion 27 of the mop board 26, and passes about the cooling fins 34 and periphery of the compressor casing 31, absorbing heat therefrom. The air leaving the machinery compartment 15 then passes upwardly between the rear wall of the cabinet and the surface of the condenser 32 adjacent the rear wall of the cabinet. The rising warm air thus sets up a current of cooling air about the condenser 32, and the latter is sufficiently cooled by natural draft, it being unnecessary, in the machine illustrated, to provide a fan, or other forced draft cooling apparatus. The circulation of cooling air, over the surfaces of the condenser 32, is further facilitated in that the sides of the space between the condenser and the rear wall of the cabinet are left open, so that the air may circulate in a lateral direction therethrough. The refrigerant in the condenser 32, which is thus liquefied by the transfer of heat therefrom to the surrounding cooling air, drains by gravity to the lower manifold 42. The liquid refrigerant thus accumulated in the lower manifold 42 is forced through the outlet 102 by the pressure of high pressure refrigerant vapor in the condenser above the level of liquid refrigerant therein, and through the conduit 101 to the float valve casing 90. The liquid refrigerant accumulated in the float valve casing 90 is supplied to the evaporator 33 through the liquid line 103 in sufficient quantity to maintain the header 79 about half full of liquid refrigerant. The refrigerant circulatory passages 80 are thus flooded with liquid refrigerant. The refrigerant, which is vaporized by the absorption of heat from the cooling compartment 14, is collected in the header 79, above the level of the liquid refrigerant contained therein, and is drawn off to the compressor contained in the casing 31 through the suction conduit 104, and the cycle is repeated continuously during operation of the machine.

The refrigerating machine described may be removed from the cabinet or the like used therewith for purposes of shipment and is preferably arranged for shipment with the evaporator 33 supported above the condenser 32 by brackets 114 and 114*a*, in the position shown in Fig. 3. When removing this machine from the cabinet, the bolt 76 is removed from the bracket 75, thus freeing the front end of the compressor unit 31. The bolts and machine screws 61, 66, and 73, which secure the condenser 32 in position on the rear of the cabinet, are removed. The cover 88 and insulating pad 87 are removed from the top of the cabinet. The horizontal angle iron 22, which is normally secured to the base 23 by the bolts 73, is also removed. As the conduits 101 and 104 are flexible, it is then possible to swing the condenser 32 and compressor unit 30, which are rigidly connected together, to the rear of the cabinet, so that the compressor unit 30 is moved out of the machinery compartment 15. The top liner 82 and the evaporator and float valve structure, which is secured thereto, may then be moved vertically upward out of the cooling compartment 14. The entire refrigerating machine can be thus removed from the cabinet without the necessity of altering or breaking any of the refrigerant connections. The V-shaped brackets 114 and 114*a* are used to support the evaporator 33 on the upper end of the condenser for shipment. The lower end of the bracket 114*a* is secured to the side flange 46 of the condenser 32 by bolts 115 passing through the holes 115*a* formed in the flange 46. As shown in Fig. 2, the opposite ends of the brackets 114 and 114*a* are bent inwardly. It should be noted that in Fig. 2, the top liner 82 has been shown in a position at right angles with respect to the condenser 32, in order that a better view of the parts of the apparatus may be had. When in position for shipment, the top liner 82 is preferably arranged at an acute angle, with respect to the condenser 32, as illustrated in Fig. 3 in order to reduce the height of the apparatus. It will be understood that any desired angular relation may be used. The inturned upper ends of the brackets 114 and 114*a* are pivotally secured by pins 118 to U-shaped brackets 116 and 117 respectively, the U-shaped brackets being welded, or otherwise secured, at their bases to the upper side of the top liner 82. It will be noted that the elbows of the brackets 114 and 114*a* project beyond the bend in the conduits 101 and 104 thus protecting them during shipment. The rearwardly extending portions 57 and 58 of the brackets 55, 56, and the corresponding portions of the brackets 62 and 63, serve as feet on which the apparatus may be supported during shipment. It will be seen that the strong construction of the condenser 32, which I have provided, is also advantageous during shipment of the apparatus, since it is rigid enough to properly support the compressor unit 31 and the evaporator 33 thereon. The brackets 114 and 114*a* are preferably attached to the apparatus, as shown, before it is removed from the cabinet. Then the condenser 32 may be swung to the rear, pivoting on the pins 117 and 118, its weight being thus supported on the cabinet by the removable top liner 82 during the disassembly process.

In assembling the refrigerant liquefaction and expansion apparatus on the cabinet, the operations described are reversed; that is, the evaporator 33 is moved vertically downward into its proper position in the cooling compartment 14 with the top liner 82 horizontally in place, the condenser 32 and compressor unit 31 are swung into position and bolted to the cabinet and the brackets 114 and 114*a* are then removed.

I have shown in Fig. 6 a modified form of air cooled condenser 119, which may be substituted for the condenser 32 in the refrigerating machine, described above, the condenser 119 being approximately of the same size as the condenser 32. The condenser 119 is described and claimed in my divisional application Serial No. 41,929, referred to above. The condenser 119 is made up of inner and outer portions or sheets of metal 120 and 121, which are provided with a series of complementary vertical indentations therein, such as the indentations 122 and 123. These vertical indentations form a series of vertical refrigerant circulatory passages, which are connected in parallel relationship at their upper and lower ends by manifolds 124 and 125 respectively. The mani-

folds 124 and 125 are formed by complementary horizontal indentations in the inner and outer sheets 120 and 121. The sheets 120 and 121 are joined together in face engagement by line-welding or by a series of closely spaced spot-welds extending about the peripheral edges thereof, and along the contacting portions thereof between the indentations formed therein. The sheets 120 and 121 are then bent in a corrugated form, as shown in Fig. 6, both in order to strengthen the condenser structure thus formed, and in order to increase the surface area thereof without increasing its width. The corrugations formed in the condenser 119 constitute transversely extending reinforcing sections therein. The vertical edges of the condenser 119 are bent outwardly to form flanges 126 and 127, provided with holes 128 and 129 therein, respectively. Bolts, or other securing means, may be inserted through the holes 128 and 129 to mount the condenser 119 on the exterior side of the rear wall of the cabinet. It will be noted, that the sides 130 and 131 of the condenser 119 are somewhat longer than the depth of the corrugations formed therein and in this way space is provided for the circulation of cooling air between the rear wall of the cabinet and the adjacent surface of the condenser, as described above in connection with the construction shown in Figs. 1 to 5 inclusive. A pair of horizontal straps 132 and 133 are welded, or otherwise secured, to the top of the corrugations on the front of the corrugated condenser 119, these straps being provided with holes 134 and 135 respectively, registering with similar holes extending through the condenser 119 through which bolts are inserted for rigidly supporting a compressor unit, or the like, thereon. The straps 132 and 133 also serve to strengthen the corrugated sheet metal structure. Other horizontal straps such as the strap 136 may be welded, or otherwise secured, to the rear side of the condenser 119, in order to further strengthen the same, as well as to protect the rear of the condenser from damage. Compressed gaseous refrigerant enters the condenser 119, through an inlet 137, which communicates with one of the vertical circulatory passages formed therein and condensed liquid refrigerant leaves the condenser 119 through an outlet 138, which communicates with the lower manifold 125.

While I have shown a particular embodiment of my invention in connection with a compression type refrigerating machine, I do not desire my invention to be limited to the particular construction shown and described, and I intend, in the appended claims, to cover all modifications within the spirit and scope of my invention.

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

1. A refrigerator comprising a cabinet provided with a machinery compartment and a cooling compartment, means including a refrigerant evaporator for abstracting heat from said cooling compartment, a rigid vertical condenser extending over a major portion of an exterior vertical side wall of said cabinet, a refrigerant circulatory unit extending laterally from said condenser and rigidly secured thereto, means including said condenser for supporting said refrigerant circulatory unit in said machinery compartment, and means including said refrigerant circulatory unit and said condenser for supplying refrigerant to said evaporator.

2. A refrigerator comprising a cabinet provided with a machinery compartment and a cooling compartment above said machinery compartment, means including a refrigerant evaporator for abstracting heat from said cooling compartment, a rigid vertical condenser extending over a major portion of a rear wall of said cabinet, a refrigerant circulatory unit extending laterally from said condenser and rigidly secured thereto, means including said condenser for supporting said refrigerant circulatory unit in said machinery compartment, and means including said refrigerant circulatory unit and said condenser for supplying refrigerant to said evaporator.

3. A refrigerator comprising a cabinet provided with a machinery compartment and a cooling compartment, means including a refrigerant evaporator for abstracting heat from said cooling compartment, a rigid vertical condenser including complementary portions of sheet metal defining a refrigerant passage therebetween, said condenser extending over the major portion of a vertical wall of said cabinet, a refrigerant circulatory unit extending laterally from said condenser and rigidly secured thereto, means including said condenser for supporting said refrigerant circulatory unit in said machinery compartment, and means including said refrigerant circulatory unit and said condenser for supplying refrigerant to said evaporator.

4. A refrigerator comprising a cabinet provided with a machinery compartment and a cooling compartment above said machinery compartment, means including a refrigerant evaporator for abstracting heat from said cooling compartment, a rigid vertical condenser including complementary portions of sheet metal defining a refrigerant passage therebetween, said condenser extending over the major portion of the rear wall of said cabinet, a refrigerant circulatory unit extending laterally from said condenser and rigidly secured thereto, means including said condenser for supporting said refrigerant circulatory unit in said machinery compartment, and means including said refrigerant circulatory unit and said condenser for supplying refrigerant to said evaporator.

5. A refrigerator comprising a cabinet provided with a machinery compartment and a cooling compartment, means including a refrigerant evaporator for abstracting heat from said cooling compartment, a rigid vertical condenser extending over the major portion of a vertical wall of said cabinet, said condenser including a pair of complementary sheet metal portions having an extended refrigerant passage therebetween, said sheet metal portions being provided with transversely extending reenforcing sections therein, a refrigerant circulatory unit extending laterally from said sheet metal portions and rigidly secured thereto, means including said sheet metal portions for supporting said refrigerant circulatory unit in said machinery compartment, and means including said refrigerant circulatory unit and said condenser for supplying refrigerant to said evaporator.

6. A refrigerator comprising a cabinet provided with a machinery compartment and a cooling compartment, means including a refrigerant evaporator for abstracting heat from said cooling compartment, a rigid vertical condenser extending over the major portion of the rear wall of said cabinet, said condenser including a pair of complementary sheet metal portions having an extended refrigerant passage therebetween, said sheet metal portions being formed of a channel-shaped cross section, portions of said condenser extending rearwardly thereof for pro-

tecting said condenser, refrigerant circulatory unit extending laterally from said sheet metal portions and rigidly secured thereto, means including said sheet metal portions for supporting said refrigerant circulatory unit in said machinery compartment, and means including said refrigerant circulatory unit and said condenser for supplying refrigerant to said evaporator.

7. A refrigerator comprising a cabinet provided with a machinery compartment and a cooling compartment, means including a refrigerant evaporator for abstracting heat from said cooling compartment, a rigid vertical condenser extending over the major portion of a vertical wall of said cabinet, said condenser including a pair of complementary sheet metal portions having an extended refrigerant passage therebetween, means supporting said condenser in spaced relation to said wall of said cabinet for facilitating the circulation of cooling air over said condenser, refrigerant circulatory unit extending laterally from said sheet metal portions and rigidly secured thereto, means including said sheet metal portions for supporting said refrigerant circulatory unit in said machinery compartment, and means including said refrigerant circulatory unit and said condenser for supplying refrigerant to said evaporator.

8. A refrigerator comprising a cabinet provided with a machinery compartment and a cooling compartment above said machinery compartment, means including a refrigerant evaporator for abstracting heat from said cooling compartment, a rigid vertical condenser extending over the major portion of the rear wall of said cabinet, said condenser including a pair of complementary sheet metal portions having an extended refrigerant passage therebetween, means supporting said condenser in spaced relation to said cabinet for facilitating the circulation of cooling air over said condenser, a refrigerant circulatory unit extending laterally from said sheet metal portions and rigidly secured thereto, means including said sheet metal portions for supporting said refrigerant circulatory unit in said machinery compartment, and means including said refrigerant circulatory unit and said condenser for supplying refrigerant to said evaporator.

9. A refrigerating machine separable from a cabinet or the like used therewith and comprising an air cooled condenser including a plurality of complementary sheet metal portions, means for securing said sheet metal portions together, at least one of said sheet metal portions having an indentation therein cooperating with the other of said sheet metal portions to form an extended refrigerant passage therebetween, a refrigerant circulatory unit extending laterally from said sheet metal portions and supported thereby, an evaporator, means for flexibly connecting said evaporator to said condenser, and means including said refrigerant circulatory unit and said condenser for supplying refrigerant to said evaporator.

10. A refrigerating machine separable from a cabinet or the like used therewith comprising an air cooled condenser including a plurality of complementary sheet metal portions, means for securing said sheet metal portions together, at least one of said sheet metal portions having an indentation therein cooperating with the other of said sheet metal portions to form an extended refrigerant passage therebetween, a refrigerant circulatory unit extending laterally from said sheet metal portions and supported thereby adjacent one end thereof, an evaporator, means for flexibly connecting said evaporator to said condenser adjacent the opposite end thereof, and means including said refrigerant circulatory unit and said condenser for supplying refrigerant to said evaporator.

11. A refrigerating machine separable from a cabinet or the like used therewith comprising an air cooled condenser including a plurality of complementary sheet metal portions, means for securing said sheet metal portions together, at least one of said sheet metal portions having an indentation therein cooperating with the other of said sheet metal portions to form an extended refrigerant passage therebetween, said sheet metal portions being provided with transversely extending reenforcing sections therein, a refrigerant circulatory unit extending laterally from said sheet metal portions and supported thereby, an evaporator, means for flexibly connecting said evaporator to said condenser, and means including said refrigerant circulatory unit and said condenser for supplying refrigerant to said evaporator.

12. A refrigerating machine separable from a cabinet or the like used therewith comprising an air cooled condenser including a plurality of complementary sheet metal portions, means for securing said sheet metal portions together, at least one of said sheet metal portions having an indentation therein cooperating with the other of said sheet metal portions to form an extended refrigerant passage therebetween, at least one of said sheet metal portions being of a channel-shaped cross section, a refrigerant circulatory unit extending laterally from said sheet metal portions and supported thereby, an evaporator, means for flexibly connecting said evaporator to said condenser, and means including said refrigerant circulatory unit and said condenser for supplying refrigerant to said evaporator.

13. A refrigerating machine separable from a cabinet or the like used therewith comprising an air cooled condenser including a plurality of complementary sheet metal portions, means for securing said sheet metal portions together, at least one of said sheet metal portions having an indentation therein cooperating with the other of said sheet metal portions to form an extended refrigerant passage therebetween, said sheet metal portions being of channel-shaped cross section and bowed outwardly in the center thereof in the direction of the legs of said channel, a refrigerant circulatory unit extending laterally from said sheet metal portions and supported thereby, an evaporator, means for flexibly connecting said evaporator to said condenser, and means including said refrigerant circulatory unit and said condenser for supplying refrigerant to said evaporator.

14. A refrigerating machine separable from a cabinet or the like used therewith comprising an air cooled condenser including a plurality of complementary corrugated sheet metal portions, means for securing said sheet metal portions together, at least one of said sheet metal portions having an indentation therein cooperating with the other of said sheet metal portions to form an extended refrigerant passage therebetween, a refrigerant circulatory unit extending laterally from said sheet metal portions and supported thereby, an evaporator, means for flexibly connecting said evaporator to said condenser, and means including said refrigerant circulatory unit

and said condenser for supplying refrigerant to said evaporator.

15. A refrigerating machine separable from a cabinet, or the like, used therewith comprising an air cooled condenser including a plurality of complementary sheet metal portions, means for securing said sheet metal portions together, at least one of said sheet metal portions having an indentation therein cooperating with the other of said sheet metal portions to form an extended refrigerating passage therebetween, said sheet metal portions being of channel-shaped cross sections and bowed outwardly in the center thereof in the direction of the legs of said channel, a refrigerant circulatory unit extending laterally from said sheet metal portions adjacent one end thereof and supported thereby, an evaporator, a flexible conduit communicating with said passage and with said evaporator, a second flexible conduit communicating with said evaporator and with said refrigerant circulatory unit, and means including said conduits for flexibly connecting said evaporator to the end of said condenser opposite said refrigerant circulatory unit.

16. A refrigerating machine separable from a cabinet, or the like, used therewith comprising a rectangular relatively thin condenser, a refrigerant circulatory unit extending laterally from said condenser and rigidly supported thereby, a refrigerant evaporator, and means including a removable bracket for pivotally connecting said evaporator and said condenser.

17. A refrigerating machine separable from a cabinet or the like used therewith comprising a rectangular relatively thin condenser, a refrigerant circulatory unit extending laterally from said condenser adjacent one end thereof, a refrigerant evaporator, and means including a removable angular bracket for supporting said evaporator laterally with respect to the opposite end of said condenser.

18. A refrigerating machine separable from a cabinet or the like used therewith comprising an air cooled condenser including a plurality of sheet metal portions, means for securing said sheet metal portions together, at least one of said sheet metal portions having an indentation therein cooperating with the other of said sheet metal portions to form an extended refrigerant passage therebetween, said condenser being provided with outwardly extending side flanges, a refrigerant circulatory unit extending laterally from said condenser adjacent one end thereof and rigidly secured thereto, a refrigerant evaporator, and means including a pair of V-shaped brackets for supporting said evaporator at an acute angle with respect to the opposite end of said condenser, each of said brackets having a leg secured to an adjacent side flange of said condenser.

CHRISTIAN STEENSTRUP.

DISCLAIMER

2,071,183.—*Christian Steenstrup*, Schenectady, N. Y. REFRIGERATOR. Patent dated February 16, 1937. Disclaimer filed February 18, 1939, by the assignee, *General Electric Company*.

Herby enters this disclaimer to claims 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, and 14 of said Letters Patent.

[*Official Gazette March 21, 1939.*]