

April 13, 1937.

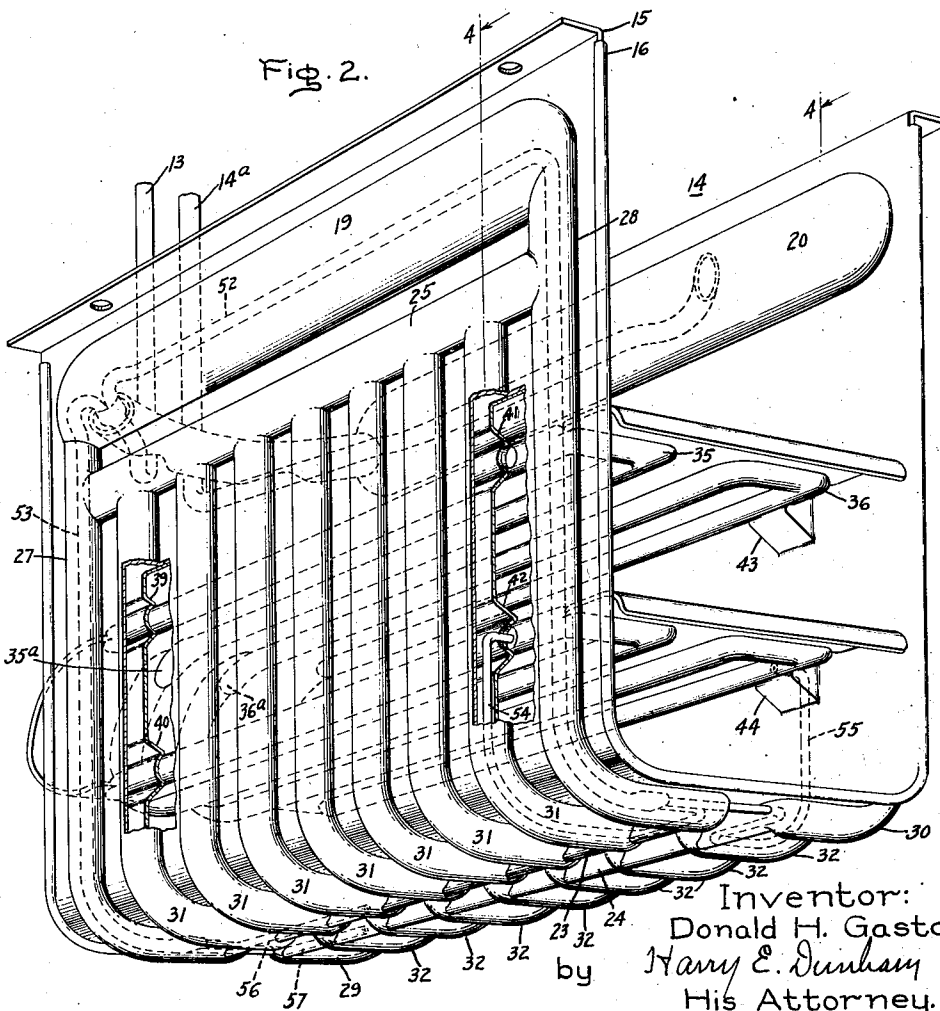
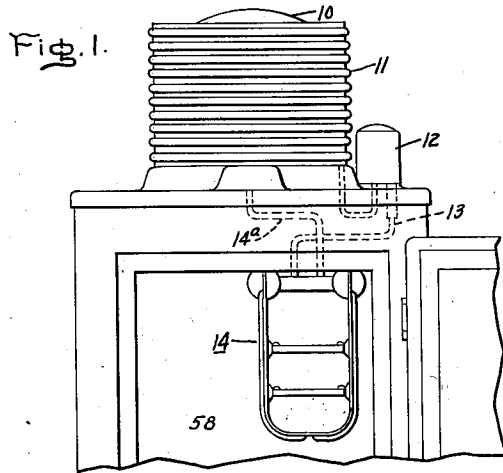
D. H. GASTON

2,077,348

REFRIGERATING MACHINE

Filed Nov. 3, 1934

2 Sheets-Sheet 1



Inventor:
Donald H. Gaston,
by Harry E. Dunham
His Attorney.

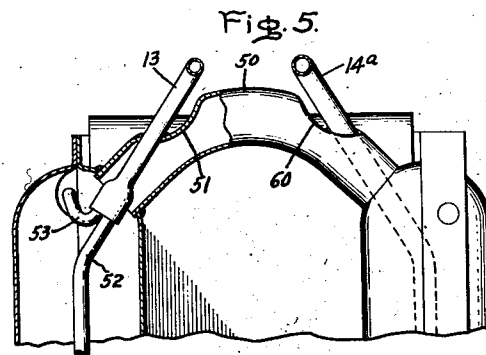
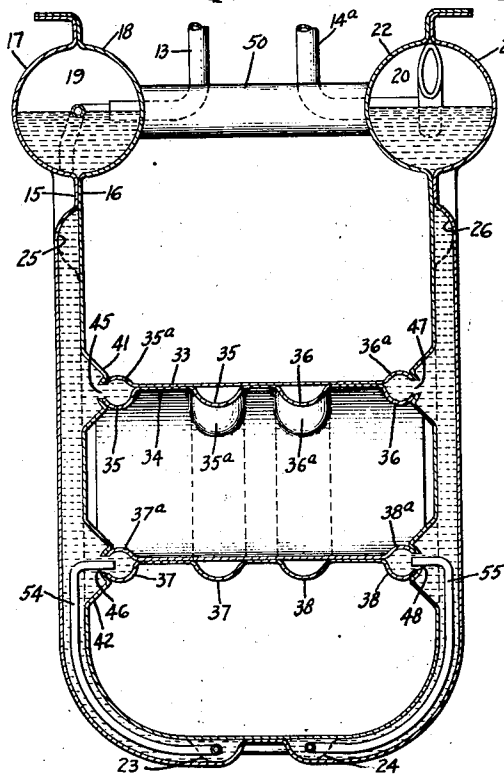
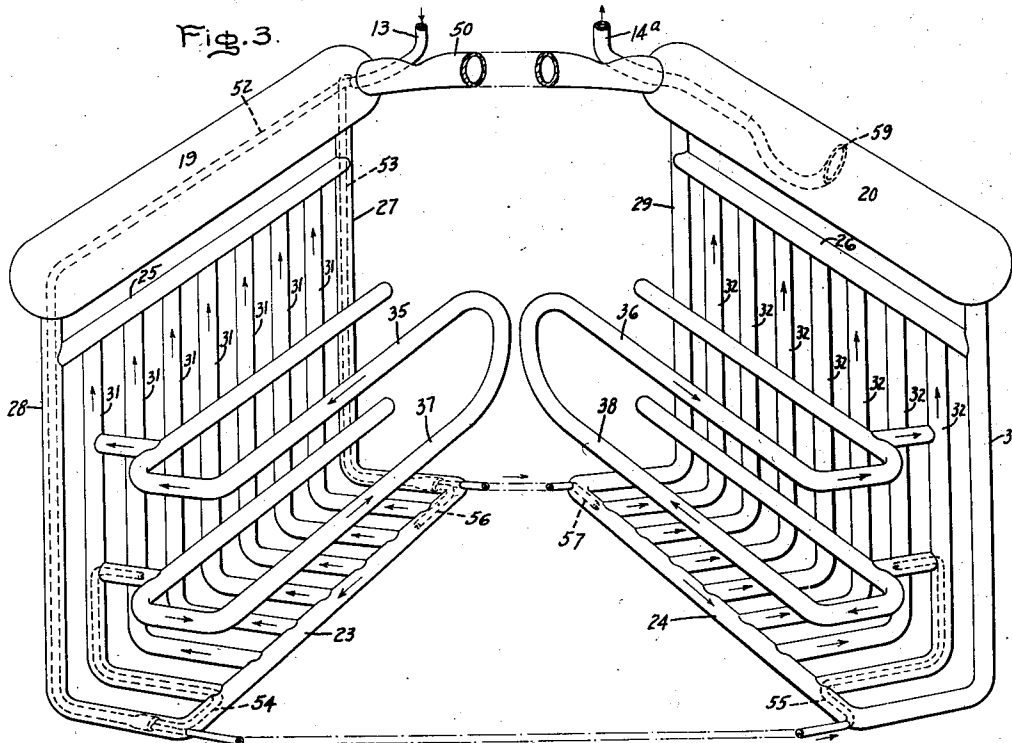
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D. H. GASTON
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2 Sheets-Sheet 2



Inventor:
Donald H. Gaston,
by *Harry E. Dunham*
His Attorney.

UNITED STATES PATENT OFFICE

2,077,348

REFRIGERATING MACHINE

Donald H. Gaston, Fort Wayne, Ind., assignor to
General Electric Company, a corporation of
New York

Application November 3, 1934, Serial No. 751,355

18 Claims. (Cl. 62—126)

My invention relates to evaporators for refrigerating machines.

It is an object of my invention to provide an evaporator for refrigerating machines which forms a freezing compartment of relatively large storage capacity, and which includes an arrangement for efficiently refrigerating a plurality of shelves located therein.

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.

For a better understanding of my invention reference may be had to the accompanying drawings in which Fig. 1 is a front elevation of a portion of a refrigerating machine including an evaporator embodying my invention; Fig. 2 is a perspective view partly in section of the evaporator shown in Fig. 1; Fig. 3 is a schematic representation of the refrigerant circulatory system of the evaporator shown in Figs. 1 and 2; Fig. 4 is a sectional view on the line 4—4 of Fig. 2; and Fig. 5 is a fragmentary plan view partly in section of the rear portion of the evaporator shown in Fig. 2.

Referring to the drawings, in Fig. 1, I have shown a refrigerating machine including an evaporator embodying my invention. In this refrigerating machine a motor and a compressor are arranged in an hermetically sealed casing 10. Gaseous refrigerant is compressed by the motor driven compressor in the casing 10 and is discharged into a condenser 11 where it is liquefied. The liquefied refrigerant flows from the condenser 11 through a flow controlling float valve 12 into a liquid line 13 which injects liquid refrigerant into the evaporator 14. Vaporized refrigerant is returned to the compressor in casing 10 through the suction line 14a from the evaporator 14.

The evaporator 14 includes a U-shaped outer member made up of complementary portions or sheets of metal 15 and 16, which are preferably made of stainless steel. As shown more clearly in Fig. 4, complementary indentations 17 and 18 are provided in the sheets 15 and 16 respectively adjacent the edges thereof to form a header 19, the header 20 being formed adjacent the opposite edges of the sheets 15 and 16 by similar complementary indentations 21 and 22. Manifolds 23 and 24 are formed by parallel indentations in the bottom of the evaporator 14. Manifolds 25 and 26 arranged in parallel relationship to the headers 19 and 20, respectively, are formed by indentations in the sheet 15. The ends of the headers

19 and 20 are connected to the manifolds in the adjacent side of the evaporator 14 by the end passages 27, 28 and 29, 30 respectively.

The manifolds 23 and 25 are connected intermediate their ends by a plurality of parallel passages 31 formed by indentations or corrugations extending longitudinally in the sheet 15 and the manifolds 24 and 26 are similarly connected intermediate their ends by a plurality of parallel passages 32 which are also formed by indentations extending longitudinally in the sheet 15. The inner sheet 16 is made slightly wider than the sheet 15 and its edges are folded over the adjacent edges of the sheet 15 in order that the evaporator 14 will present smooth, rounded edges. The sheets 15 and 16 are welded or otherwise secured together along their peripheral edges and between the indentations formed therein.

The construction of an evaporator made up of complementary portions of sheet metal, a header portion being formed by indentations in one or both of the sheets, and the sheets being welded together between the indentations therein and then bent to the desired shape is not my invention but is the invention of Christian Steenstrup and is described and claimed in his copending application Serial No. 389,050, filed August 28, 1929, and assigned to General Electric Company, the assignee of my present invention.

After being secured together the sheets are bent into a U-shape, as shown in the drawings. The evaporator 14 is thus provided with two headers, one located adjacent the top of each of the vertical walls of the evaporator, and a separate set of refrigerant circulatory passages communicating with each of the headers and extending about the adjacent vertical wall of the evaporator and a portion of the horizontal wall.

The evaporator arrangement described above is not my invention but is the invention of Frank T. Grothouse and is described and claimed in his copending application, Serial No. 751,337, filed November 3, 1934 and assigned to General Electric Company, the assignee of my present invention.

In accordance with my invention, the evaporator 14 is provided with a shelf assembly which is supported within the evaporator described above and which provides a plurality of refrigerated horizontal shelves therein. In the illustrated form of my invention, the shelf assembly is made up of complementary sheet metal portions 33 and 34. Sinuous indentations 35 and 36 are provided in the sheet 34 extending longitudinally thereof. Similar longitudinal indentations 37

and 38 are formed in the sheet 33. The adjacent ends of the passages 35 and 37, and 36 and 38, respectively, are overlapped at 35a and 36a, as shown in Figs. 2 and 4. The sheets 33 and 34 are welded or otherwise secured together entirely about the edges thereof and between the indentations therein throughout their length, as by a series of spot welds or line welding, and are then bent in a horizontal U-shape as best shown in Fig. 2.

Embossments 39, 40, 41 and 42 are formed in the sheet 16 on one of the inner walls of the evaporator 14 and similar embossments are formed in the sheet 16 on the opposite wall of the evaporator 14, the front pair being designated in the drawings as 43 and 44. As best shown in Fig. 4, indentations are formed in the sheets 33 and 34 opposite the ends of the passages 35, 36, 37 and 38, respectively, so that the latter passages have a round cross section at their extremities. Holes are provided in the sides of these passages registering with apertures 45, 46, 47 and 48 formed in the embossments 41, 42, 43 and 44, respectively. The shelf assembly made up of sheets 33 and 34 may be welded or otherwise secured to the embossments formed on the inner sheet 16 of the evaporator shell in order that the shelf assembly may be securely supported thereon. A strong, rugged structure of smooth pleasing appearance is thus provided.

The liquid line 13 which supplies liquid refrigerant to the evaporator 14 enters the latter through a wall of an equalizing conduit 50 which connects the headers 19 and 20 at about the normal liquid level therein as shown in Fig. 4. A depression 51 is formed in the wall of the equalizing conduit 50 surrounding the point at which the liquid line 13 enters the same in order to facilitate making a gas tight joint between the liquid line 13 and the wall of the conduit 50. The liquid line 13 branches into two sections 52 and 53. The section 52 passes longitudinally through the header 19, downwardly through the passage 28, and is provided with a pair of branched ends 54 and 55. Liquid refrigerant is injected from the branched ends 54 and 55 into the passages 37 and 38, respectively, of the shelf assembly. Liquid refrigerant injected into these passages passes therethrough and circulates upwardly into the passages 35 and 36, respectively, in the upper shelf, as indicated by the arrows in Fig. 3. After circulating through the passages 35 and 36 the liquid refrigerant therefrom passes through the apertures 45 and 47, respectively, into the refrigerant passages 31 and 32. The branch 53 of the liquid line 13 passes downwardly through a passage 27 and its lower end is provided with branched ends 56 and 57 which inject liquid refrigerant into the manifolds 23 and 24, respectively. It will be noted that the branched ends 56 and 57 are of the same developed length in order that the pressure drop therein will be equal. Liquid refrigerant injected into these manifolds 23 and 24 passes upwardly through the passages 31 and 32 to the manifolds 25 and 26 respectively, as indicated by the arrows in Fig. 3, and mixes with the refrigerant from the refrigerant passages in the shelves. The branched ends 54 and 55 of branch 52 of the liquid line are smaller than the apertures 46 and 48 respectively, and, therefore, they not only inject liquid refrigerant into the shelf passages but also induce circulation there-through of liquid refrigerant from the passages 31 and 32. This produces a recirculation of liquid

refrigerant from the passages 31 and 32 through the shelf passages. As the liquid refrigerant circulates through the refrigerant passages in the manner described it absorbs heat from articles stored in the freezing compartment formed by the evaporator 14 and from articles contained in a food storage compartment 58 in which the evaporator 14 is located. Such absorption of heat causes the liquid refrigerant to be at least partially vaporized. Liquid and vaporized refrigerant passing upwardly into the manifolds 25 and 26 passes therefrom into the adjacent headers 19 and 20. The headers 19 and 20 are maintained about half full of liquid refrigerant, the vaporized refrigerant collecting above the surface of the same. The vaporized refrigerant collected in the header 19 passes through the equalizing conduit 50 to the header 20. The vaporized refrigerant collected in the header 20 is drawn off to the motor driven compressor in the casing 10 through the suction line 14a, the open end 59 of the suction line 14a being located above the level of the liquid refrigerant in the header 20. It will be noted that the suction line 14a enters the evaporator 14 through a depression 60 in the wall of the equalizing conduit 50. The liquid line 13 and the suction line 14a are angularly disposed with relation to each other in order that they may extend through the equalizing conduit 50 in opposite directions into the adjacent headers. By so arranging the liquid line 13 and the suction line 14a that they enter the evaporator 14 through the equalizing conduit 50 it is possible to avoid the necessity of providing additional apertures in the sheet metal portions 15 and 16 of the evaporator 14, and the making of additional joints. Also, if desired, the equalizing conduit 50 may be made of copper or some such relatively soft metal which will facilitate the making of a gas tight joint.

While I have shown a particular embodiment of my invention in connection with a compression 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 of the United States is:

1. An evaporator of the flooded type for refrigerating machines comprising sheet metal portions forming at least two side walls of a freezing compartment and having a header formed therebetween, a shelf assembly located within said compartment and comprising complementary U-shaped sheet metal portions forming two horizontal shelves, means joining said sheet metal portions, said last mentioned sheet metal portions having an extended refrigerant passage therebetween extending about said shelves, and means for providing communication between said passage and said header.

2. An evaporator of the flooded type for refrigerating machines comprising means forming at least two vertical walls of a freezing compartment, said means including a plurality of refrigerant passages extending about said walls, a shelf assembly located within said compartment and comprising complementary U-shaped sheet metal portions forming two horizontal shelves, means joining said sheet metal portions, said last mentioned sheet metal portions having an extended refrigerant passage therebetween extending about said shelves.

3. An evaporator of the flooded type for re-

frigerating machines comprising complementary U-shaped sheet metal portions forming two side walls and the bottom wall of a freezing compartment, means joining said sheet metal portions together, said sheet metal portions having an extended refrigerant passage therebetween extending about said walls, a shelf assembly located within said compartment and comprising complementary U-shaped sheet metal portions forming two horizontal shelves, means joining said last mentioned sheet metal portions together, said last mentioned sheet metal portions having an extended refrigerant passage therebetween extending about said shelves.

4. An evaporator of the flooded type for refrigerating machines comprising complementary U-shaped sheet metal portions forming two side walls and the bottom wall of a freezing compartment, means joining said sheet metal portions together, at least one of said sheet metal portions having indentations therein forming a separate extended refrigerant passage extending about each of said side walls, a shelf assembly located within said compartment and comprising complementary U-shaped sheet metal portions forming two horizontal shelves, means joining said last mentioned sheet metal portions together, at least one of said last mentioned sheet metal portions having indentations therein forming a plurality of refrigerant passages extending about said shelves.

5. An evaporator of the flooded type for refrigerating machines comprising complementary U-shaped sheet metal portions forming two side walls and the bottom wall of a freezing compartment, means joining said sheet metal portions together, said sheet metal portions having an extended refrigerant passage therebetween extending about said walls the inner one of said sheet metal portions having embossments formed thereon, a shelf assembly located within said compartment and comprising complementary U-shaped sheet metal portions forming two horizontal shelves mounted on said embossments, means joining said last mentioned sheet metal portions together, at least one of said last mentioned sheet metal portions having indentations therein forming a refrigerant passage extending about said shelves.

6. An evaporator for refrigerating machines comprising complementary sheet metal portions forming a side wall of a freezing compartment, means joining said sheet metal portions together, said sheet metal portions having an extended refrigerant passage therebetween, the inner one of said sheet metal portions having an embossment formed thereon having an aperture therein communicating with said refrigerant passage, and a shelf supported in said freezing compartment on said embossment, said shelf being provided with a refrigerant passage communicating with said first mentioned refrigerant passage through said aperture.

7. An evaporator of the flooded type for refrigerating machines comprising complementary sheet metal portions forming a vertical wall, means joining said sheet metal portions together, said sheet metal portions having an extended refrigerant passage extending therebetween, a shelf secured to said vertical wall said shelf being provided with a refrigerant passage, and a refrigerant supply conduit entering said evaporator adjacent the top of said vertical wall extending downwardly between said sheet metal portions and discharging into said last mentioned refrigerant

passage for supplying liquid refrigerant thereto.

8. An evaporator of the flooded type for refrigerating machines comprising complementary U-shaped sheet metal portions forming two side walls and the bottom wall of a freezing compartment, means joining said sheet metal portions together, said sheet metal portions having an extended refrigerant passage extending therebetween, a shelf extending across said freezing compartment said shelf being provided with a refrigerant passage, and a refrigerant supply conduit entering said evaporator adjacent the top of one of said side walls and extending downwardly between said sheet metal portions and discharging into said last mentioned refrigerant passage for supplying liquid refrigerant thereto.

9. An evaporator of the flooded type for refrigerating machines comprising complementary sheet metal portions forming a side wall of a freezing compartment, means joining said sheet metal portions together, a header located adjacent the top of said side wall, said sheet metal portions having an extended refrigerant passage extending therebetween and communicating with said header, a shelf extending across said freezing compartment said shelf being provided with a refrigerant passage, and a refrigerant supply conduit entering said evaporator adjacent the top of said side wall and extending downwardly between said sheet metal portions, said supply conduit having an outlet for discharging liquid refrigerant into the lower portion of said first mentioned refrigerant passage and a second outlet for discharging liquid refrigerant into said refrigerant passage in said shelf.

10. An evaporator of the flooded type for refrigerating machines including a pair of headers, means for circulating liquid refrigerant to said headers, an equalizing conduit connecting said headers, and a liquid supply conduit and a suction conduit entering said evaporator through a wall of said equalizing conduit.

11. An evaporator of the flooded type for refrigerating machines comprising complementary U-shaped sheet metal portions forming two side walls and a bottom wall of a freezing compartment, means joining said sheet metal portions together, at least one of said sheet metal portions having indentations therein forming a header adjacent the top of each of said side walls, a plurality of depending refrigerant passages formed by said sheet metal portions and communicating with said headers, an equalizing conduit connecting said headers, and a liquid supply conduit and a suction conduit entering said evaporator through a wall of said equalizing conduit.

12. An evaporator of the flooded type for refrigerating machines comprising complementary U-shaped sheet metal portions forming two side walls and a bottom wall of the freezing compartment, means joining said sheet metal portions together, at least one of said sheet metal portions having indentations therein forming a header adjacent the top of each of said side walls, a plurality of depending refrigerant passages formed by said sheet metal portions and communicating with said headers, an equalizing conduit connecting said headers and having a pair of spaced depressions in a wall thereof, a liquid supply line entering said evaporator through an aperture formed in one of said depressions and a suction conduit angularly disposed with respect to said liquid supply line entering said evaporator

through an aperture formed in the other of said depressions.

13. A refrigerant containing evaporator comprising an inner and outer sheet metal wall members, said sheets being bent to substantially a U-shaped form to form a freezing chamber, refrigerant containing passageways between the wall members, header portions formed by the sheets adjacent the upper branches of the U-shaped form and connecting the refrigerant passageways, refrigerant inlet means to the passageways and refrigerant vapor outlet means from the header portions, a shelf having refrigerant containing passageways formed therein, and means provided on the inner evaporator sheet for supporting the shelf within the freezing chamber and for providing a refrigerant passage between wall member passageways to and from the shelf passageways.

14. A refrigerant-containing evaporator embodying inner and outer sheet metal wall members, said outer sheet metal wall member having a plurality of longitudinally-extending corrugations formed therein, said inner and outer sheet metal wall members being bent to form a sharp freezing chamber and being welded at their meeting edges and between the corrugations to form refrigerant passages, shelf supports formed in the inner sheet metal wall member, a refrigerant-containing shelf for the evaporator, and means extending through the inner sheet metal wall member for conveying refrigerant to said refrigerant-containing shelf.

15. An evaporator of the flooded type for refrigerating machines comprising sheet metal portions forming at least two side walls of a freezing compartment and having a header formed therebetween, a shelf assembly located within said compartment and comprising complementary U-shaped sheet metal portions forming two horizontal shelves, said last mentioned sheet metal portions having an extended refrigerant passage therebetween extending about said shelves, means for admitting liquid refrigerant to the lower one of said shelves and for circulating refrigerant from the lower one of said shelves to the upper one of said shelves through the passage formed therein, and means for providing communication between said passage and said header.

16. An evaporator of the flooded type for refrigerating machines comprising complementary U-shaped sheet metal portions secured together and having a refrigerant passage formed there-

between and providing two side walls and the bottom wall of a freezing compartment, a shelf assembly arranged within said compartment and comprising complementary U-shaped sheet metal portions secured together and having a refrigerant passage formed therebetween and providing two horizontal shelves, the closed end of the U formed by said shelf assembly being arranged at the rear of said evaporator, means for admitting refrigerant to the passage in said shelf assembly, and means providing communication between the passage in said shelf assembly and the passage in the walls of said evaporator.

17. An evaporator of the flooded type for refrigerating machines comprising complementary U-shaped sheet metal portions secured together and having refrigerant passages formed therebetween and providing two side walls and the bottom wall of a freezing compartment, one of said refrigerant passages being formed in each of said side walls, a shelf assembly arranged within said compartment and comprising complementary U-shaped sheet metal portions secured together, said shelf assembly having two refrigerant passages formed therein, each of said passages having a portion extending through both said shelves, one of said shelf passages communicating at one end with the passage in one of said side walls of said evaporator and the other of said passages communicating at one end with the passage in the other of said side walls of said evaporator, and means for supplying refrigerant to the other ends of said shelf passages and for circulating refrigerant through said shelf passages and into said passages in said side walls.

18. An evaporator of the flooded type for refrigerating machines comprising a header and a plurality of depending refrigerant circulating passages forming a side wall of a freezing compartment, a shelf extending across said freezing compartment, said shelf having a refrigerant passage therein, means providing communication between said refrigerant passage and said depending passages for admitting refrigerant to said shelf, means injecting refrigerant into said shelf passage for producing a circulation of refrigerant in said shelf passage and a recirculation of liquid refrigerant from said depending passages through said shelf passage, and means for withdrawing vaporized refrigerant from said evaporator.

DONALD H. GASTON.