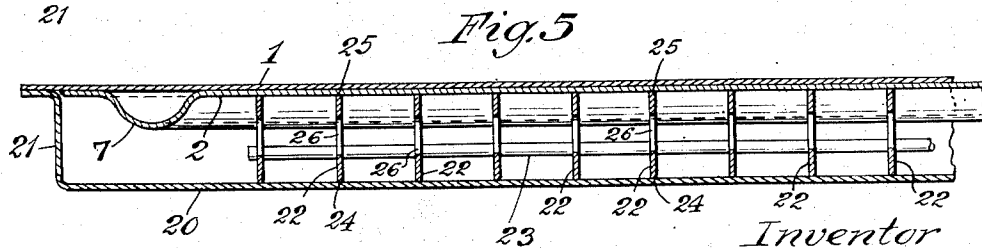
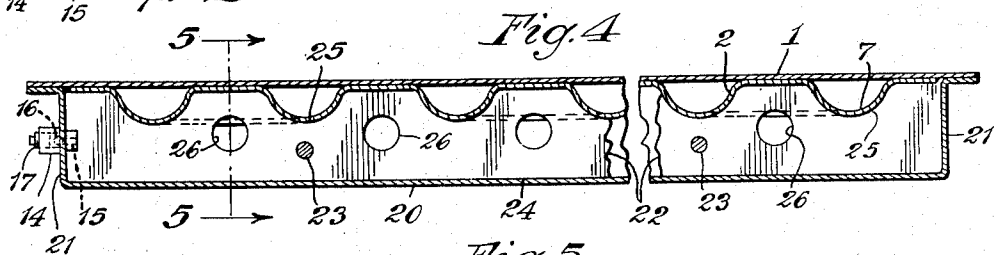
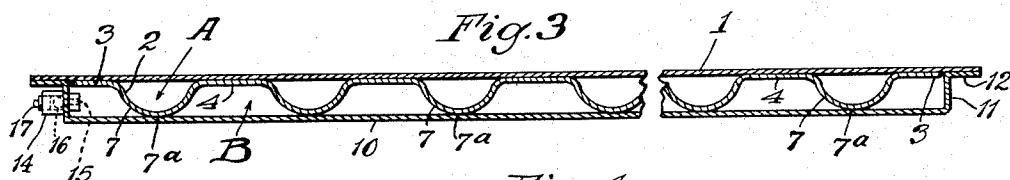
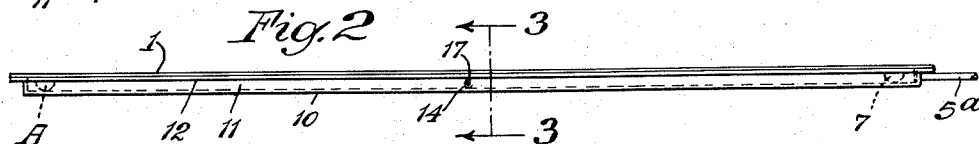
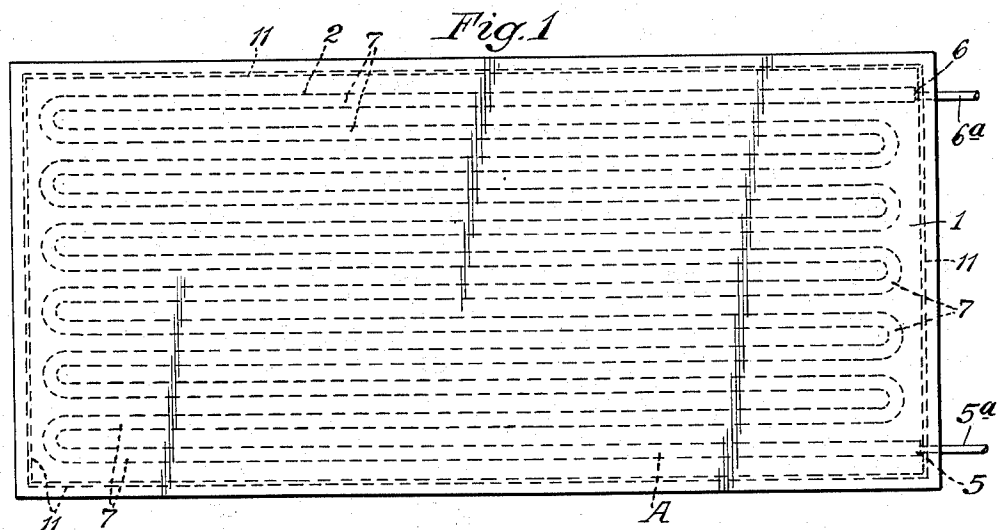


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H. W. KLEIST
REFRIGERANT PLATE

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REFRIGERANT PLATE

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My invention relates to an improvement in cold plates, and has for one purpose to provide a plane-sided cold plate which is efficient in use and simple to manufacture.

Another object is to provide a cold plate which includes a pressed metal coil or evaporator passage structure.

Another object is to provide a cold plate in which, in association with the pressed metal coil, a container is provided which is adapted to receive an eutectic.

Another purpose is to provide an improved cold plate in which a pressure differential between the interior and the exterior of the plate is employed to hold parts of the plate in heat exchange relationship.

Another purpose is to provide a plate having a pressed metal coil and a plane wall which is held in contact with the coil or with heat transfer vanes, by a pressure differential between the interior and the exterior of the plate.

Other purposes will appear from time to time in the course of the specification and claims.

I illustrate my invention more or less diagrammatically in the accompanying drawings wherein:

Figure 1 is a plan view;

Figure 2 is a side view of the structure of Figure 1;

Figure 3 is a section on an enlarged scale, on the line 3-3 of Figure 2, with parts broken away;

Figure 4 is a section similar to Figure 3, through a variant form of plate; and

Figure 5 is a section on the line 5-5 of Figure 4.

Like parts are indicated by like symbols throughout the specification and drawings.

Referring to the drawings, 1 generally indicates a plate side wall of sheet metal, shown as plane from edge to edge. 2 generally indicates an intermediate wall of sheet metal which is shown as pressed into proper shape to define, with the wall 1, an evaporating coil or passage, generally indicated as A. The member 2 may have plane edge portions 3 and intermediate plane portions 4, all of which abut against the inner surface of the side wall 1. They are appropriately secured together. They may, for example, be initially spot-welded, and thereafter seam-welded, in such fashion that the two walls together define an evaporator passage or coil A which is substantially gas-tight from the end 5 to the end 6.

The coil proper is formed by bowed or offset wall portions 7 of the wall 2, which may be of any suitable contour, and which are herein shown as generally rounded and so formed as to be readily made by a pressing operation. It will be under-

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stood that the ends of the evaporator passage A, as at 5 and 6, are connected to suitable ducts or tubes 5a and 6a, which may constitute, respectively, inlet and outlet passages for a volatile refrigerant. If the volatile refrigerant is admitted in liquid or partially liquid form through the pipe 5a, it is allowed to evaporate in the coil space A, and the evaporated refrigerant may then be discharged along the tube 6a.

In designing and using cold plates I find it highly desirable to have the sides of the plates plane, and, in most instances, parallel. It is easier to clean the surfaces of the plates and to remove frost. Plane surfaced plates are applicable to a wide variety of uses. It is frequently important to nest such plates in narrow spaces, the individual plates having adjacent walls separated by air spaces, as in air conditioning units and the like, or in refrigerating units for cooling air or liquids. In that event, it is important to have the outer surfaces of the plates plane on both sides. I employ a second outside wall 10, shown as plane throughout most of its surface, but as having side wall portions 11 and edge flanges 12 which may be secured to corresponding portions of the edge of the side wall 1, to form a housing or plate which is gas-tight.

It will be understood that I may form a plate otherwise than by the particular shape of edge flanges herein shown, but the structure shown in the drawings is practical and satisfactory. The space between the side wall 10 and the intermediate wall 2, which I indicate as B, may receive an eutectic, or may be air-filled. In either event, I prefer partially to exhaust the space B. This may be done in any suitable fashion, but I may, for example, employ any suitable pump, not herein shown, to exhaust air through the fitting generally indicated as 14. This fitting may have a duct 15 through which air may be drawn from the interior of the plate. When a suitable pressure differential has been obtained the operation of the pump may be terminated. When this takes place the outside air pressure urges the locking ball 16 against the inlet end of the duct or passage 15. Thereafter, any suitable sealing material may be positioned about the ball 16, if desired, and a tight closure plug 17 may be inserted. As a result, the pressure differential may be permanently, or substantially permanently, maintained, with the outside excess pressure effective to urge the side wall 10 firmly against the crests 1a of the coil structure 2. Thus an adequate heat exchange relationship is maintained between the side plate 10 and the evaporating refrigerant in the coil

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space A. And the plate is maintained flat and firm, with the side walls 1 and 10 plane, and parallel in relation to each other.

Whereas a small volume of eutectic may be used in the form of Figures 1 to 3, under normal circumstances, where a eutectic is used, it is advantageous to provide a relatively large body of eutectic. In such event, the form of Figures 4 and 5 may be employed, in which the plate side wall 20 is provided with circumferential walls or flanges 21 which are substantially deeper or broader than the walls 11 of Figure 3. Since this positions the plane portion of the side wall 20 remotely from the pressed coil structure of the intermediate wall 2, I provide a plurality of vanes 22 which may be connected by any suitable cross supports, spacing rods or the like 23. The vanes 22 have straight edges 24 adapted to abut against the inner surface of the side wall 20, when that side wall is inwardly drawn by the above described pressure differential. The vanes 22, at their opposite edges, may engage the opposed surface of the intermediate plate 2. It will be understood, however, that whereas it is advantageous to form the vane edges 25 to conform generally to the coil structure or intermediate wall 2, it is not necessary to employ micrometric accuracy.

The result of the employment of the above described temperature differential is to cause the atmosphere, operating on the exterior surfaces of the side walls 1 and 20, to hold the edges of the vanes 22 in adequate heat exchange relation with the wall 20 on the one hand and with the wall 2 on the other. In order to permit distribution of and expansion of the eutectic, I provide any suitable apertures or broken away portions in the vanes 22. I illustrate, for example, apertures 26.

It will be realized that, whereas, I have described and illustrated a practical and operative device, nevertheless many changes may be made in the size, shape, number and disposition of parts without departing from the spirit of my invention. I therefore wish my description and drawings to be taken as in a broad sense illustrative or diagrammatic, rather than as limiting me to my precise showing. For example, the intermediate wall 2, which is shown as secured to the plate side wall 1, may also be secured directly to the side wall 10. Its edge portions, for example, may also be secured directly to the side wall 10. Its edge portions may extend, for example, between the plate side wall 1 and the edge flanges 12 of the plate side wall 10, if desired.

I claim:

1. In a vacuum type plate, two plate walls having generally parallel, plane surfaced sides and connecting edge portions, said edge portions being secured together in gas-tight relationship with said plane surfaced sides spaced apart, an intermediate sheet metal wall in the space between said plate walls and forming, with one of said plate walls, a coil space adapted to receive

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a volatile refrigerant, the opposed portions of said intermediate sheet metal wall and said last mentioned plate wall being secured together in gas-tight relationship, a supporting structure lying between the intermediate sheet metal wall and the other plate wall, said supporting structure being of heat conductive material and being formed and positioned directly to engage the outer surface of the coil forming portion of the intermediate sheet metal wall and the inner surface of the other plate wall, and means for maintaining a less-than-atmospheric pressure in the interior of the space between said last mentioned plate wall and said intermediate wall, and for thereby holding the plane surfaced side of said last mentioned plate wall against and in heat transfer relationship with the supporting structure, said means including a fitting through which air may be exhausted, and closure means for the fitting.

2. The structure of claim 1 characterized in that the supporting structure includes a plurality of parallel metal strips each having one edge in engagement with the inner surface of the plate wall remote from the coil and an opposite edge in heat exchange relationship with the coil.

3. The structure of claim 1 characterized in that the supporting structure includes a plurality of parallel metal strips each having one edge in engagement with the inner surface of the plate wall remote from the coil and an opposite edge in heat exchange relationship with the coil, said strips being apertured to permit the passage of liquid therethrough, the space in which they lie being at least partly filled by a eutectic.

4. The structure of claim 1 characterized in that the space in which the supporting structure lies is at least partially filled by a eutectic.

5. The structure of claim 1 characterized in that the supporting structure includes a plurality of strips lying in parallel with each other and generally at right angles to the sides of the plate, and connecting means for securing said strips together in predetermined spaced relationship.

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