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REFRIGERATION

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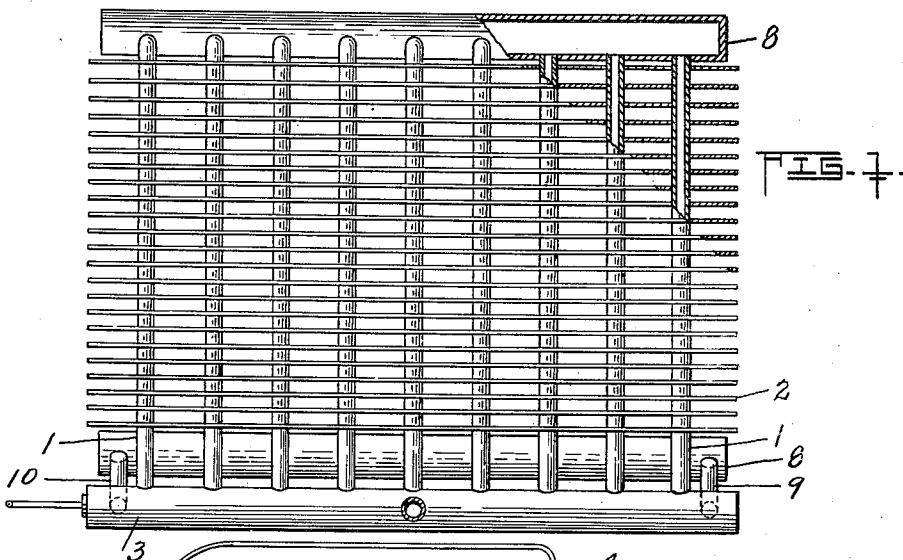
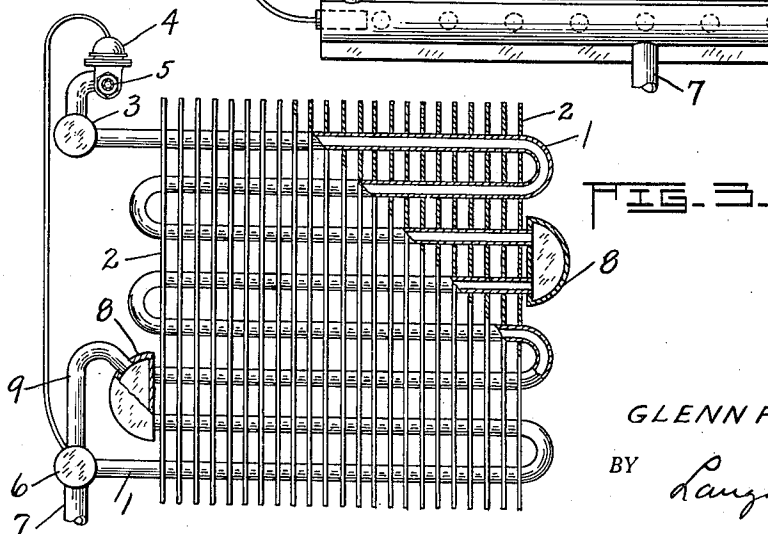
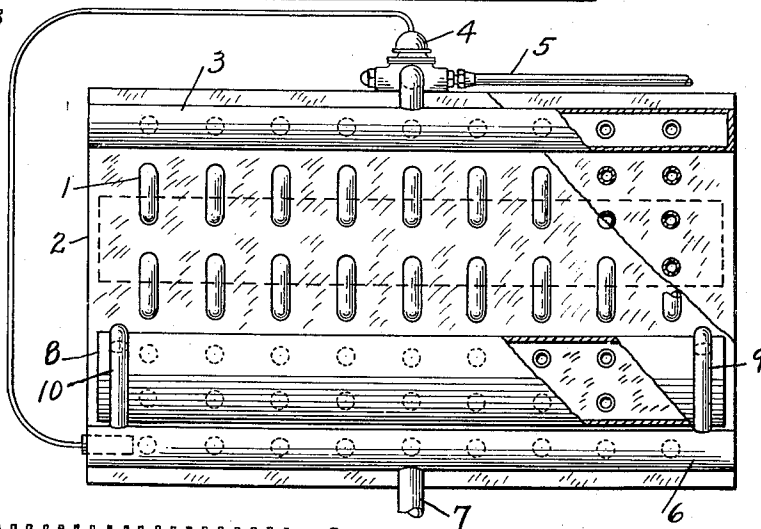


FIG. 2.



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REFRIGERATION

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2 Claims. (Cl. 62-126)

This invention relates to improvements in refrigeration and more particularly to the structure of a cooling coil or evaporator such as may be employed with either the compression or absorption types of refrigerating apparatus.

It has been found that by using a conventional type of dry expansion coil in which there are a multiplicity of tubes arranged in parallel fed by one expansion valve such as used in air conditioning apparatus, that there is a marked tendency for some of the tubes to "flood", while others "starve".

This condition is probably accounted for by the fact that a rapid current of vapors over the liquid refrigerant tends to produce a refrigerant temperature corresponding to the saturated vapor temperature for the pressure in question and under extreme conditions possibly causing a slight super-cooling; while on the other hand, a liquid refrigerant without a flow of vapors over it, or a slight flow of vapor may superheat.

The result of this behavior is that when one tube has liquid in it which is superheated, it floods liquid refrigerant through the coil, while the tube in which vaporization is rapidly taking place may vaporize all of the liquid fed into the tube and the vapors then continuing their course through the rest of the tube in the coil become superheated.

This condition of part of the tubes of a coil superheating the refrigerant vapors while other tubes are flooding is more or less commonplace, and has been met by using a multiplicity of expansion valves and limiting the number of tubes connected in parallel to any one expansion valve. This method of handling refrigeration is expensive and calls for additional complexity in adjustment and service.

It is an object of this invention to provide a cooling coil or evaporator which will overcome the above objections by a simple change or addition in the construction of the coil.

With this and other objects in view, reference is made to the accompanying sheet of drawings which illustrates a preferred embodiment of this invention with the understanding that minor changes may be made without departing from the scope thereof.

In the drawing:

Figure 1 is a top plan view of a cooling coil or evaporator embodying this invention, with parts broken away and parts shown in section.

Figure 2 is a view in front elevation of Figure 1, with parts broken away and parts shown in section.

Figure 3 is an end view of Figure 1, with parts broken away and parts shown in section.

The embodiment of this invention, as illustrated, is applied to a cooling coil or evaporator such as used in air conditioning devices wherein a plurality of parallel coils of pipe 1 are arranged in vertical rows parallel to each other and equally spaced apart with each pipe continued back and forth to form parallel equally spaced apart sections in each vertical row. It is preferable to pass the pipes 1 through a plurality of equally spaced apart vertical plates 2 which not only form a means of support but also act as radiating fins. This is a conventional form of evaporator or cooling coil and the ends of the upper row of the pipes 1 are connected to the usual manifold 3 in turn connected to the customary expansion valve 4 to which the liquid refrigerant conveyed by the pipe 5 from the refrigerating apparatus. In passing through the expansion valve, the liquid refrigerant is released under less pressure within the manifold and pipes 1 leading therefrom, and returns to gaseous form. The ends of the lower row of tubes 1 empty into the customary manifold 6 and the gaseous refrigerant collecting therein is returned by the pipe 7 to the refrigerating apparatus.

This invention contemplates the provision of two or three box headers 8, depending upon the length of the coil, interposed in parallel relation to each other and to the manifolds 3 and 6, each of which connects all of the pipes 1 in one horizontal row to all of the pipes forming the horizontal row next below upon the exterior of the outer plate 2, as shown in Figure 3.

It has been found that by the provision of the said box headers, a very high velocity that may develop in one tube is equalized in the box header and, therefore, cannot continue through the series of coils to the exhaust manifold. On the other hand, a tube that is flooded discharges its excess liquid into the box header and all the tubes leading from the box header have an equal chance to receive their proportional share of liquid, thereby preventing any one or several tubes to flood all the way to the coil to the exhaust manifold.

To further lessen the complication of irregular velocity through different tubes in parallel, it is preferable, especially where the velocity in the tubes is rather high, to by-pass a part of the refrigerant vapor from a box header approximately two-thirds of the way through the coil to the exhaust manifold, as by the tubes 9 and 10 leading to the opposite ends of the header 8 to the manifold 6, to prevent the building up of excessive

velocity within the lower portion of the coil and mitigating the tendency to create different rates of flow through the coil.

What I claim is:

1. An evaporator for refrigerating apparatus including an inlet manifold adapted to be connected through an expansion valve to a source of liquid refrigerant, an outlet manifold parallel to and spaced from said inlet manifold, equalizing conduits arranged on opposite sides of the evaporator, and a plurality of sets of pipe elements arranged one set above another, each equalizing conduit connecting all of the adjacent ends of one set of elements to all of the adjacent ends of

the next set, said pipe elements arranged to provide a plurality of pipe portions extending parallel to the base of the evaporator with one portion above another in parallel spaced-apart rows extending upwardly from the base, said pipe elements arranged to cooperate with the equalizing conduits to provide continuous channels connecting the inlet manifold to the outlet manifold. 5

2. The structure of claim 1, wherein the lower equalizing conduit is provided with a plurality of 10 by-pass pipes leading therefrom to the outlet manifold.

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