

Feb. 25, 1936.

L. U. LARKIN

2,032,134

HEAT EXCHANGER

Filed Jan. 3, 1935

2 Sheets-Sheet 1

Fig. 1.

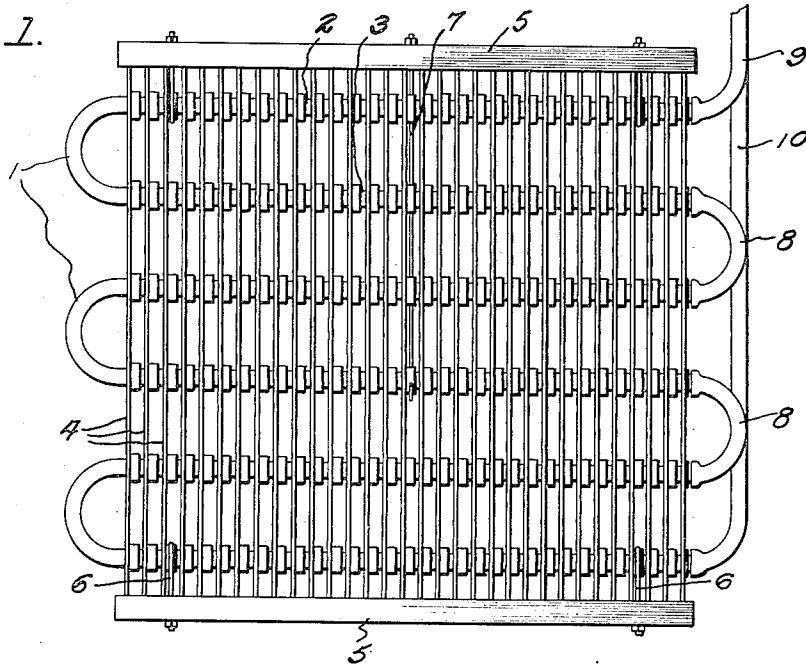


Fig. 2.

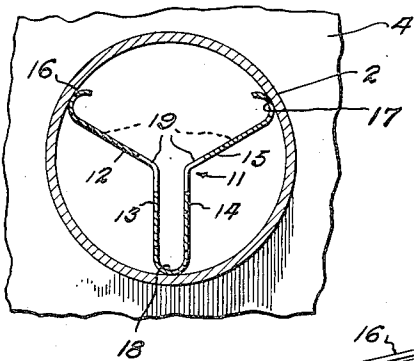
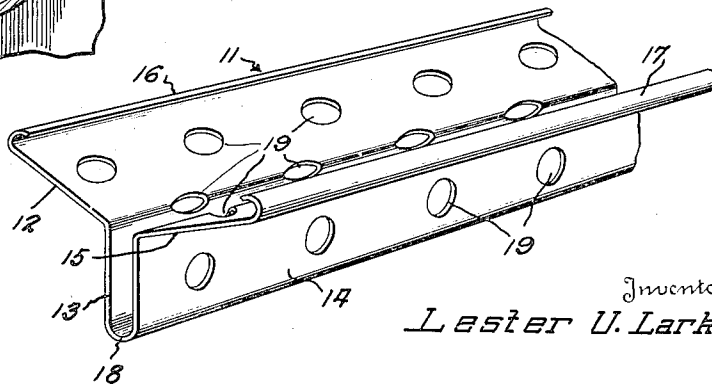


Fig. 3.



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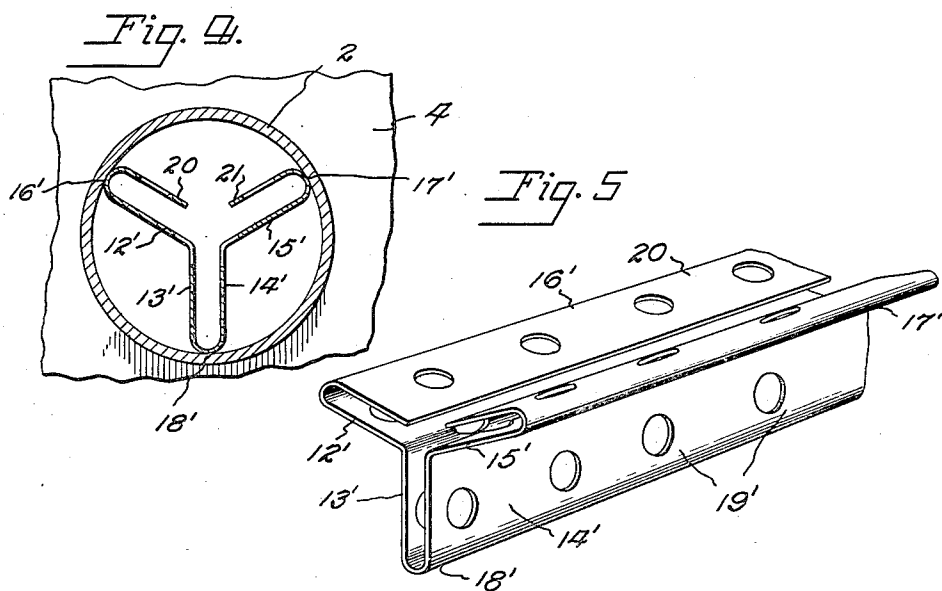
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,032,134

HEAT EXCHANGER

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Application January 3, 1935, Serial No. 274

3 Claims. (Cl. 257-262)

This invention relates generally to heat exchanging conduits such as are commonly used to form the coils in refrigerating units; and more particularly, to improvements in conduits forming the tubular body of mechanical refrigerating units of the type illustrated in my U. S. Patent No. 1,823,275, September 15, 1931.

In running capacity tests on coils of the type disclosed in my said patent, there was found to exist a considerable temperature difference between the refrigerant in the center of the tubes of the unit and the walls of the tubes. In some cases, the temperature difference between the refrigerant in the center of the tube and the wall of the tube, amounted to as much as 20° F. As the temperature differences between points spaced apart through an equal distance on the cross fins of the unit are very slight in comparison with the temperature differences thus found to exist between similarly spaced apart points in the refrigerant in the tubes, the necessity for eliminating all or any part of this waste of heat in the operation of devices of this character became apparent.

The main object of the present invention is, therefore, to provide refrigerant conducting tubing with means to increase its efficiency to exchange heat with the refrigerant fluid therein.

Another object of this invention is to provide a device of this character, preferably in the form of a tube insert, which will not materially decrease the volume of refrigerant within the tubing, or prevent proper expansion and diffusion of expanding gases throughout the cross sectional area of the tubing.

Other objects of the invention will become apparent as the detailed description thereof proceeds.

In the drawings:

Figure 1 is a side elevation of a mechanical refrigerating unit, to which the present invention may be applied;

Figure 2 is a fragmentary transverse section through a refrigerant tube provided internally with one form of heat exchanging fin embodying the present invention;

Figure 3 is a fragmentary perspective of the tube insert shown in section in Figure 2;

Figure 4 is a fragmentary transverse section through another form of the present invention;

Figure 5 is a perspective view of the tube insert shown in Figure 4.

As shown in Figure 1 of the drawings, refrigerating units of the type disclosed in my aforesaid patent, comprise a series of U-shaped tubes

1 having their legs 2 and 3 assembled parallel to each other, by means of the cross fins 4 and suitable securing means such as the angle irons 5 and bolt rods 6 and 7.

The open ends of the legs 2 and 3 are suitably connected to and closed by elbows 8, and inlet and outlet pipes 9 and 10; all as described in my said patent. The invention, of course, is not limited to use with units of the patented type, which is described herein merely by way of example. Before these open ends of the tubes are closed, it will be necessary, in the forms shown in Figures 2 to 5 of the drawings, to insert in each of the legs 2 and 3, one of the heat conducting inserts shown in said figures.

The Y-shaped fin 11, shown as an insert in Figure 2, is formed from a sheet of heat conducting resilient metal, bent to form the plates 12, 13, 14 and 15. In order to ensure something better than hair line contact between the ends of fin 11 and the wall of tube 2, the outer ends of the plates 12 and 15 are shaped to form semi-cylindrical bends 16 and 17; and the plates 13 and 14 are spaced apart by a similar bend 18.

The fin 11 is, of course, made in such size that it will fit with a tight friction fit within the tube 2; and slightly oversize, so that the inherent spring in the material of the fin will assure a metal to metal contact between the ends of the fin and the wall of the tube. By this construction, the insulating film existing on the wall of the tube is broken, and heat is transferred directly from the tube and through the metallic fin to the center of the tube and throughout the tube.

Each plate of the fin 11 is provided with perforations 19 to permit the substantially free passage or flow of fluid between the compartments formed lengthwise in the tube by the plates of the inserted fin. Preferably, these perforations should be staggered to avoid weakening the fin plates so far as to decrease materially the resilience necessary to secure the desired metal to metal contact between the ends of the inserted fin and the wall of the tube.

The form of the invention shown in Figures 4 and 5 is substantially the same as the form shown in Figures 2 and 3. The parts shown in Figures 4 and 5, corresponding to similar parts in Figures 2 and 3 are designated by the same reference numerals primed and need not be further described. In Figures 4 and 5 plates 20 and 21 are shown as extending from the bends 16' and 17' parallel to plates 12' and 15'. This form is a little more symmetrical than that shown in Figures 2 and 3. In each case, the adjacent plates are ar-

ranged preferably at an angle of 120° relative to each other, in order to effect equi-angular spacing of the branches of the Y-shaped fin around the cylinder formed by the tube 2.

5 While I have described this invention as embodied in a refrigerating unit, it must be understood that this is done for purpose of illustration only. The invention is adapted for use in heat radiating units just as readily as in heat absorbing units; and is designed for use in any kind of
10 tubular heat exchangers of either type.

What I claim is:

1. In a heat exchanger: a heat conducting tube; a heat conducting plate of resilient material inserted lengthwise in said tube; said plate being
15 bent to form a U-shaped member having the bend thereof in contact with the inner surface of said tube and the legs thereof spaced apart and symmetrically arranged relative to a plane
20 containing the axis of the tube; and bent also to form two other members extending symmetrically on opposite sides of said plane from the ends of the said legs into yielding contact with the inner
25 surface of said tube, the outer ends of said other members being bent to form members substantially parallel to the first named members and terminating short of said plane.

2. In a heat exchanger: a heat conducting tube; a heat conducting plate of resilient material inserted lengthwise in said tube; said plate being
30 bent to form a U-shaped member having the

bend thereof in contact with the inner surface of said tube and the legs thereof spaced apart and symmetrically arranged relative to a plane containing the axis of the tube; and bent also to form two other members extending symmetrically on opposite sides of said plane from the ends of the said legs into yielding contact with the inner surface of said tube, said legs and members being perforated to permit passage of fluid between the compartments in the tube formed
10 by said plate.

3. In a heat exchanger: a heat conducting tube; a heat conducting plate of resilient material inserted lengthwise in said tube; said plate being bent to form a U-shaped member having
15 the bend thereof in contact with the inner surface of said tube and the legs thereof spaced apart and symmetrically arranged relative to a plane containing the axis of the tube; and bent also to form two other members extending symmetrically on opposite sides of said plane from the ends of the said legs into yielding contact with the inner surface of said tube, the outer
20 ends of said other members being bent to form members substantially parallel to the first named
25 members and terminating short of said plane, said legs and members being perforated to permit passage of fluid between the compartments in the tube formed by said plate.

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