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PLATE CONDENSER

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FIG. 1.

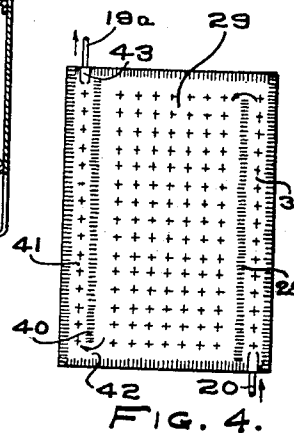
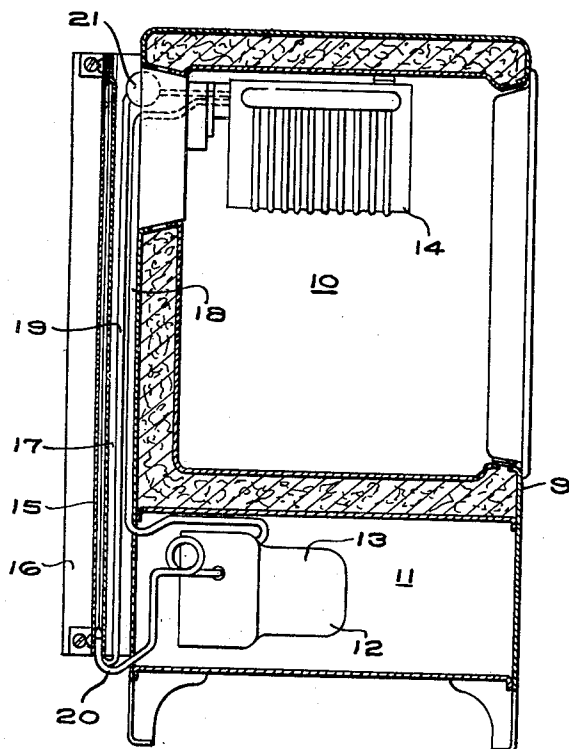


FIG. 3.

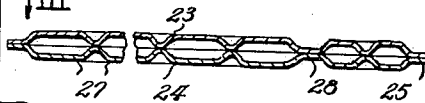
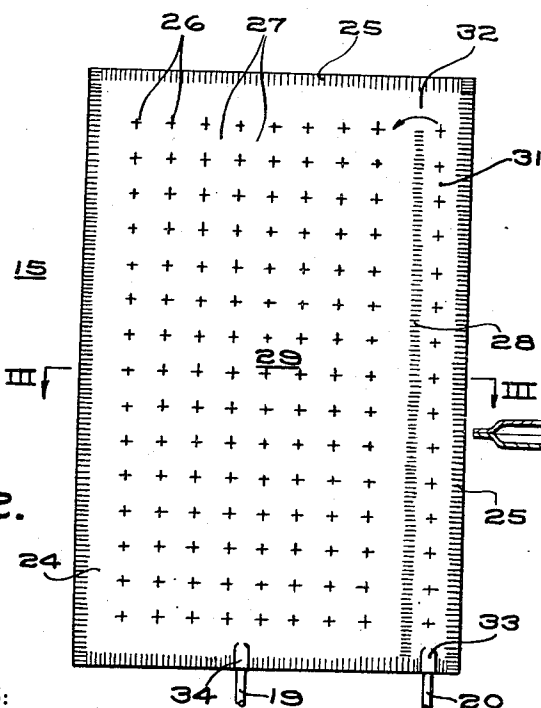


FIG. 2.



WITNESSES:

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PLATE CONDENSER

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6 Claims. (Cl. 257—36)

My invention relates to heat exchangers for use with refrigerating machines and it has for an object to provide an improved heat exchanger.

5 A further object of my invention is to provide an improved condenser for refrigerating machines which may be economically produced from sheet material.

10 A still further object of my invention is to deliver gaseous refrigerant above the body of condensed refrigerant in a plate type condenser having its gas inlet connection adjacent the bottom thereof.

15 These and other objects are effected by my invention as will be apparent from the following description and claims taken in connection with the accompanying drawing, forming a part of this application, in which:

20 Fig. 1 is a vertical sectional view of a domestic refrigerator having my improved condenser applied thereto;

Fig. 2 is an elevation of the condenser shown in Figs. 1 and 2;

25 Fig. 3 is a sectional view taken on line III—III of Fig. 2; and,

Fig. 4 is a view similar to Fig. 2 showing a second embodiment of my invention.

30 Heretofore, in the construction of domestic refrigerators having a bottom mounted compressor and a plate type condenser arranged thereabove, it has been the practice to connect a long gas conduit from the compressor to the top of the condenser, so that gas entering the condenser is not delivered into the body of condensed refrigerant and, furthermore, to prevent the flow of liquid refrigerant through the conduit toward the compressor. This connection required a long conduit disposed, usually, on the outer cabinet where it was unsightly or subjected
40 to mechanical injury.

45 In accordance with my invention, I provide a relatively flat condenser of sheet metal having its opposed walls joined, adjacent an intermediate portion thereof, to provide a condensing chamber and a gas duct within the condenser walls. The gas duct extends from the bottom of the condenser to adjacent the top thereof; where it communicates with the upper portion of the condensing chamber. The gas inlet may then be
50 connected to the bottom of the gas duct, and gas entering the condenser passes upwardly through the enclosed duct prior to its admission into the condensing chamber.

55 Preferably, the condenser walls are connected by seam welding to provide the gas duct, which

welding adds to the strength of the condenser. The walls defining the condensing chamber may be joined at several points to strengthen the condenser and to provide a plurality of interconnected passages in the chamber for the flow
5 of gas to be condensed.

Referring now to the drawing, Fig. 1 shows a domestic refrigerator cabinet 9 having a storage chamber 10 and an apparatus compartment 11
10 therebelow, in which a refrigerating machine 12 is disposed. The latter may include a motor driven compressor (not shown) which is hermetically sealed within a casing 13. An evaporator 14 is arranged within the storage chamber 10
15 for cooling the same when refrigerant is circulated therethrough by the machine 12.

20 Arranged, preferably, on an outer wall of the refrigerator, is a vertically disposed condenser 15 of the plate type. The condenser 15 may be secured to the cabinet 9 in any suitable manner as, by means of one or more brackets 16. Preferably, the bracket 16 supports the condenser 15 in spaced relation with the wall of the cabinet 9 on which it is carried, so that a duct 17 is defined. Both sides of the condenser 15 are cooled;
25 the rear being exposed to the ambient atmosphere and the front side to the thermally induced stream of air passing through the duct 17. When the cabinet 9 is disposed in a room so that the condenser 15 is adjacent and parallel
30 to a wall thereof, a second duct for air flow is defined by the rear of the condenser 15 and the wall.

35 Suction and liquid conduits 18 and 19 connect the evaporator 14 to the refrigerating machine 12 and the condenser 15, respectively. Both of these conduits may be disposed within the duct 17. As shown, a high pressure gas conduit 20 extends from the refrigerating machine 12 to the condenser 15 for conveying the
40 compressed gas to be condensed. A suitable pressure reducing device such as, for example, a conventional float valve 21, is arranged in the liquid conduit 19 for reducing the pressure of the liquid, prior to its admission into the evaporator. The system disclosed operates on the well-known compressor condenser expander cycle, as will be understood.

45 I have shown, in Figs. 2 and 3 my improved condenser 15 which includes wall members 23 and 24 of a sheet material such as, for example, steel and which are secured together along their margins, as shown at 25, preferably by welding. The walls 23 and 24 may be attached together
50 at a plurality of points distributed over the sur-
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face thereof, preferably by spot welding, as shown by the crosses 26, whereby strength is added to the structure and a plurality of interconnected passages 27 is provided for the vapor to be condensed. A wall 28 is formed within the condenser, preferably, by seam welding, so that the condenser structure is divided into a condensing chamber 29 and a gas duct 31.

The wall 28 extends from adjacent the bottom of the condenser toward the top thereof, but terminates in spaced relation with the top, to define a passage, indicated at 32, between the condensing chamber 29 and gas duct 31. The high pressure gas conduit 20 may be connected, as shown at 33, to the gas duct 31 adjacent its lower end or the end which is adjacent the refrigerating machine 12. The liquid conduit 19 is connected to the condensing chamber below the liquid level therein as shown at 34.

During operation of the refrigerating machine 12, gas is delivered through the conduit 20 to the duct 31 and rises to the top of the condenser structure 15 where it enters the condensing chamber 29 through passage 32. Heat is abstracted from the gas and vapor, in the passages 27 of the chamber 29 and is dissipated through the walls 23 and 24 to the ambient atmosphere. The condensed vapor collects in the bottom of the condensing chamber 29 and passes to the float valve 21 through the conduit 19. Vapor which may condense in the gas duct 31 is mechanically suspended in the gas stream and carried thereby to the condensing chamber 29.

In manufacturing a preferred form of my improved condenser, a pair of flat steel plates are employed for forming the walls 23 and 24, which have indentations formed therein for defining the inlet and outlet connections 32 and 34. The plates are juxtaposed and the margins joined by seam welding, as shown at 25. The seam welds forming the wall 28 and the spot welds indicated at 26 are made; after which, fluid, under high pressure, is admitted through one or both of the connections 33 or 34. The disconnected portions of the surface of the plates are forced apart by the high pressure fluid to form the passages 27 and 32 and the gas duct 31.

I have shown in Fig. 4, a modification of the condenser 15 shown in the prior embodiment in which a second seam weld defines a wall 40 extending from the top of the structure 15 toward the bottom thereof, whereby a liquid duct 41 is formed. The wall 40 terminates in spaced relation with the bottom for defining a passage 42 which provides communication between the condensing chamber 29 and the duct 41. An outlet 43 for condensed refrigerant is provided at the top of the condenser structure, to which a conduit 19^a may be attached for conducting liquid refrigerant from the condenser 29 to the float valve 21. With this embodiment, it is not necessary to extend the long conduit 19 of the prior embodiment to the bottom of the condenser. It will be understood that the bottom of the wall 40 is submerged at all times in the liquid refrigerant in the condenser.

From the foregoing, it will be apparent that I have provided a strong and relatively inexpensive plate type condenser. Furthermore, by providing the gas inlet duct 31 within the condenser structure and the gas inlet connection adjacent the bottom of the condenser, where it is convenient for connection to the compressor, I eliminate the usual, long, high pressure gas conduit, which has been employed in the past for conveying the

compressed gas to the top of the condenser. The usual, long conduit to the evaporator disposed above the condenser, may be reduced in length by providing a liquid duct within the condenser; the conduit to the evaporator being connected to the upper portion of said duct.

It will be understood that metals other than steel, may be employed in the manufacture of my improved condenser and that the wall elements of the condenser may be joined by brazing, or methods other than welding.

While I have shown my invention in two forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. In a condenser, the combination of spaced walls joined along their edges and defining a receptacle for media to be condensed, a partition connecting said walls and extending from one edge of the walls toward the opposite edge thereof but terminating in spaced relation with the opposite edge, said partition dividing the receptacle into a condensing chamber and a condensate duct, which communicates beneath the partition, means for admitting fluid to be condensed to the condensing chamber and means for removing condensate from the duct adjacent an upper portion thereof.

2. In a condenser, the combination of spaced wall members joined along their margins to define a receptacle for media to be condensed, a partition connecting said wall members and extending from adjacent the bottom of the receptacle toward the top thereof but terminating in spaced relation with the top, a second partition extending from adjacent the top of the receptacle toward the bottom thereof but terminating in spaced relation with the bottom, said partitions dividing the receptacle into a condensing chamber, a gas duct and a condensate duct, said gas duct communicating with the condensing chamber above the first-mentioned partition, said condensate duct communicating with the condensing chamber beneath said second partition, means for admitting gaseous media to be condensed to the gas duct adjacent the bottom thereof and means for removing condensate from the condensate duct adjacent the top thereof.

3. In a heat exchanger for condensing refrigerant vapor, the combination of first and second substantially flat wall members secured together at the edges thereof, means defining a partition connecting said wall members and extending from the bottom edge of the wall members toward the top edge thereof but terminating in spaced relation with the top edge, said partition being disposed adjacent a side edge of the wall whereby a relatively wide condensing chamber and a narrow duct are defined between the wall members, said condensing chamber and duct communicating above the partition, means for admitting refrigerant vapor to the duct adjacent the bottom thereof and means for conveying condensed refrigerant from the lower portion of the condensing chamber to the exterior thereof, said duct having a flow area of such proportions that the velocity of vapor passed therethrough is sufficient to mechanically carry condensed vapor in suspension.

4. In a sheet metal heat exchanger for con-

densing refrigerant vapor, the combination of a pair of substantially flat vertical walls spaced apart and joined at their edges, a welded seam connecting the walls and extending vertically 5 from the bottom of the walls toward the top thereof but terminating in spaced relation with the top for defining a relatively wide condensing chamber and a relatively narrow vapor duct, said chamber and duct communicating above the seam, a plurality of spot-welds distributed 10 throughout the condensing chamber and connecting said walls for providing a series of interconnected passages in the condensing chamber, means for admitting vapor to be condensed to 15 the duct adjacent the bottom thereof and means for conveying condensed vapor from the condensing chamber adjacent the bottom thereof; said duct having a flow area of such proportions that the velocity of vapor passed therethrough is 20 sufficient to mechanically carry condensed vapor in suspension.

5. In a heat exchanger for condensing refrigerant vapor, the combination of first and second substantially flat wall members secured together 25 at the edges thereof, means defining a partition connecting said wall members and extending from the bottom edge of the wall members toward the top edge thereof but terminating in spaced relation with the top edge, said partition 30 defining a relatively wide condensing chamber with one side edge of the wall members and a relatively narrow vapor duct with the other side edge of the wall members, said condensing chamber and vapor duct communicating above the 35

partition, means for admitting refrigerant vapor to the duct adjacent the bottom thereof and means for conveying condensed refrigerant from the lower portion of the condensing chamber, 5 said duct having a flow area of such proportions that the velocity of vapor passed therethrough is sufficient to mechanically carry condensed vapor in suspension.

6. In a heat exchanger for condensing refrigerant vapor, the combination of first and second 10 substantially flat wall members secured together at the edges thereof, means defining a partition connecting said wall members and extending from the bottom edge of the wall members toward the top edge thereof but terminating in 15 spaced relation with the top edge, said partition defining a relatively wide condensing chamber with one side edge of the wall members and a relatively narrow vapor duct with the other side edge of the wall members, said condensing 20 chamber and vapor duct communicating above the partition, a plurality of spot welds distributed throughout the surface of the condensing chamber and connecting said wall members for 25 defining a series of interconnected passages in the condensing chamber, means for admitting refrigerant vapor to the duct adjacent the bottom thereof and means for withdrawing condensed 30 refrigerant from the bottom of the condensing chamber, said duct having a flow area of such proportions that the velocity of vapor passed therethrough is sufficient to mechanically carry condensed vapor in suspension.

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