

Nov. 8, 1938.

S. MORSE

2,135,875

APPARATUS FOR REFRIGERATION

Original Filed Aug. 8, 1932

4 Sheets-Sheet 1

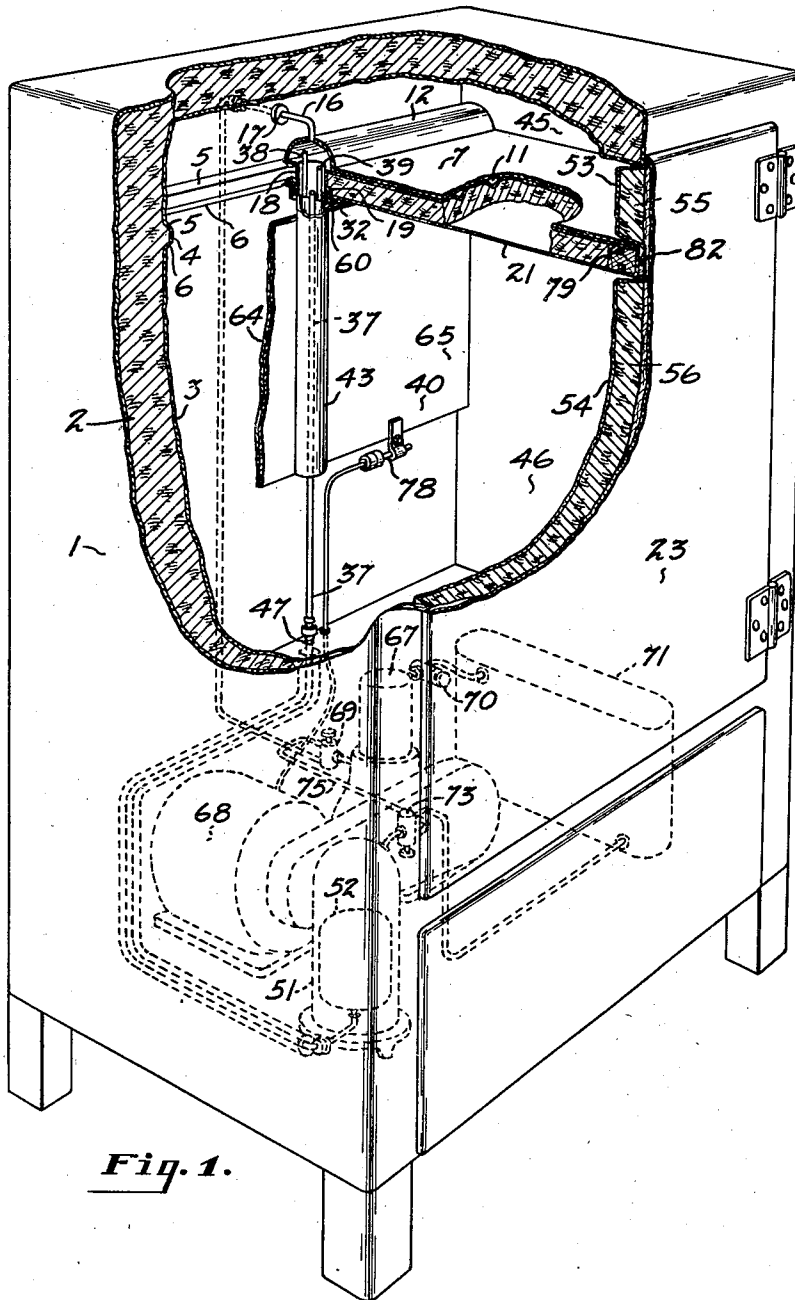


Fig. 1.

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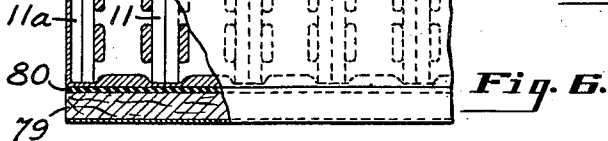
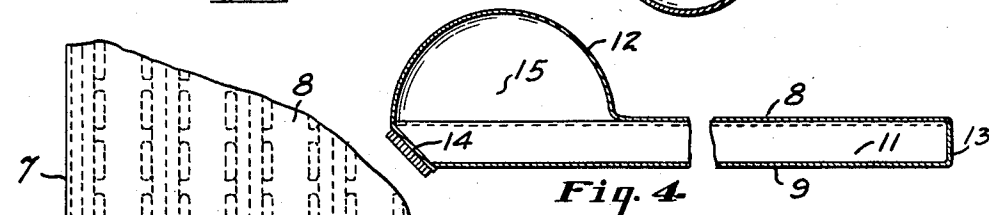
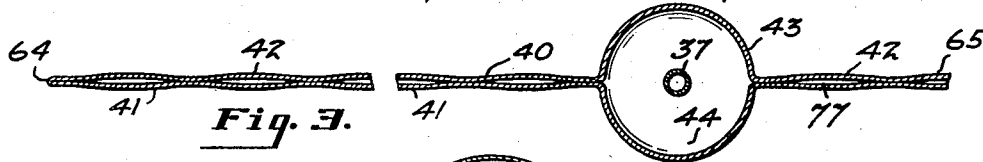
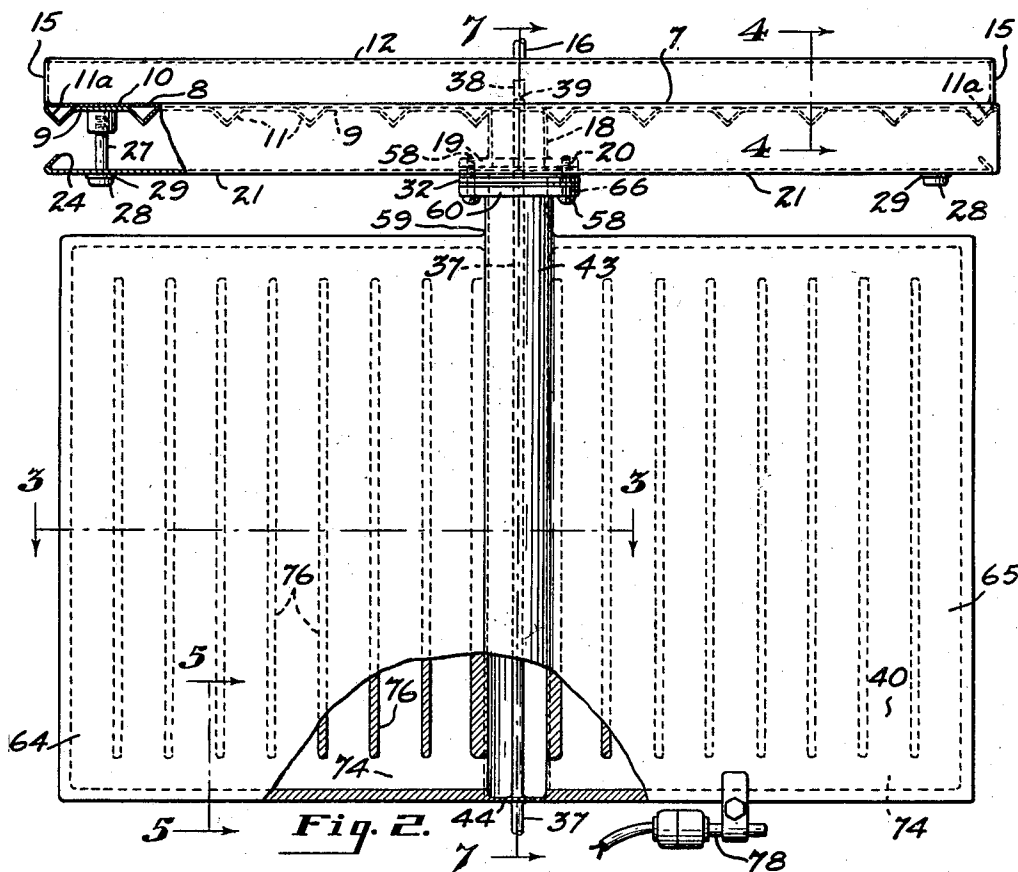
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4 Sheets-Sheet 2



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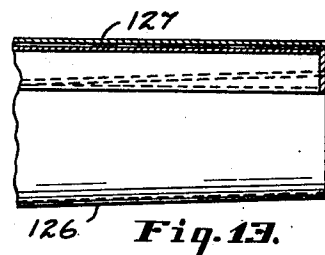
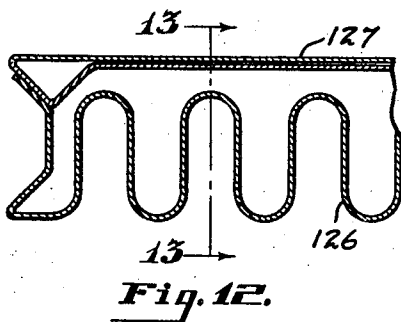
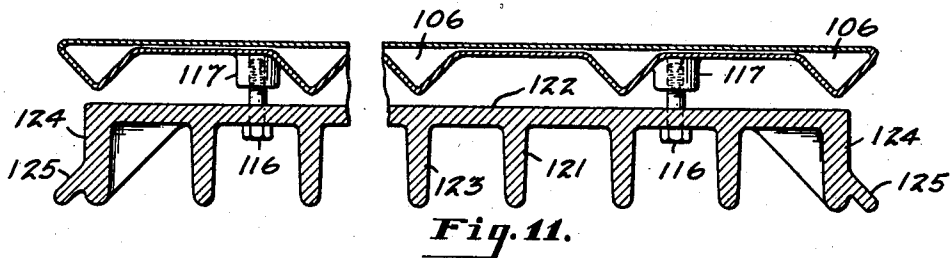
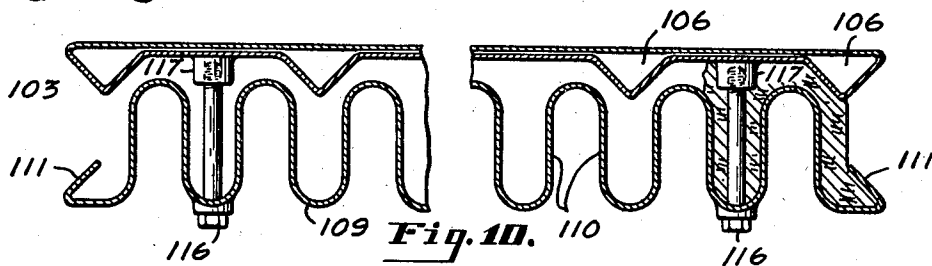
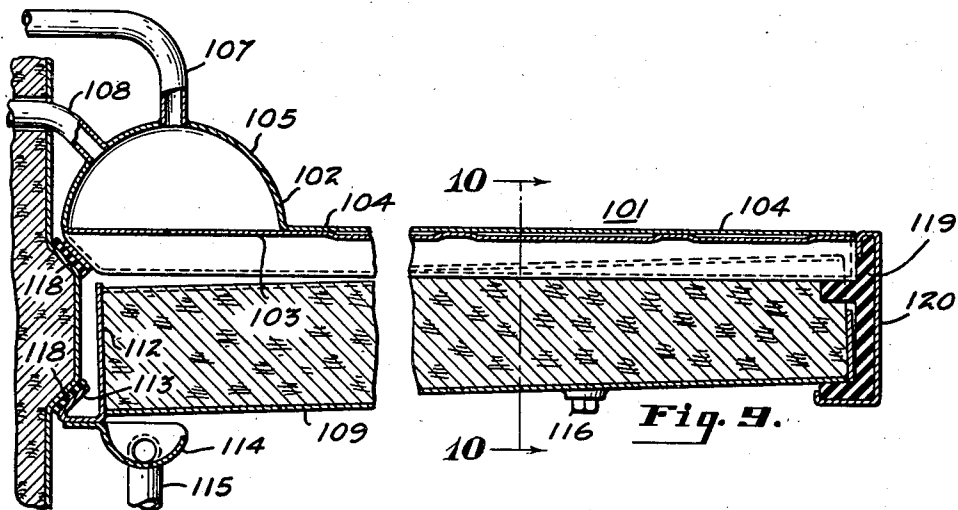
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APPARATUS FOR REFRIGERATION

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4 Sheets-Sheet 4



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2,135,875

APPARATUS FOR REFRIGERATION

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Application August 8, 1932, Serial No. 627,924
Renewed April 7, 1938

11 Claims. (Cl. 62—116)

This invention relates to refrigerating systems and more particularly to such systems as applied to domestic or other small refrigerating units. More particularly still, it relates to the design of evaporators for such units.

An object of the invention is to provide an evaporator so constructed that it will freeze ice for table use in containers provided for that purpose and at the same time operate in such a manner that frost deposit on its surfaces is largely or completely prevented.

Another object is the provision of an evaporator, one portion of which is designed to freeze ice or foods and the other portion of which is designed to cool the air in the food storage compartment of the refrigerator.

Another object is the provision of an integral evaporator comprising an air cooling portion in full gaseous connection with a freezing portion which air-cooling portion operates substantially above the freezing point of water and to a large extent above the dew point of a relatively saturated atmosphere in the food storage compartment.

Another object related to the preceding is the provision of a mechanically cooled refrigerator the food compartment of which as a whole maintains a nearly saturated atmosphere with respect to water vapor.

Another object is the provision of a freezing evaporator which forms a portion of a partition separating the cabinet into a food storage and a freezing compartment.

Another object is the provision of an evaporator which has portions able to operate at two different average temperatures simultaneously, one substantially below freezing and the other somewhat above freezing, with but one thermostatic control of the apparatus.

Another object is the provision of an air cooling unit consisting of an extended surface in close relation with a capillary space for refrigerant liquid.

Another object is the provision of controlled heat flow from the air cooling evaporator to the freezing evaporator during periods of idleness of the cooling means used to cool the latter.

Another object is the provision of a partition between a freezing compartment and the food storage compartment with such defined heat conductivity that its surface in contact with the food storage space contributes materially to the refrigeration of this space but without permanent condensation of frost thereon.

Another object is the provision in a refrigerator

having a freezing space and a food storage space of a separating partition having an extended surface and such an amount of heat insulation that the partition is able to refrigerate the food storage space without permanent condensation of frost thereon but with sufficient refrigerating power to effectively cool the food storage space.

A serious problem of the refrigerating industry has been the accumulation of frost on air cooling units. Such frost seriously affects the efficiency of such a unit and must be periodically removed. It will always form when a cooling unit is maintained at a temperature substantially below that of freezing if such a unit is in contact with air containing moisture as is practically always the case in refrigerating installations.

The problem is particularly difficult in the case of the modern domestic mechanical refrigerator. It is a requirement of such refrigerators that they be able to freeze ice and maintain it frozen. It, accordingly, has not been considered possible to prevent the deposit of frost on their freezing units. The present invention succeeds in overcoming this difficulty by dividing the space in the refrigerator cabinet into two spaces, an upper space of little height, which is consistently maintained at temperatures below freezing. This is separated from the food storage space proper by a partition of predetermined heat conductivity, such that the surface of the partition in contact with the air of the food storage space is, under the influence of the temperature differential between the two spaces, maintained at a temperature above freezing but sufficiently below the temperature of the air in the food storage space to afford material or entire refrigeration thereof. In the case in which the partition only partially cools the space, a unitary evaporator is provided which is made in two sections, one designed to operate at temperatures substantially below freezing and constituting the floor of the upper or freezing space, the other depending therefrom into the food storage compartment and consisting of a vertical plate.

During operation of the compressor or other cooling means the former or freezing section of the evaporator is cooled to a comparatively low temperature. During this period the air cooling portion of the evaporator is cooled somewhat but generally not below freezing. During the period of idleness of the compressor, heat flow at a controlled rate occurs through the dividing partition as above noted. Heat also flows at a controlled rate from the air cooling portion of the evaporator to the freezing portion of the

evaporator by evaporation of the refrigerant liquid in the latter, condensation of the evaporant in the former and return of the condensed liquid to the latter again. Since the air cooling portion of the evaporator is made of very extended surface, as is also the surface of the partition in contact with the air in the food storage compartment, these two elements can be maintained at temperatures as regards the greater part of their area at least only a degree or two below that of the air in the compartment. Under these conditions, very little condensation of water occurs and, therefore, the air in the food storage compartment is maintained at saturation, and at temperatures comparing very favorably with the best present practice as regards the temperature at which the compartment can be kept and as regards the constancy thereof.

In order to secure the two temperatures of operation used in the two different portions of the evaporator, the freezing portion is made so as to contain a considerable volume of refrigerant liquid but so disposed as to offer very large surface from which evaporation can occur.

In the air cooling evaporator, on the other hand, the surface of the evaporator in contact with the air is made, as before noted, very extensive, and evaporation of the refrigerant liquid is caused to take place in a very narrow capillary space, not over .001 of an inch in thickness, escape of the vapor taking place through the same space. In order to secure these conditions this portion of the evaporator is made of two flat pieces of steel, seam welded together at various points and enclosing a very thin capillary space. Owing to the capillary pressure on this space and also to the viscous resistance to gas escaping therefrom, liquid in this space boils at a substantially higher temperature than in the other portions of the evaporator where evaporation is wholly free. On operation of the compressor boiling is relatively rapid in the freezing portion of the evaporator while absorption of heat owing to the small space which it refrigerates is quite small. The contrary condition is present in the case of the lower evaporator where absorption of heat is very free and the rate of boiling somewhat restricted. It follows, therefore, that the freezing portion of the evaporator cools much more rapidly than the air cooling portion of the evaporator.

As a concrete example with a given apparatus, the freezing portion of the evaporator, during some fifteen minutes running of the compressor, drops from about 30° to 5° or less Fahrenheit. In the same time the lower edge of the air cooling portion of the evaporator will have dropped from about 35° to about 29° while the upper edge will have fallen from about 37° to about 36°, the air in central position in the food storage space dropping from 38° to 37°. During the next hour or so, while the compressor is inactive, the temperature in the freezing portion of the evaporator rises steadily, at first rapidly and then more slowly, to about 30° again, but the air cooling evaporator tends, for a time, lasting at least half of the period, to still decrease in temperature, due to the fact that the refrigerant liquid therein continues to evaporate, being condensed in the freezing portion of the evaporator and overflowing back into the air cooling evaporator. That is, the air cooling portion of the evaporator has continuous refrigerating effect and although ordinarily at least as regards its upper edge, only a degree or two below the

temperature of the air is able to maintain the latter at a very constant temperature, the temperature variation of the air in the food storage compartment being only about two degrees during a complete cycle of operation.

During the inactive period of the compressor the relatively small portion of the air cooling evaporator which reached a temperature below freezing during the operation of the compressor rises above freezing. Consequently, any moisture which is frozen to this portion of the evaporator during the action of the compressor is melted and runs off during the latter portion of the idle period of the compressor. The amount, however, condensed is extremely small, from 70% to 90% of the area of the air cooling evaporator never condensing any moisture under operating conditions. It follows that if moist articles or water is exposed in the food storage space that the atmosphere in the space is almost completely saturated, being between 99 and 100% relative humidity in the upper portion and not lower than 93% in the lower portion of the space.

It has been before noted that in order to make it possible to keep the air cooling means at a temperature so little below that of the air in the refrigerated space that it will not tend to condense moisture, large cooling area is necessary. In a specific successful example the dimensions of the food storage compartment were such as to give an area through which heat entered this space of 19.6 sq. ft. The area of the air cooling evaporator was approximately 5.1 sq. ft. and the area of the bottom of the surface of the partition separating this space from the freezing space was 3.4 sq. ft. The area of the air cooling evaporator was, accordingly, 26% of the area through which heat entered the space, and the total cooling surface was about 43% of the area through which heat flowed into the space. The insulation of the side walls was two inches of Celotex, that of the door one inch plus the thickness of the door. The total heat conduction into the space was about 3.9 B. t. u. per degree Fahrenheit temperature difference per hour. Under better conditions of insulation the relative amount of cooling surface may be decreased, but preferably not below 25% of the wall space through which heat inflow occurs. Correspondingly, the total area of the air cooling evaporator proper should not be decreased below 15% of the wall area through which inflow of heat occurs. The insulation between the freezing compartment and the food storage space, as above noted, was very much less thorough and permitted heat flow through the partition of about one to one and a half B. t. u. per hour per degree Fahrenheit difference per square foot.

Referring now to the drawings,

Figure 1 is a perspective view of a domestic refrigerator cabinet using an air cooling evaporator partly broken away to show the details of the evaporator system and the general construction, the mechanical portion of the unit being shown diagrammatically and in dotted lines;

Fig. 2 is a frontal view partially in section of the evaporator and insulating partition used in Fig. 1;

Fig. 3 is a horizontal section along the line 3—3 in Fig. 2 showing the method of construction of the air cooling evaporator, the capillary space being considerably exaggerated in thickness;

Fig. 4 is a vertical section along the line 4—4

in Fig. 2 of a portion of the freezing evaporator, the central portion of this section being broken out;

Fig. 5 is a vertical section of a portion of the air cooling evaporator along the line 5—5 in Fig. 2 showing particularly the channel along the bottom edge;

Fig. 6 is a plan view of a portion of the freezing evaporator showing the method of welding;

Fig. 7 is in part a vertical central section of the freezing and air cooling evaporators, the middle of both structures being broken out, and in part a diagrammatic representation in the form of a flow sheet of the course of the refrigerant fluid;

Fig. 8 is a vertical section of the evaporator and insulating partition shown in Fig. 7 along the line 8—8 in Fig. 7;

Fig. 9 shows in central vertical section parallel to the side wall, a form of refrigerator construction in which the insulating partition shown in Figs. 1 to 7 is increased in area and in which the air cooling evaporator shown in Figs. 1 to 7 is omitted;

Fig. 10 is a vertical section parallel to the back wall of the evaporator and insulating partition shown in Fig. 8 taken along the lines 9—9 in Fig. 8;

Fig. 11 is a section similar to Fig. 9 showing another type of partition between the freezing space and the air cooling space of a refrigerator;

Fig. 12 is a section similar to Fig. 9 but showing the insulating partition as permanently welded to the evaporator;

Fig. 13 is a section along the line 12—12 in Fig. 11.

Referring now to Figures 1 to 7, which show a domestic refrigerator operated according to this system and provided with an air cooling evaporator, partially broken away to show the various operating elements, 1 is the outer casing of the refrigerator; 2 is the layer of insulation, and 3 the metal liner, usually vitreously enameled. The metal of the liner 3 is bent inwardly to form a horizontal ledge 4 extending around the two sides and the back of the liner. This ledge is so shaped on cross section as to consist of an upper beveled surface 5 inclined at about 45° from the horizontal, and a lower beveled edge 6 inclined at 45° but in the reverse direction. This structure is better shown in Fig. 7. Lying on this beveled surface 5 and supported thereby is the freezing evaporator 7. This is a structure composed generally of two sheets of steel, an upper sheet 8 and a lower sheet 9. The lower sheet 9 as regards the largest portion of its area is in a single flat plane, being bent, however, to form the parallel corrugations 11 which extend downward from this plane to a depth of about a half inch or thereabouts and run from front to back. The two lateral corrugations 11a rest against the surface 5 on each side wall of the liner.

The upper plate 8 of the freezing portion of the evaporator 7 is generally flat and in close relationship with the plane portion 10 of the lower section 9. It is, however, bent along the rear edge to form the semi-cylindrical dome 12 projecting above its general plane. It is also continued into projections 13 along the front edge which are bent downward through an angle of 90° to form material for closing the ends of the corrugations 11 in the lower plate 8, and is also continued into similar projections at the back 14 to close the corrugations 11 at their rear end, the metal of the lower plate 9 being cut back along a plane making

an angle of about 135° with the plane of this portion of the evaporator, the projections 14 being bent in to lie within this plane. Semicircular projections 15 are also left on lower plate 9 to close the ends of the semi-cylindrical dome 12. The two plates 8 and 9 are welded along the seam so made around the four sides thereof and they are further seam or spot welded together at numerous points where the plane surface of the lower plate 9 is in contact with the flat surface of the upper plate 8. The method of seam welding is well shown in Fig. 6, the rounded sectioned areas representing the welds between the surfaces of plates 8 and 9. A tube 16 is welded into a convenient point in the top of the dome 12 preferably at its middle point and passes out of the casing of the refrigerator through the hole 17 therein, suitable packing material being packed about it.

There is welded to the lower plate 8 of the freezing portion of the evaporator 7 at a point on its middle line and near its posterior edge a tube 18 preferably oval in cross section, vertically disposed, relatively short and bearing at its lower edge a flange 19. The total length of the tube 18 and the flange 19 thereon is such that the lower surface of the flange 19 extends nearly to the horizontal level of the lowest portion of the ledge 4 where it runs into the general plane of the liner 3. The flange 19 is provided with suitable bolt holes 20 which are tapped for the reception of bolts 58. There is provided an insulating partition consisting of a sheet of vitreously enameled steel 21 having a shape to fit the horizontal cross section of the space enclosed by the metal liner 3 and suitable insulating material 92, disposed between the sheet 21 and the evaporator 7. The sheet 21 is provided with a hole 22 registering with the aperture of the tube 18, surrounded by holes registering with the bolt holes 20 in flange 19. It is provided with edges 24 bent upward through an angle of about 135° which, when the partition is in place, register with the lower surface 6 of the ledge 4. The front edge 63 is bent upward through 90° only. At their front edge, the evaporator 7 and the insulating partition 21 are secured to a wooden bar 79. This bar is rabbeted along its upper inner corner to afford reception for the front edge of the evaporator 7. A rubber strip 80 molded to fit the corrugations 11 of the evaporator 7 is placed between the bar 79 and the front edge of the evaporator 7. A saw cut 81 in the lower surface of the bar 79 affords space for the upturned front edge 63 of the partition 21. A piece of sheet metal 83 is so shaped as to dip into the rabbeting groove and into the saw cut 81, thus protecting the front surface of the bar.

The door 23 is provided with two pans 53 and 54 behind which is insulation 55 and 56. The pan 53 closes the space 45 and pan 54 the space 46. Insulation or packing 82 is placed about the edges of both pans and serves to pack the door 23 tightly against the casing 1 and the bar 79. The partition 21 is provided at suitably spaced positions with relatively large holes 25 which register with nuts 26 welded onto the lower surface 9 of the freezing evaporator 7. The large size of the holes 25 takes care of distortion during enameling. Between the edges 24 of the insulating shelf 21 and the lower beveled surface 6 of the ledge 4 and also between the upper beveled surface 5 and the beveled edge of the freezing portion of the evaporator 7 is inserted a soft packing 30. The insulating partition 21 can be securely fastened to the lower surface 9 of the freezing portion of

the evaporator by tightening of the screws 27, which have broad heads 28 under which are soft washers 29.

The freezing portion of the evaporator 7 and the insulating partition 21 with the insulation 92 placed between them when so secured in position, clamping the ledge 4 between them, constitute together a relatively air-tight and heat insulating partition separating the space surrounded by the metal liner 3 into two portions, an upper freezing space 45 relatively shallow in vertical dimension, and a food storage space 46 comprising the rest of the interior of the cabinet, and these spaces, when properly closed in front, afford no appreciable amount of air circulation from the space 45 to the space 46. A gasket 31 is provided between the flange 19 and the insulating partition 21. The insulation 92 provides a heat conductivity of about 1-2 B. t. u. per degree Fahrenheit per hour per square foot of partition 21, between evaporator 7 and the space 46.

There is provided a separating plate 32 generally corresponding in dimension to the flange 19 and provided with bolt holes registering with the bolt holes 20. Within the space covering the aperture in the tube 18 it is bored with three holes which afford a force fit for the tubes 37, 38 and 39. The tube 37 is the inlet tube for refrigerant liquid and its further course will be later described. Tube 38 is a short tube which when the plate 32 is in position extends up through the tube 18 nearly to the top of the dome 12, ending at the lower surface of the plate 32. The tube 39 is a similar tube which extends just about to the plane of the top of the plate 8 and ends at the lower surface of the plate 32.

There is provided the air cooling evaporator 40. This is fashioned from a front sheet 41 and a back sheet 42 and is disposed in a vertical plane. The front sheet 41 and the back sheet 42 are bent semi-circularly at their middle point so that when placed together they form a tubular vertical central portion 43 and heat absorbing vanes 64 and 65 at the side. They are welded together at their edges and a circular plate of metal 44 is welded in place to close the bottom of the tubular portion 43. A hole is made in the plate 44 and the tube 37 is passed therethrough and welded or otherwise secured in place. This tube, as before mentioned, passes with a tight fit through the separating plate 32 and extends a convenient distance into the tube 18 when the apparatus is assembled. It passes out of the food storage space through the hole 47 which is suitably packed air-tight about it.

The tubular portion 43 of the air cooling evaporator is caused to extend a short distance above the upper edge of the air cooling evaporator 40 to form the tubular projection 59, the edges of the front and back plate being butt welded or otherwise secured together to form this tube, and to it is welded the flange 60, generally corresponding in shape to the flange 19, and provided with bolt holes 66. A gasket 61 between insulating partition 21 and separating plate 32 and a similar gasket 62 between the separating plate 32 and the flange 60 are provided. By means of the bolts 58 the freezing evaporator is connected to the air cooling evaporator 40, the separating plate 32 being placed between to separate the two spaces except for the connection by the tubes 38 and 39.

The refrigerating system here shown is of the flooded type employing a high side float 52 in the liquid receiver 51. The suction pipe 16 passes through the rear wall of the cabinet through the

hole 17 and passes down to the inlet of the compressor 67, here shown as reciprocating and being driven by the motor 68. A three-way valve 69 is placed at the inlet of the compressor and another of similar form 70 at the outlet. The discharge line of the compressor 67 passes to the condenser 71 which connects with the liquid receiver 51 through the three-way valve 73. From the bottom of the liquid receiver 51 passes the inlet tube 37 of the evaporator. In the liquid receiver 51 the float valve 52 permits passage of liquid into the tube 37 when the level in the receiver 51 exceeds a certain amount. A separate tube 75 passes from the three-way valve 69 to the three-way valve 73. The third connection of the three-way valve 70 is to air, this connection and that of the jumper tube 75 being used only during the process of air exhaustion and filling the apparatus with refrigerant fluid.

Operation is as follows: The apparatus having been exhausted of air, sufficient refrigerant is admitted to fill the liquid receiver to the point where it begins to admit liquid through the tube 37 to the upper portion of the evaporator. A sufficiently greater amount is now admitted so that the tube 18 is filled and overflows into the corrugations 11, filling them. This having been accomplished, a small quantity is again added which overflows through the tube 39 into the lower section of the evaporator, that is, the air cooling section. This portion flows into the tubular portion 43 of the air evaporator 40, and into the capillary space between the front and back sheets 41 and 42 by way of the more expanded space 74 along the bottom edge, and is drawn up by capillarity into a considerable proportion of this space. The vertical seam welds 76 fastening the sheets 41 and 42 together throughout their area are interrupted at the bottom and at the top to permit this to occur. On operation of the compressor 67 the liquid in the freezing evaporator 7 begins to boil actively, and under the pressure reigning in the suction line. The liquid in the capillary space 77 in the air cooling evaporator 40 also boils. It is, however, under a capillary pressure which is to be added to the suction pressure and the escape of gas from this space is somewhat impeded by viscous resistance. The liquid in this space, accordingly, boils at a higher temperature than the liquid in the evaporator 7.

Moreover, as above noted, the heat absorption of the evaporator 40 is large while that of the evaporator 7 is relatively small, and the evaporator 7, accordingly, falls in temperature much more rapidly than the evaporator 40. During this time the float valve 52 in the liquid receiver 51 insures that the total amount of refrigerant liquid in the two evaporators is the same. Liquid is first delivered by the tube 37 to the upper evaporator and if the level in this evaporator has exceeded the level necessary to overflow into tube 39, it flows over into this tube and into the evaporator 40. The temperature of the evaporator 40, particularly of its lower edge, does, however, go down and a thermostat 78 placed at this point in such manner as to be sensitive partially to the air temperature and partially to the temperature of this portion of the evaporator, is arranged to stop the compressor when the temperature at this point is slightly below freezing. During this interval, the temperature of the freezing evaporator, as before mentioned, has gone very much lower, to about 5° F. or thereabouts. On the compressor ceasing to operate, evaporation from the freezing evaporator 7 becomes very slow or ceases,

whereas evaporation from the air cooling evaporator 40 continues. The evaporant, as before noted, is condensed in the freezing evaporator and the resultant liquid is returned to the air cooling evaporator. For a time, the temperature of the air cooling evaporator 40 continues to fall until the temperature of the freezing evaporator 7 has risen to such a point as to make transfer of heat from evaporator 40 to evaporator 7 slower than the influx of heat into the former. The temperature of the air evaporator now commences to rise rather rapidly owing to the fact that it has a very low heat capacity. When the lower edge has risen to a point a little above freezing the thermostat again acts to start the compressor and the process is repeated.

Under certain circumstances the apparatus shown in Figs. 1 to 7 and described in connection therewith may be considerably simplified. The apparatus shown in these figures utilizes for the refrigeration of the food storage space, first, the under surface of the separating partition 21 and, second, the depending or vertical portion of the evaporator 40 as before outlined. The surface of the vertical portion of the evaporator is about twice that of the lower surface of the partition. If we cause the surface of the insulating partition to be about trebled in area, increasing at the same time the heat conductivity between this partition and the freezing evaporator to three times the former figure, we can for certain dimensions of a refrigerator cabinet omit the air cooling portion of the evaporator altogether and secure adequate refrigerating effect solely from the partition. Three different ways of accomplishing this are shown in Figures 9 to 13, inclusive.

Referring now to Figure 9, there is shown in central vertical section an evaporator and heat insulating partition, the section being taken on a plane parallel to the side wall of the refrigerator. Figure 10 shows a vertical section parallel to the back wall taken on the line 10-10 in Fig. 8. In these figures, 101 is the evaporator proper consisting of two sheets 102 and 103, sheet 102 forming generally a flat surface 104 but being bent to form a semi-cylindrical dome 105 at its rear portion. The sheet 103 is corrugated, as is the case in the freezing portion of the evaporator shown in Figs. 1 to 7, the corrugations running from front to back and forming channels 106 in which the refrigerating liquid lies, the dome 105 serving to feed these channels. The two sheets are welded together precisely as is the case in the evaporator shown in Figs. 1 to 7. Suction tube 107 and liquid inlet tube 108 are welded into the upper surface of the dome 105 at convenient points.

There is provided the insulating and refrigerating partition 109 lying below the evaporator 101. This is bent into deep corrugations 110, the edges being bent up at the sides through an angle of 135° to form the beveled surfaces 111. These corrugations run from front to back and the partition as a whole is somewhat slanted from front to back so that the back portion of the corrugations 110 are at the lowest level. The piece of sheet metal 112 is welded to the back edges of the corrugations 110 to close the same and is continued and bent upward through an angle of 135° to form the back beveled surface 113. A piece of metal 114 bent to form a shallow channel extending under the posterior edges of the corrugation 109 serves to collect any condensation thereon, which is carried away by the tube 115 welded thereto. Screws 116 passing through holes in the

partition 109 and screwed into the nuts 117 welded to the bottom of the evaporator 101 serve to press the two structures together and clamp the surfaces 113 and 111 against the ledge in the liner 118. The space between the evaporator 101 and the partition 109 is closed in front by a molded rubber member 119 which is surrounded and protected by a metal enclosure 120.

In Figure 11 an essentially similar form of construction is shown except that the partition 109 in Figures 8 and 9 is formed of an aluminum casting 121 consisting of a main web 122 on which are cast heat conducting fins 123. On the two lateral fins 124 are cast short surfaces 125 disposed at approximately 135° from the plane of the web 122 adapted to cooperate with the ledge 118 in the liner shown in Fig. 8 to make possible a relatively air tight joint between the freezing compartment in the refrigerator and the food storage compartment.

In Figures 12 and 13 the insulating partition 126, which is otherwise shaped as shown in the partition 109 in Figs. 8 and 9, is shown as integrally welded to the evaporator 127 which may be otherwise formed as is the evaporator 101 shown in Figs. 8 and 9.

It will be seen that in the present invention I have devised a method by which it is possible to operate a refrigerator capable of freezing ice or foodstuffs, but which in the food storage compartment is capable of maintaining a temperature of 40° Fahrenheit or lower without appreciably dehydrating the air in such compartment.

Ice may be frozen in the usual way in trays resting on the shelf constituted by the evaporator 7. In addition to this, large platters containing foods may be placed therein.

As under ordinary conditions the food storage space 46 maintains a constantly saturated atmosphere, there is practically no evaporation from foods placed therein and no hydrator or other special means of preserving fresh vegetables such as lettuce or celery is required.

Furthermore, it is to be understood that the particular form of apparatus shown and described, and the particular procedure set forth, are presented for purposes of explanation and illustration and that various modifications of said apparatus and procedure can be made without departing from my invention as defined in the appended claims.

What I claim is:

1. A sheet metal evaporator consisting of two substantially flat sections, one section being disposed horizontally, having an upper wall composed of sheet metal and having a lower wall composed of sheet metal in which are corrugations whereby long horizontal channels are provided for refrigerant liquid, and the other disposed vertically, the vertical portion having walls in close proximity, thereby providing an extended capillary space in which evaporation of refrigerant can occur.

2. In combination, a refrigerating cabinet having insulating walls and having a partition dividing the interior of the cabinet into two compartments and closed from one another for preventing the circulation of air therebetween, a heat absorber in one of said compartments and adapted to be connected with refrigerant circulating mechanism for maintaining a freezing temperature in said compartment, said partition forming a heat absorbing surface for cooling the other of said compartments and having a maximum heat conductivity of two British thermal units per de-

gree Fahrenheit per hour per square foot area exposed to said other compartment for maintaining said other compartment at a relatively higher temperature than the freezing compartment, said heat absorber having a heat absorbing surface extending into said other compartment.

3. In combination, a refrigerating cabinet having insulating walls, and a horizontally disposed structure adapted to be connected with refrigerant circulating mechanism and insertable in the cabinet as a unit for dividing said cabinet into a plurality of compartments closed from one another, said structure also including refrigerating surfaces on opposite sides thereof each for cooling one of said compartments, the upper surface being hollow for containing refrigerant and providing a refrigerated shelf for an ice tray.

4. In combination, a refrigerating cabinet having insulating walls, and a structure adapted to be connected with refrigerant circulating mechanism and insertable in the cabinet as a unit for dividing said cabinet into a plurality of compartments closed from one another, said structure also including a refrigerating surface on one side thereof for cooling one of the compartments and a refrigerating surface of colder temperature on the opposite side of the structure for cooling the other of said compartments to a lower temperature.

5. In combination, a refrigerating cabinet having insulating walls, and a structure adapted to be connected with refrigerant circulating mechanism and insertable in the cabinet as a unit including a partition for dividing said cabinet into two separate compartments and including a heat absorber disposed on the one side of the partition for cooling one of said compartments to a relatively cold temperature, said partition having limited insulating qualities and the opposite wall thereof forming a heat absorbing surface for cooling the other of said compartments.

6. In combination, a refrigerating cabinet having insulating walls, and a structure adapted to be connected with refrigerant circulating mechanism and insertable in the cabinet as a unit including a partition for dividing said cabinet into two separate compartments and including a heat absorber disposed on the one side of the partition for cooling one of said compartments to a relatively cold temperature, said partition having limited insulating qualities and the opposite wall thereof forming a heat absorbing surface for cooling the other of said compartments, said heat absorber having a heat absorbing surface extending into said other compartment.

7. A refrigerator having insulating walls and forming a freezing compartment and a food storage compartment, an evaporator adapted for con-

nection with refrigerant liquefying mechanism, said evaporator having a section arranged for cooling the freezing compartment and having a section arranged for cooling the storage compartment, said sections being connected for the free flow of refrigerant from one to another, the walls of the evaporator section for the storage compartment forming a refrigerant path of capillary dimension for impeding the flow of vaporized refrigerant therethrough.

8. A refrigerator having insulating walls and forming a plurality of compartments, an evaporator adapted for connection with refrigerant liquefying mechanism, said evaporator having a plurality of sections, one for each compartment, one of said sections having a free connection with the other, the walls of one of the sections forming a refrigerant path of capillary dimensions for impeding the flow of vaporized refrigerant therethrough.

9. A refrigerator having insulating walls and forming a plurality of compartments, an evaporator having an inlet for receiving liquid refrigerant from a refrigerant liquefying mechanism and having sections, one for each compartment, the material of one section forming a refrigerant path of capillary dimension for impeding the flow of vaporized refrigerant therethrough and having a vapor outlet in free communication with the other section, and a vapor outlet for said other section for returning gaseous refrigerant to the liquefying mechanism.

10. A refrigerator having insulating walls and forming a plurality of compartments, an evaporator having an inlet for receiving liquid refrigerant from a refrigerant liquefying mechanism and having sections, one for each compartment, the material of one section forming a refrigerant path of capillary dimension for impeding the flow of vaporized refrigerant therethrough, said section having a liquid refrigerant inlet at one end and having a vapor outlet at the other end in free communication with the other section, and a vapor outlet for said other section for returning gaseous refrigerant to the liquefying mechanism.

11. A refrigerator having insulating walls and forming a plurality of compartments, an evaporator having a plurality of sections, one for each compartment, one of the sections having a liquid refrigerant inlet and a gaseous refrigerant outlet for connection with a refrigerant liquefying mechanism, the other of said sections having inlet and outlet connections with the first section, the material of the second section forming a path of capillary dimensions for impeding the flow of vaporized refrigerant therethrough.

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