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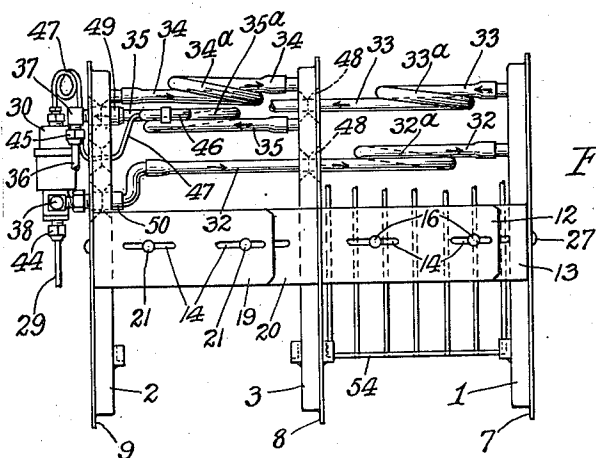
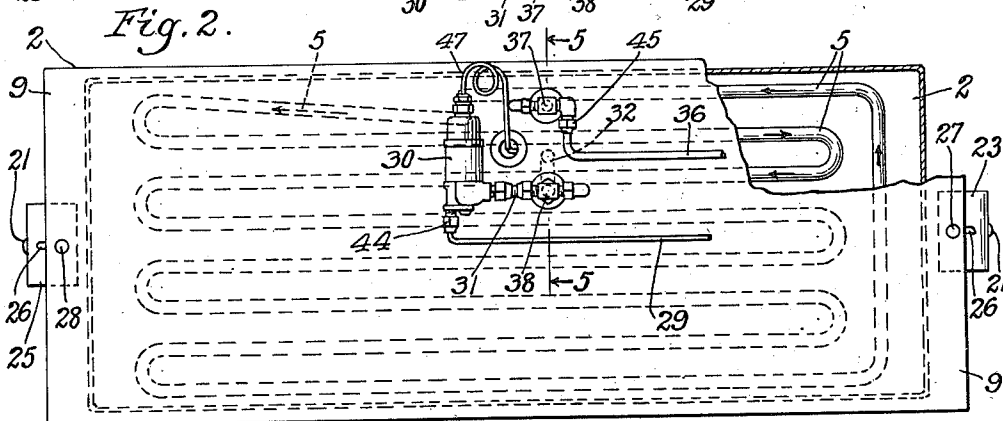
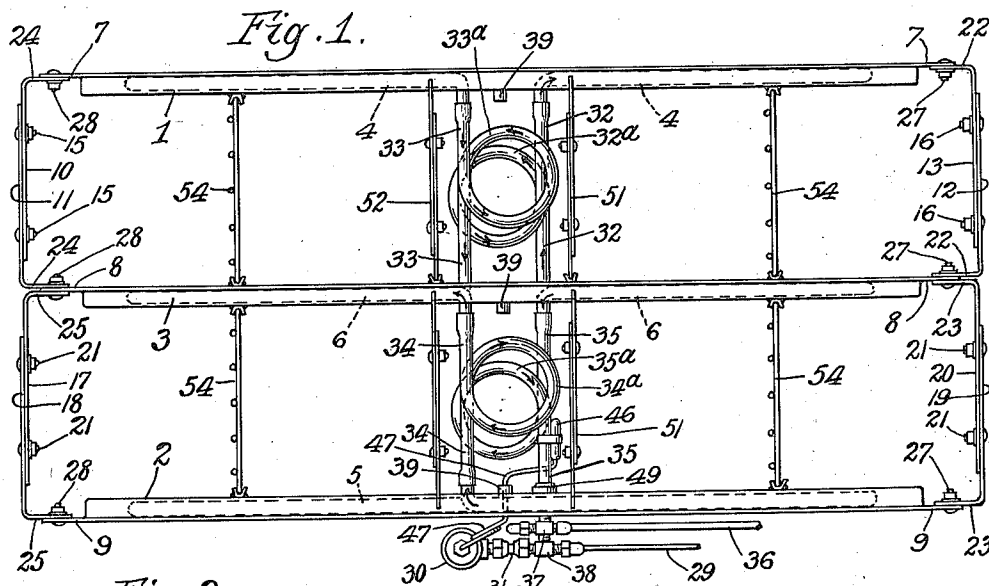
H. W. KLEIST

2,231,012

COOLING APPARATUS

Filed Dec. 23, 1938

3 Sheets-Sheet 1



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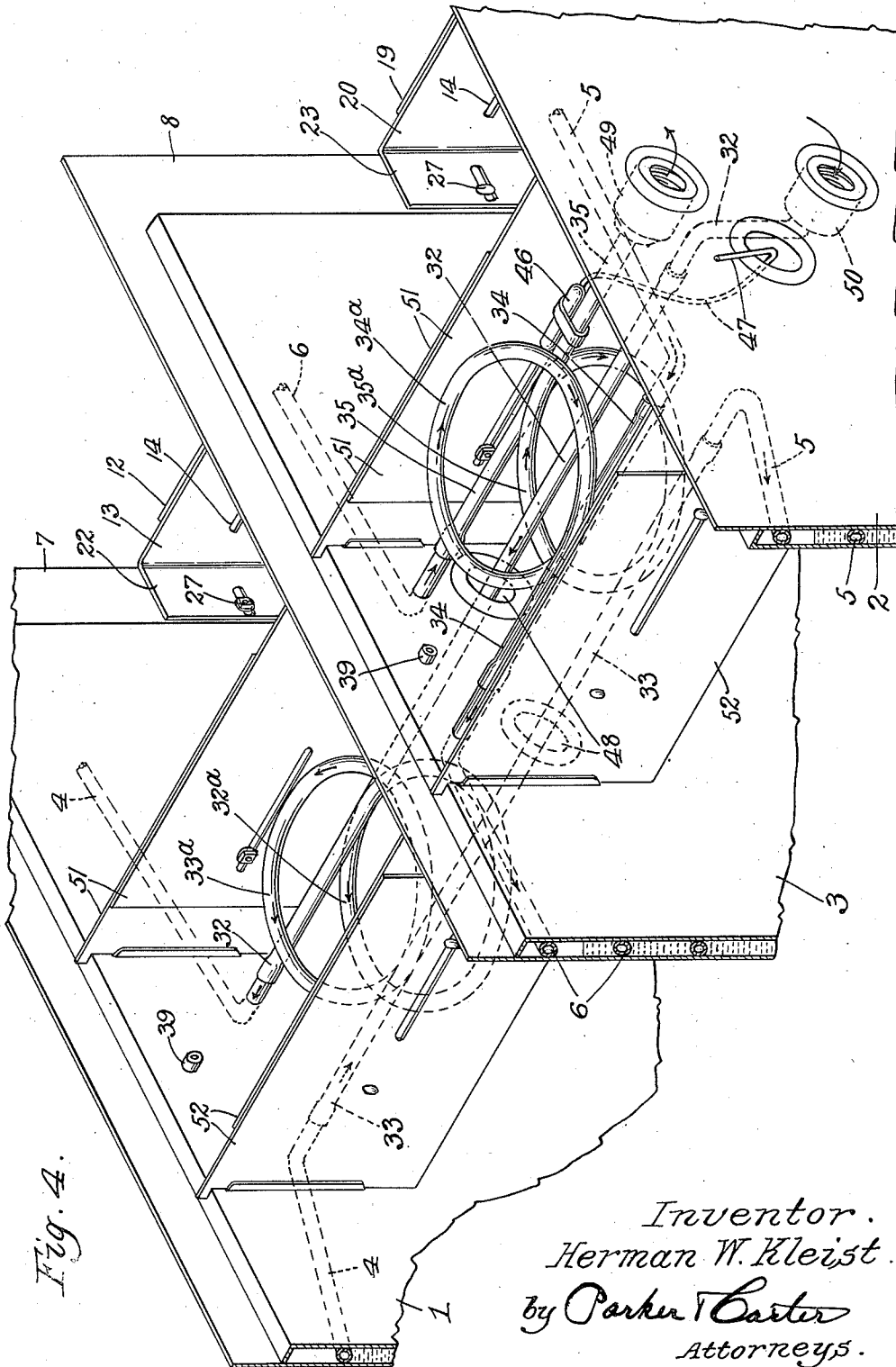
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3 Sheets-Sheet 3

Fig. 6.

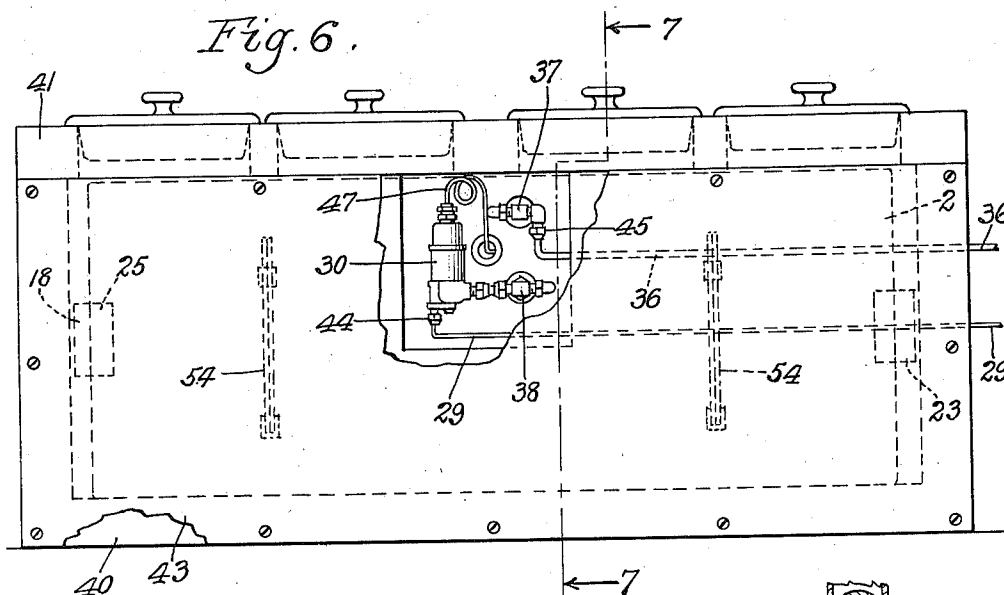


Fig. 7.

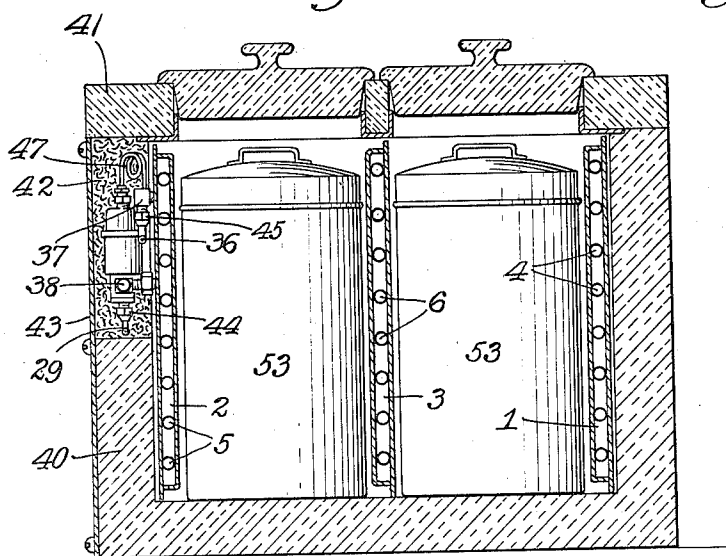
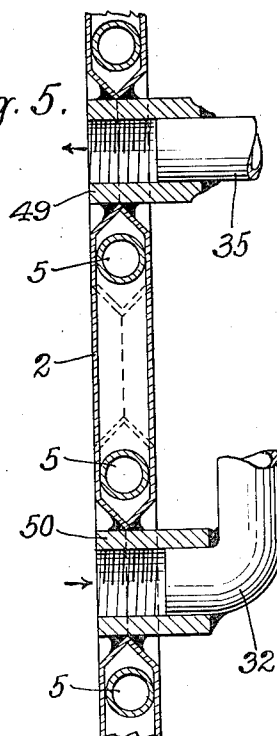


Fig. 5.



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UNITED STATES PATENT OFFICE

2,231,012

COOLING APPARATUS

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Application December 23, 1938, Serial No. 247,458

8 Claims. (Cl. 62-99)

This invention relates to cooling apparatus and has for its object to provide a new and improved device of this description.

5 The invention has as a further object to provide a cooling or refrigerating apparatus particularly adapted for a cooling cabinet conversion unit. The invention shown in this application is an improvement on my Patent No. 2,166,161, issued July 18, 1939.

10 The invention has as a further object to provide a cooling or refrigerating apparatus consisting of a series of plates with refrigerating coils in them and means for adjustably connecting these plates together, so that they may be made up in the factory and shipped to the point of use and place in cabinets varying in size, the device being arranged so that the connections are all on the outside.

15 The invention has as a further object to provide a cooling or refrigerating apparatus of the type herein set out where the inlets and the outlets for the refrigerant are on the outside of the device, so as to eliminate any connections inside of the cabinet, thereby making it easier to install and decreasing the danger of leakage occurring in any of the fittings.

20 The invention has further objects which are more particularly set out in the accompanying description.

25 Referring now to the drawings,

30 Fig. 1 is a top view of the apparatus ready to be inserted in the cabinet;

Fig. 2 is a side elevation with parts broken away;

35 Fig. 3 is an end view of the device with parts omitted;

Fig. 4 is a perspective view with parts broken away;

40 Fig. 5 is an enlarged sectional view taken on the line 5-5 of Fig. 2, with parts omitted;

Fig. 6 is a side view of the cabinet, with parts broken away; and

Fig. 7 is a sectional view taken on the line 7-7 of Fig. 6.

45 Like numerals refer to like parts throughout the several figures.

Referring now to the drawings, wherein I have shown one form of device embodying the invention, there is illustrated a series of plates 1, 2 and 3. These plates are each made up of a pair of sheets of metal, each pair of sheets having a space between them. There is a pipe in this space preferably formed into a coil which extends back and forth in the space. The plates are preferably hermetically sealed and air ex-

hausted therefrom, so as to cause the plates to tightly contact the pipe between them. There may be a eutectic fluid partially filling the space between the plates, if desired, but there should be left a space empty of the eutectic fluid so as to allow for the expansion thereof when it congeals and to allow for the proper exhaustion of air between the sheets. The pipe or coil 4 is located in the space between the sheets of plate 1, the pipe or coil 5 in the space between the sheets of plate 2 and the pipe or coil 6 in the space between the sheets of plate 3.

The several plates are adjustably connected together. As herein shown, there are projecting parts 7, 8 and 9, one projecting from each plate, and adjustable uniting devices are connected to these projecting parts. In the construction shown, for example, the projecting parts 7 and 8 of the plates 1 and 3 are connected together at one end by the overlapping members 10 and 11, and at the other end by the overlapping members 12 and 13. These overlapping members having registering slots 14 through which pass suitable fastening devices, such as the bolts 15 and 16. The plates 2 and 3 are united by similar uniting devices consisting of the overlapping members 17, 18, 19 and 20, which have similar registering slots 14 therein and which are connected together by the bolts 21. It will be seen that by loosening the bolts in these uniting devices, the plates may be moved toward and from each other to adjust them to fit into the cabinet and the bolts may then be tightened, so as to hold the parts in fixed relationship. It will be noted that there is both lateral and longitudinal adjustment. The longitudinal adjustment is secured by having the overlapping members provided with bent ends 22, 23, 24 and 25 and these, or the projections on the plates, may be provided with slots 26, see Fig. 2, or they may both be provided with registering slots. Bolts 27 and 28 pass through these slots and through openings in the parts 7, 8 and 9. It will be seen that by loosening the bolts, the uniting devices may be moved toward and from the plates to adjust the device longitudinally to fit into the cabinet.

Means is provided for passing a suitable refrigerant through the coils between the sheets of the several plates. I prefer to arrange the parts so that the refrigerating apparatus will form a self-contained unit which requires no connections inside of the unit or between the plates which need to be adjusted or loosened or tampered with in any way. The parts are

preferably arranged so that there are only two connections to be made, one the inlet for the admission of the refrigerant material for the cooling coil and the other the outlet for the discharge of the refrigerant material from the cooling coil, both being on the outside of the unit so as to be easily accessible and easily controlled.

In the construction shown the refrigerant material from the compressor passes through the conduit 29 to the expansion valve 30 and then passes through the conduit 31 to the shut-off valve 38 and then to the conduit 32 and through the plate 2 and also through the center plate 3. The conduit 32 is then looped at a point between the plates 1 and 3, as shown at 32a. The conduit then passes into the plate 1 connecting with the coil 4 in between the sheets of this plate. The refrigerant material then passes through this coil and then passes out into conduit 33. The conduit 33 is provided with a loop 33a between the plates 1 and 3. The conduit then passes through the plate 3, see Fig. 4. The conduit 33 then passes into the plate 2 connecting with the pipe or coil 5 between the sheets of plate 2. The refrigerant material then passes through the coil or pipe 5 and then out into the conduit 34, which conduit extends into the space between the plates 2 and 3, and there is formed in the conduit 34, between these plates, a loop 34a. The conduit 34 then passes into the plate 3 and connects with the pipe or coil 6 located in the space between the sheets of plate 3. The refrigerant material then passes out of plate 3 into the conduit 35. This conduit is provided between the plates 2 and 3 with a loop 35a and then passes through the plate 2 and into the return conduit 36, and is returned to the source of refrigerant supply. There is a shut-off valve 37 on the outside of the unit for shutting off the connection between the conduits 35 and 36 and there is a shut-off valve 38 for shutting off the connection or the admission of the refrigerant material to the conduit 32.

Air is exhausted from between the sheets of the plates by applying the air withdrawing device to the nipples or bibs 39.

The loops in the various conduits may be of any shape or form and are for the purpose of permitting the parts to be adjusted toward and from each other without having any adjustable connections, as the loops expand or contract when pressure is applied to the plates, so as to easily permit their adjustment with relation to each other.

The unit is made up in the factory and is sent out to be placed in the cabinet and the parts are adjusted at the point of installment, to fit the particular cabinet, and placed in the cabinet. The cabinet 40 may be any of the usual cabinets and is of insulating material. The expansion valve and shut-off valves and connections are preferably placed between the walls of the cabinet, as shown in Fig. 7. When the expansion valve and shut-off valves are placed between the wall of the cabinet, as shown in Fig. 7, there is provided an opening and a recess in the wall of the cabinet so that these parts can be inserted, preferably from the top, when the cover portion 41 is moved out of the way, or is not in place. Insulating material 42 may then be placed in the recess so as to preserve the insulating effect of the cabinet. The recess is provided with a door or a removable section 43 of the cabinet, to secure

access to the expansion valve and shut-off valves and associated parts.

When it is desired to connect the unit with the refrigerating apparatus, it is only necessary to connect the conduit 29 leading from the refrigerating apparatus to the expansion valve by means of the nut 44, and connect the conduit 36 leading back to the refrigerating apparatus by the nut 45 to the connection leading to the shut-off valve 37 and to then open the shut-off valves 37 and 38.

The admission of the refrigerant to the pipes in the plates is controlled in the usual manner by a bulb 46 placed in a suitable location in the unit, and which is connected to the expansion valve by the tube 47. Where the conduits pass through the center plates 3, holes 48 are provided and these holes are hermetically sealed around the edges so that a vacuum can be maintained inside of the plate. The points where the conduits pass into the plates 1 and 2 are also hermetically sealed.

The expansion valve and shut-off valves are supported on the outer plate 2 in any desired manner. One construction for accomplishing this purpose is illustrated in the drawings, the details of which are shown in Fig. 5. In this construction, there is an opening through the plate 2 which is hermetically sealed all around its periphery and there is a threaded sleeve 49 inserted in this opening and fastened in position in any desired manner, as by welding, soldering or the like. The end of the conduit 35 is attached to the sleeve 49 in any desired manner, preferably by means of a permanent joint, such as welding, brazing, or the like. The shut-off valve 37 has a nipple or part which is threaded into the threaded end of the sleeve 49 opposite to that to which the conduit 35 is attached, so as to be on the outside of the plate. There is a similar sleeve 50 passing through a similar opening in the plate 2, the sleeve being secured to the plate and the opening through which the sleeve passes by being hermetically sealed. The conduit 32 is connected with the sleeve 50 in any desired manner, being preferably connected thereto as by welding, brazing or the like. The shut-off valve 38 is connected to a part which is screwed into the other end of the sleeve 50, that is on the outside of the plate 2. The expansion valve is supported by the connection from the shut-off valve 36 or some part associated therewith.

The conduits with their loops are preferably located at the middle of the unit and are protected by plates 51 and 52 on opposite sides thereof, see Fig. 1. The cabinet is preferably divided into sections for holding the ice cream cans 53, preferably by wire cross members 54.

By having no adjustable or other form of connections or fittings on the inside of the cabinet that need to be adjusted or loosened or separated, it is only necessary, if it is desired to shut off the cabinet, to shut off the two shut-off valves and then the refrigerant material remains in the pipes in the plates and there can be no leakage. By having all the removable connections on the outside, it will be seen that these connections can be adjusted or taken off and the parts repaired or replaced by simply shutting off the shut-off valves. It will be noted that in this construction the refrigerant material is first passed through the pipe in the outside plate 1. It is then passed through the pipe in the outside plate 2 and is lastly passed through the pipe in the intermediate or middle plate 3. This gives

a uniform coldness or temperature extending over the entire unit, thus securing an even refrigeration of the ice cream or other material.

I claim:

1. A cooling cabinet conversion unit comprising a plurality of separated plates, each made up of a pair of sheets with a space between them, a pipe extending back and forth in the space of each of said plates, through which refrigerant material is circulated, adjustable uniting devices connecting the plates together so as to permit the plates to be moved relatively to adjust them to proper positions to fit into a cabinet, adjustable conduits connecting the pipes in the several plates together, one of said conduits having an inlet end and another of said conduits having an outlet end extending to the outer wall of one of the outer plates, a shut-off valve for said inlet and a shut-off valve for said outlet, both of said shut-off valves being on the outside of said one of said plates, and means for connecting said inlet and outlet to a refrigerant circulating device.

2. A cooling cabinet conversion unit comprising a plurality of separated plates, each made up of a pair of sheets with a space between them, a pipe extending back and forth in the space of each of said plates, through which refrigerant material is circulated, adjustable uniting devices connecting the plates together so as to permit the plates to be moved relatively to adjust them to proper positions to fit into a cabinet, adjustable conduits connecting the pipes in the several plates together, one of said conduits having an inlet end and another of said conduits having an outlet end extending to the outer wall of one of the outer plates, a shut-off valve for said inlet and a shut-off valve for said outlet, both of said shut-off valves being on the outside of said one of said plates, an expansion valve connected with said inlet, supporting devices for supporting said shut-off valves and expansion valve on said outer plate, and means for connecting said inlet and outlet to a refrigerant circulating device.

3. A cooling cabinet conversion unit comprising an intermediate plate and two outer plates, each made up of a pair of sheets with a space between them, a pipe extending back and forth in the space of each of said plates, through which refrigerant material is circulated, adjustable uniting devices connecting the plates together so as to permit the plates to be moved relatively to adjust them to proper positions to fit into a cabinet, adjustable conduits connecting the pipes in the several plates together, said intermediate plate being provided with openings sealed entirely around their periphery and through which said conduits pass, one of said conduits having an inlet end and another of said conduits having an outlet end extending to the outer wall of one of the outer plates, a shut-off valve for said inlet and a shut-off valve for said outlet, both of said shut-off valves being on the outside of said one of said plates, and means for connecting and disconnecting said inlet and outlet to a refrigerant circulating device.

4. A device of the kind described comprising an insulated cabinet, a plurality of separated plates, each made up of a pair of sheets with a space between them, a pipe extending back and forth in the space of each of said plates, through which refrigerant material is circulated, adjustable uniting devices connecting the plates together so as to permit the plates to be moved relatively to adjust them to proper positions to fit

into said cabinet, adjustable conduits connecting the pipes in the several plates together, one of said conduits having an inlet end and another of said conduits having an outlet end extending to the outer wall of one of the outer plates, a shut-off valve for said inlet and a shut-off valve for said outlet, both of said shut-off valves being on the outside of said one of said plates, an expansion valve connected with said inlet, supporting devices for supporting said shut-off valves and expansion valve on said outer plate, and means for connecting said inlet and outlet to a refrigerant circulating device, said plates being arranged in said insulated cabinet and said cabinet having a recess into which the shut-off valves and expansion valve are received.

5. A cooling cabinet conversion unit comprising an intermediate plate and two outer plates, each made up of a pair of sheets with a space between them, a pipe extending back and forth in the space of each of said plates, through which refrigerant material is circulated, adjustable uniting devices connecting the plates together so as to permit the plates to be moved relatively to adjust them to proper positions to fit into a cabinet, adjustable conduits connecting the pipes in the several plates together, said intermediate plate being provided with openings sealed entirely around their periphery and through which said conduits pass, one of said conduits having a main inlet and another of said conduits having a main outlet, both said inlet and outlet being connected with said one of said outer plates, the conduit connected with said main inlet passing through the intermediate plate and being connected with the inlet end of the pipe in the other outer plate, a conduit connected with the outlet end of the said pipe, said conduit passing through said intermediate plate and connecting with the inlet of the pipe in the first mentioned outer plate, the outlet of said latter pipe being connected to a conduit connecting with the inlet end of the pipe in said intermediate plate, the outlet end of said latter pipe being connected with the main outlet of the device.

6. A cooling cabinet conversion unit comprising an intermediate plate and two outer plates, each made up of a pair of sheets with a space between them, a pipe extending back and forth in the space of each of said plates, through which refrigerant material is circulated, and connections between the plates for circulating the refrigerant material first through the pipe on one of the outside plates, then through the pipe in the other outside plate and lastly through the pipe in the intermediate plate.

7. A cooling cabinet conversion unit comprising a plurality of separated plates, each made up of a pair of sheets with a hermetically sealed space between them, a pipe extending back and forth in the space of each of said plates, through which refrigerant material is circulated, air being exhausted from the space between said sheets so as to cause them to press tightly against a pipe in said space, adjustable uniting devices connecting the plates together so as to permit the plates to be moved relatively to adjust them to proper positions to fit into the cabinet, adjustable conduits connecting the pipes in the several plates together, one of said conduits having an inlet end and another of said conduits having an outlet end extending to the outer wall of one of the outer plates, a shut-off valve for said inlet and a shut-off valve for said outlet, both of said

shut-off valves being on the outside of said one of said plates, and means for connecting said inlet and outlet to a refrigerant circulating device.

- 5 8. A cooling cabinet conversion unit comprising a plurality of separated plates, each made up of a pair of sheets with a hermetically sealed space between them, a pipe extending back and forth in the space of each of said plates, through
10 which refrigerant material is circulated, the space between said sheets being partially filled with a eutectic solution, air being exhausted from the space between said sheets so as to cause them to press tightly against the pipe in
15 said space, adjustable uniting devices connect-

ing the plates together so as to permit the plates to be moved relatively to adjust them to proper positions to fit into a cabinet, adjustable conduits connecting the pipes in the several plates together, one of said conduits having an inlet end and another of said conduits having an outlet end extending to the outer wall of one of the outer plates, a shut-off valve for said inlet and a shut-off valve for said outlet, both of said shut-off valves being on the outside of said one of said plates, and means for connecting said inlet and outlet to a refrigerant circulating device.

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