

Oct. 13, 1925.

1,556,734

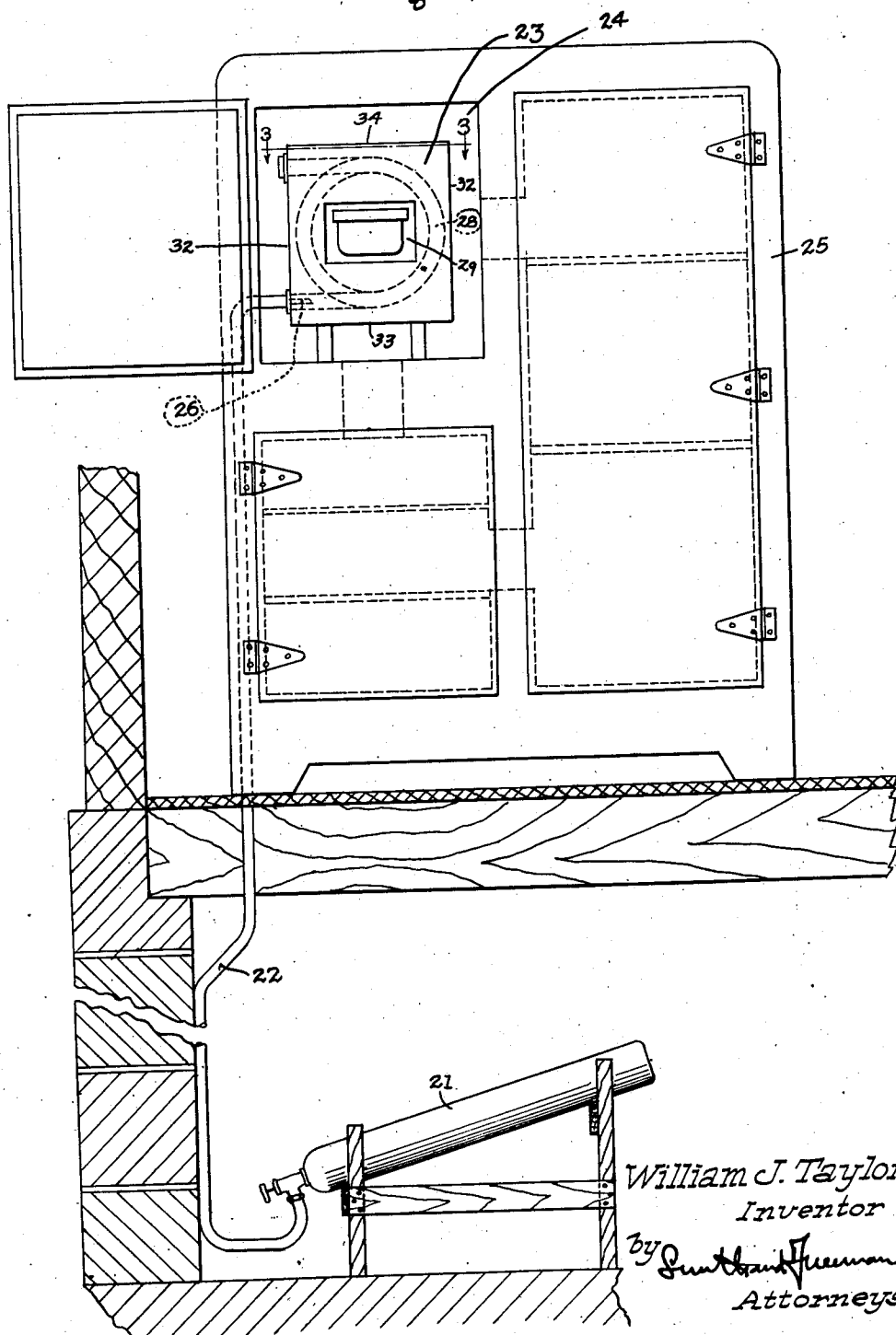
W. J. TAYLOR

REFRIGERATION

Filed Jan. 26, 1924

3 Sheets-Sheet 1

Fig. 1



William J. Taylor
Inventor
by *Smith & Freeman*
Attorneys

Oct. 13, 1925.

1,556,734

W. J. TAYLOR

REFRIGERATION

Filed Jan. 26, 1924

3 Sheets-Sheet 2

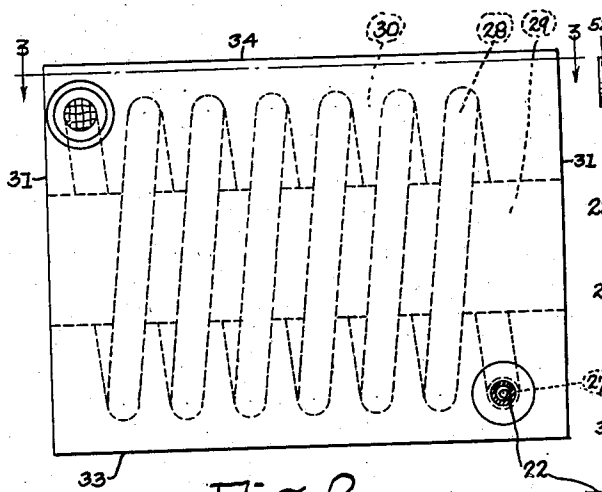


Fig. 2

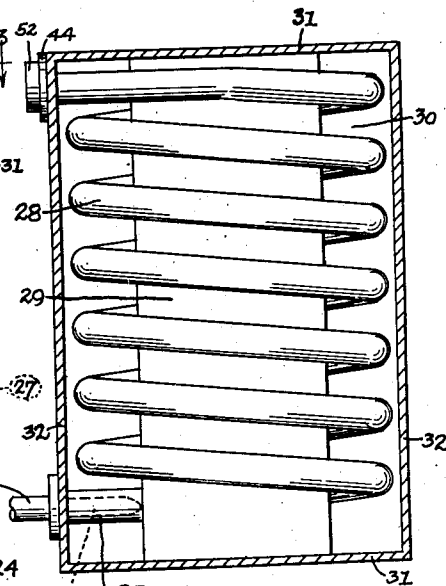


Fig. 3

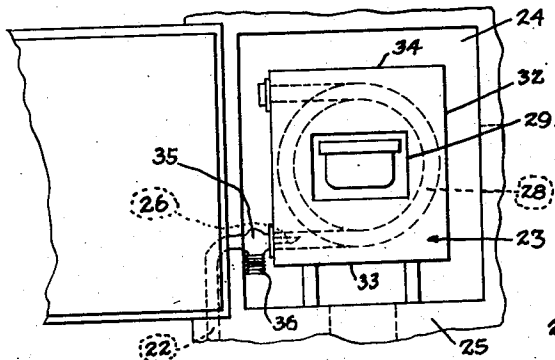


Fig. 4

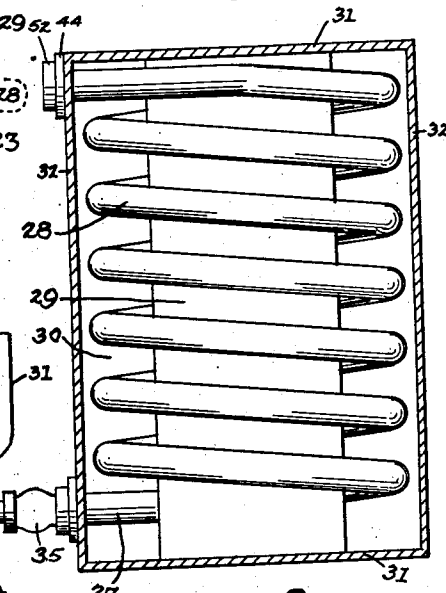


Fig. 6

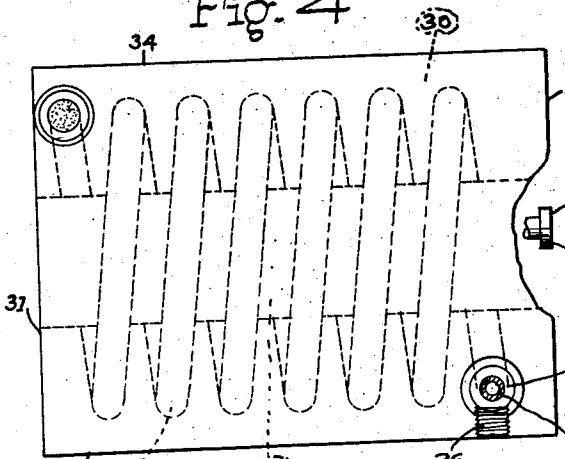


Fig. 5

William J. Taylor
Inventor

by
Smith and Freeman
Attorneys

Oct. 13 1925.

1,556,734

W. J. TAYLOR

REFRIGERATION

Filed Jan. 26, 1924

3 Sheets-Sheet 3

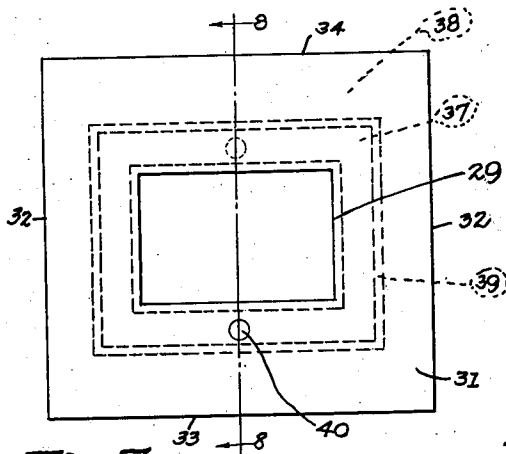


Fig. 7

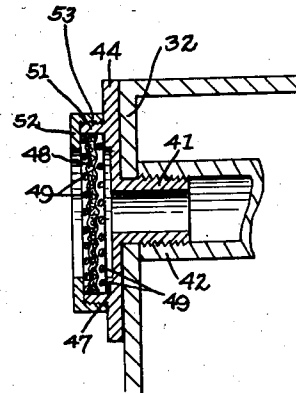


Fig. 9

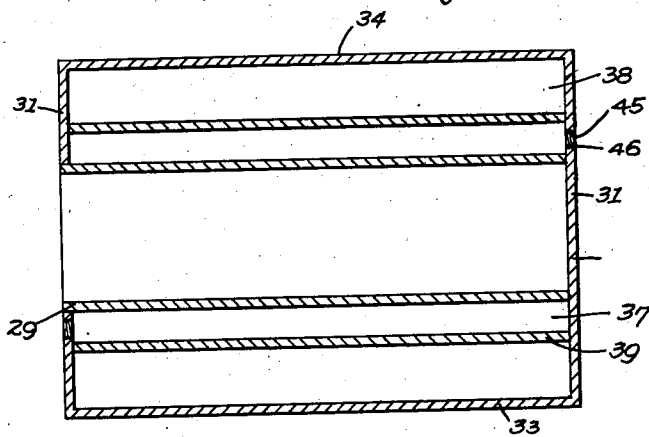


Fig. 8

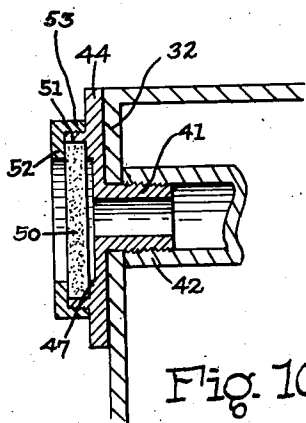


Fig. 10

William J. Taylor
Inventor
by Smith and Freeman
Attorneys

UNITED STATES PATENT OFFICE.

WILLIAM J. TAYLOR, OF DETROIT, MICHIGAN.

REFRIGERATION.

Application filed January 26, 1924. Serial No. 688,642.

To all whom it may concern:

Be it known that I, WILLIAM J. TAYLOR, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented a certain new and useful Improvement in Refrigeration, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

10 In the development and adaption of mechanical refrigeration for household purposes it has become recognized as desirable to reduce to the greatest possible extent the number of parts requiring attention and the
15 attention necessary for the operation of the refrigerating apparatus. Heretofore improvement of the refrigerating unit has been effected principally by simplifying various parts of that portion which requires the
20 most attention, the compressor unit. It has occurred to me that almost all of the operating attention could be dispensed with by substituting for the compressor unit a tank of compressed refrigerant and my invention
25 provides a refrigerating system employing this arrangement in such a manner as to secure the full advantage of the substitution. In the drawings accompanying this specification and forming a part thereof I have
30 shown, for purposes of illustration, certain forms which my invention may assume. In these drawings:

35 Figure 1 represents a general view of one form of my invention showing this form installed in a household refrigerator ready for use.

Figure 2 is a side view of the portion of the device of Figure 1 contained within the refrigerator.

40 Figure 3 is a section on the lines 3—3 on Figures 1 and 2.

Figure 4 is a view similar to the corresponding fragment of Figure 1 but showing the second embodiment of my invention.

45 Figures 5 and 6 are views similar to Figures 2 and 3 but illustrating this second embodiment.

50 Figure 7 is a front elevation of an alternative form of expansion chamber suitable for use with either of these embodiments of my invention.

Figure 8 is a section on the line 8—8 of Figure 7, while

55 Figures 9 and 10 are detail views of two forms of outlet suitable for use with the

modifications of my invention herein disclosed.

The embodiment of my invention disclosed in Figures 1 through 3 comprises a receptacle 21 containing a highly compressed refrigerant, positioned at any convenient point, and connected by means of a suitable duct 22 to an expansion unit 23 positioned within the ice chamber 24 of a refrigerator 25. The duct 22 is connected to the expansion unit 23 by means of a nozzle 26 inserted into the inlet end 27 of an expansion coil 28 which is coiled about a tube 29 formed to receive a pan containing the material to be frozen and which is positioned within a chamber 30 adapted to contain a suitable refrigerant such as brine and formed by the tube 29, the end plates 31, the side plates 32, a bottom plate 33, and a top plate 34.

75 The embodiment disclosed in Figures 4 through 6 is in all respects similar to that disclosed in Figures 1 through 3 except that the embodiment disclosed in Figures 4 through 6 includes a valve 35 arranged to control the entrance of the refrigerant into the expansion coil 28 and itself controlled by a thermostat 36 exposed to the air within the refrigerator 25 and responsive to the temperature of that air.

85 The alternative form of expansion chamber disclosed in Figures 7 and 8 retains the tube 29, end plates 31, sides 32, bottom 33, and top 34, but substitutes for the expansion coil 28 and brine chamber 30 an expansion chamber 37 and brine chamber 38 formed by a partition 39 extending between the ends 31 around the tube 29 and spaced therefrom. In this embodiment the duct 22 communicates with the expansion chamber 37 through an opening 40 formed in one of the end plates 31.

95 In all of the embodiments above described I interpose in the outlet of the expansion chamber means to control the exit of the refrigerant therefrom. In the form of expansion chambers shown in Figures 1 through 3 and 4 through 6 I interpose this means by inserting through an aperture in one of the side walls 32 a tube 41 screw threaded exteriorly to engage co-operating screw threads formed on the interior of the outlet end 42 of the expansion coil 28 to securely clamp the side wall 32 between the end 42 of the coil 28 and a flange 44 secured to the tube 41 and thus hold these parts
100
105
110

firmly assembled. In the form of expansion chamber disclosed in Figures 7 and 8 the screw threads of the tube 41 engage directly with screw threads 45 formed in the walls of an opening 46 in one of the end walls 31. In either case, the flange 44 is provided with an annular shoulder 47 adapted to form a seat for the periphery of a normally porous member which is adapted to normally permit the refrigerant to pass through yet is adapted to become clogged by frost to retard or even prevent the further passage of the refrigerant. This porous member may be of any suitable variety and particularly may be composed of the chamois 48 and wire supports 49 shown in Figure 9 or of a porous stone 50 shown in Figure 10 and in either case may be positioned within the depression formed by an annular rim 51 rising from the flange 44 and may be held in this position by means of a ring 52 having an upstanding rim 53 overlying the rim 51 and screw threadedly secured thereto.

In operation, and in the absence of automatic control of the flow of the refrigerant into the expansion chamber, the refrigerant will flow into the expansion chamber and undergo therein an absorption of heat which cools the adjacent space and will then escape through the porous member interposed in the outlet of the expansion chamber. Upon escaping, however, this refrigerant will undergo a still further expansion which will additionally lower the temperature immediately adjacent the outlet and thereby result in the deposition of frost adjacent the outlet and upon the porous member itself. The imposition of the frost will clog the porous member and thereby retard the escape of the refrigerant through the porous member and increase the pressure within the expansion chamber to thereby decrease the effective pressure forcing the refrigerant into the expansion chamber and thus decrease the flow of the refrigerant into the expansion chamber. Should the flow of the refrigerant at any time become too slight to maintain the desired cooling effect within the refrigerator the increase in the temperature of the air within the refrigerator will accelerate the dissipation of the frost from the porous member to thus reduce the back pressure within the expansion chamber and thereby permit a more rapid flow of the refrigerant into the expansion chamber until this more rapid flow causes additional frost formation sufficient to again reduce the flow.

While the device thus constructed is entirely operative I nevertheless realize that under certain conditions the operation of the porous member may not be sufficient to insure continuous operation in a satisfactory manner and accordingly I feel that it may be desirable to supplement this porous mem-

ber by an automatic control such as the thermostat shown in Figures 4 through 6. In such case I may form the automatic inlet control so that it acts concurrently and coincidentally with the porous member or so that it acts only under those abnormal conditions when the porous member requires assistance. In such a case I would form the automatic inlet control with a lost motion action and so arrange the parts that the automatic inlet control would be normally inactive and would operate to close the valve only under the influence of an abnormally low temperature within the refrigerator.

It will be understood that when the refrigerant is strictly anhydrous the frost in the porous member will form solely from the moisture already present in the refrigerator, that when the refrigerant is hydrous the frost will form also from the moisture within the refrigerant itself, and that when the refrigerant is of the type in which part of the refrigerant solidifies as the remainder evaporates, the frost will be formed at least in part by the solid particles of the refrigerant itself. Inasmuch as frost formed from the moisture in the refrigerator would be formed on the outer face of the porous member and against the pressure of the refrigerant, and would also be dependent upon the continued presence of moisture in the refrigerator, I prefer not to rely on this source of the frost but, on the contrary, to employ either a hydrous refrigerant or a refrigerant of the partly solidifying type. Furthermore, inasmuch as water vapor in the refrigerant might be emitted irregularly with a resultant irregularity in the frost formation, I prefer not to rely even on a hydrous refrigerant but rather to use the refrigerant of the partly solidifying type, either anhydrous to rely on the solidifying action alone, or hydrous to introduce the frost from the water vapor in the refrigerant.

And for the refrigerant of this type I prefer liquid carbon dioxide.

It will be readily understood by those skilled in the art that the particular embodiments of my invention herein shown and described may be variously changed and modified without sacrificing the advantages of my invention or departing from the spirit thereof. It will therefore be understood that the disclosure herein is illustrative only and that my invention is not limited thereto.

I claim:

1. In combination with the outlet of a refrigerating system expansion chamber, a porous member adapted to normally permit the passage of refrigerant fluid there-through and to become clogged by frost, and means adapted to secure said member in position over the opening in said outlet.

2. A control for the outlet of the expansion chamber of a refrigerating system comprising a porous member interposed in said outlet adapted to normally permit the passage of said fluid therethrough and to become clogged by frost.

3. In combination with the outlet of a refrigerating system expansion chamber, a porous member adapted to normally permit the passage of refrigerant fluid therethrough and to become clogged by frost, and means adapted to be secured to said outlet and to secure said member in position over the opening in said outlet.

4. In an open refrigerating system, a source of compressed refrigerant, an expansion chamber connected thereto and provided with an outlet opening into the atmosphere, automatic means controlling the entrance of refrigerant into said chamber, and porous means interposed in said outlet adapted to normally permit the passage of said refrigerant therethrough and to become clogged by frost.

5. In an open refrigerating system, a source of compressed refrigerant, an expansion chamber connected thereto and provided with an outlet opening into the atmosphere, and porous means controlling the escape of refrigerant through said outlet and responsive to the temperature within the refrigerated chamber.

6. In a refrigerating system, a source of compressed refrigerant, an expansion chamber connected thereto and provided with an outlet, automatic means controlling the entrance of refrigerant into said chamber, and porous means interposed in said outlet adapted to normally permit the passage of said refrigerant therethrough and to become clogged by frost.

7. In a refrigerating system, a source of compressed refrigerant, an expansion chamber connected thereto and provided with an outlet, and porous means interposed in said outlet adapted to normally permit the passage of said refrigerant therethrough and to become clogged by frost.

8. Refrigerating apparatus comprising a source of compressed refrigerant having an outlet, an expansion chamber having an inlet connected to said outlet and having also an outlet, and a porous closure interposed in the path of flow of said refrigerant, and formed to become more or less clogged with

frost with decrease or increase in temperature, to thus act as a thermostatic valve to control the flow of said refrigerant.

9. Refrigerating apparatus comprising a source of compressed refrigerant having an outlet, an expansion chamber having an inlet connected to said outlet and having also an outlet, and a porous closure interposed in said outlet of said expansion chamber, and formed to become more or less clogged with frost with decrease or increase in temperature, to thus act as a thermostatic valve to control the flow of said refrigerant.

10. Refrigerating apparatus comprising a source of compressed refrigerant having an outlet, an expansion chamber having an inlet connected to said outlet and having also an outlet, a closure interposed in the path of flow of said refrigerant, and formed to become more or less clogged with frost with decrease or increase in temperature, to thus act as a thermostatic valve to control the flow of said refrigerant, and means interposed in the path of flow of said refrigerant ahead of said closure and ahead of said inlet and effective to automatically regulate the supply of said refrigerant to said closure.

11. Refrigerating apparatus comprising a source of compressed refrigerant having an outlet, an expansion chamber having an inlet connected to said outlet and an outlet formed to become more or less clogged with frost with decrease or increase in temperature and to thus act as a thermostatic valve to control the flow of said refrigerant, and automatic means further controlling the flow of said refrigerant to said expansion chamber.

12. Refrigerating apparatus comprising a source of compressed refrigerant having an outlet, an expansion chamber having an inlet connected to said outlet and having also an outlet, automatic means controlling the flow of said refrigerant to said expansion chamber, and a porous closure interposed in said outlet of said expansion chamber, and formed to become more or less clogged with frost with decrease or increase in temperature, to thus act as a thermostatic valve to further control the flow of said refrigerant.

In testimony whereof, I hereunto affix my signature.

WILLIAM J. TAYLOR.