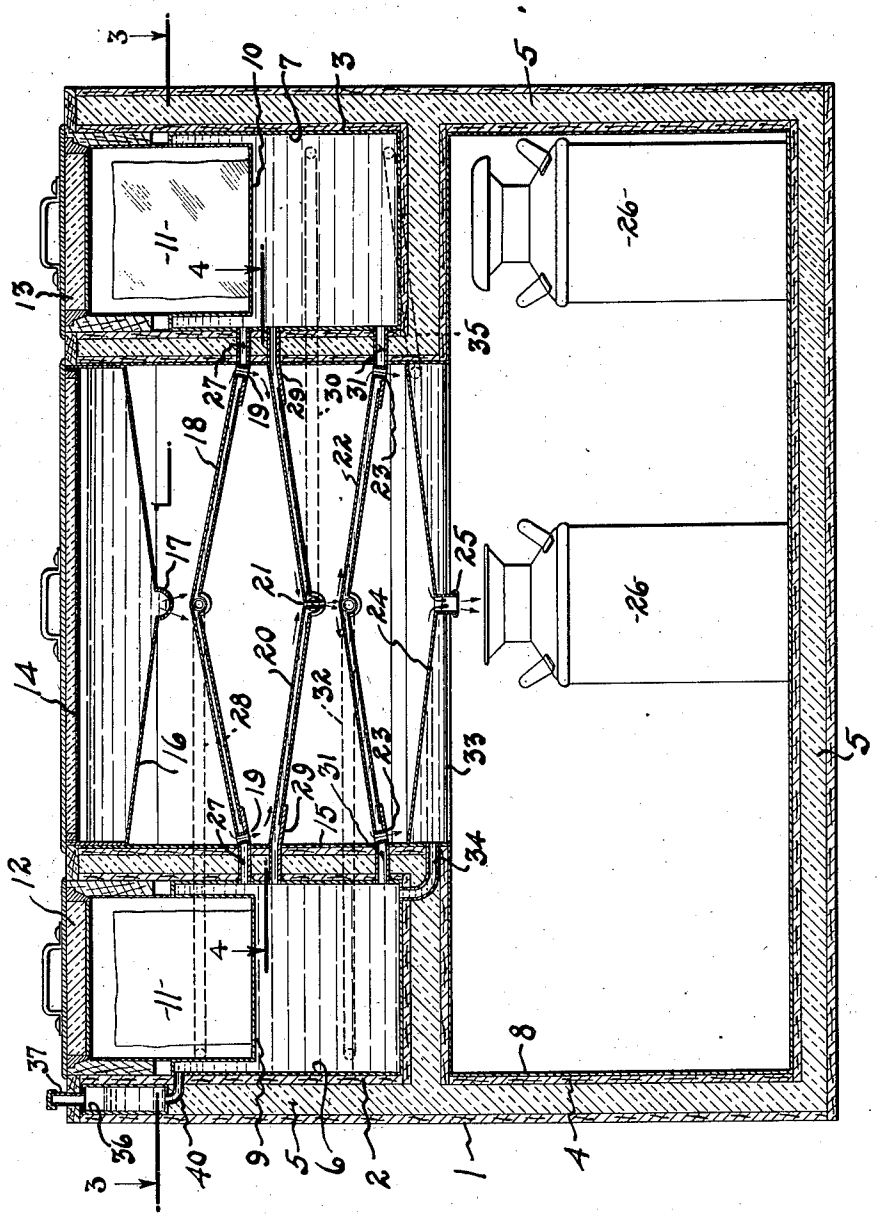
July 21, 1936. C. E. QUINN 2,048,291

REFRIGERATING APPARATUS

Filed Nov. 14, 1934 2 Sheets-Sheet 1

Fig. 1




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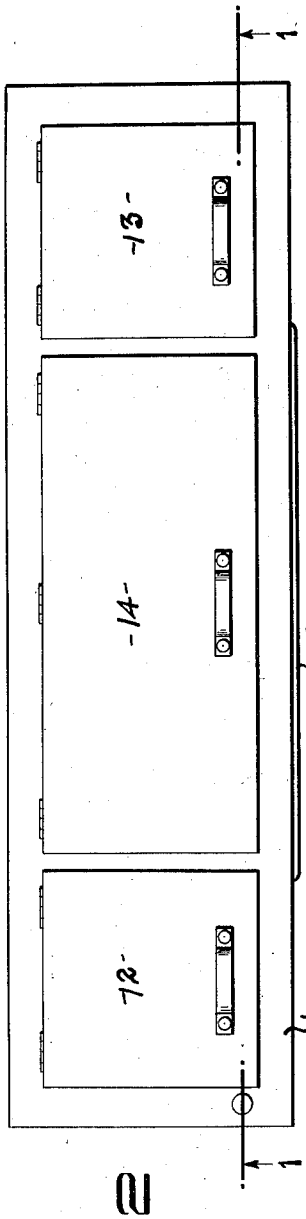



FIG. 2

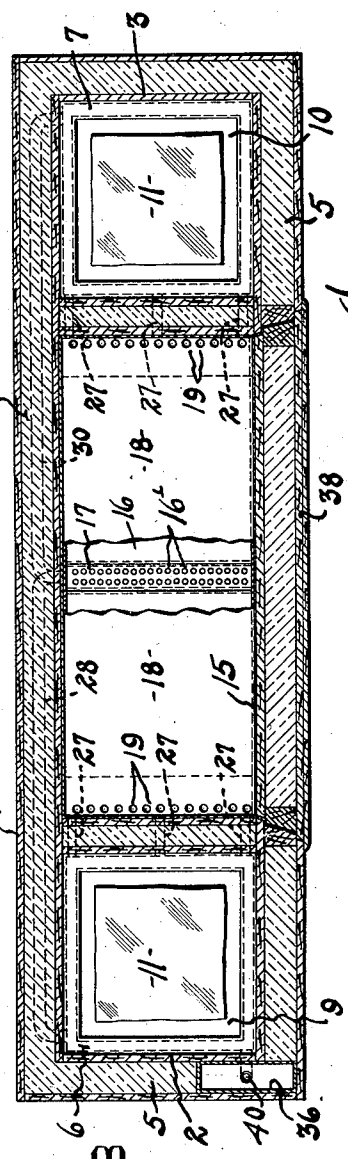



FIG. 3

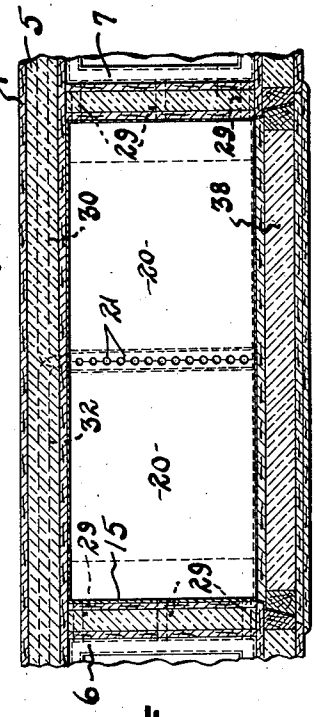



FIG. 4

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# UNITED STATES PATENT OFFICE

2,048,291

## REFRIGERATING APPARATUS

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Application November 14, 1934, Serial No. 752,905

12 Claims. (Cl. 62—101)

This invention relates to improvements in refrigerating apparatus of the type employing solid primary refrigerants and liquid secondary refrigerants.

The basic object of this invention is to provide an improved form of refrigerating and storage cooler for liquids, such as milk, for example, of the primary-secondary type.

A further object of this invention is to provide an apparatus for progressively cooling milk and the like in successive stages to reduce its temperature from 104 to 108° F., the normal temperature of raw milk, to approximately 40° F., and storing it in that apparatus.

These and many other objects as will appear from the following description are secured by means of the invention herein disclosed.

This invention resides substantially in the combination, construction, arrangement and relative location of parts, all as will be fully set forth below.

In the drawings,—

Figure 1 is a vertical, central, longitudinal, cross-sectional view through one form of device in accordance with this invention;

Figure 2 is a top plan view thereof;

Figure 3 is a cross-sectional view taken on the line 3—3 of Figure 1; and—

Figure 4 is a detailed, cross-sectional view taken on the line 4—4 of Figure 1.

The invention is illustrated in the drawings in the form of an outer cabinet 1 divided into a number of smaller compartments by inner separated cabinets 2, 3 and 4. The outer and inner cabinets are arranged in spaced relation and the space therebetween is filled with some suitable heat insulating material, such as wood, cork, and the like, as indicated at 5. Fitting in the compartments at the upper left and right hand ends of the cabinet are the closed metal containers 6 and 7 which are formed with depressions or pockets at the top, which pockets have the bottom walls 9 and 10 upon which blocks of solid refrigerants, such as solid carbon dioxide, may directly rest.

Each of these compartments is provided with a removable cover or closure member 12 and 13, respectively. Between these two compartments is a space which is lined by a metal wall 15 and having a bottom 33. This space is normally closed by means of a removable cover 14.

Mounted in the upper end of this space is a pan or container 16 having a bottom which slopes towards the center. At the center is an apertured depression, channel or gutter 17, as will be clear from Figures 1 and 3. The apertures are indicated at 16'. Extending between the end walls of the lining for this space is a double walled partition 18 which slopes from a center ridge downwardly to the ends which are apertured as indicated at 19 in Figures 1 and 3. A second double walled partition 20 is mounted below the partition 18 and in this case slopes towards the center to form a ridge having a plurality of apertures 21 therethrough. A third double walled partition 22 is mounted as shown in Figure 1, sloping from a center ridge downwardly to the ends and provided with apertures along the ends as indicated at 23. Finally mounted below this last double walled partition is a pan 24 which slopes towards the center at which is provided an opening in which the spout 25 is mounted. At 26 are indicated milk cans or other suitable containers for receiving the milk or other fluid as it is discharged from the spout 25.

At the ends of the double walled partition 18 are several pipes or conduits 27 which connect the space formed by the double walls of the partitions with the containers 6 and 7. At the ridge of the partition 18 is a pipe or pipes 28 which connect the space between the double walls with either or both the containers 6 and 7 at a higher level than the point of connection of the pipes 27. At the end of the double walled partition 20 are pipes 29 which connect to the tanks 6 and 7 and at the ridge is a pipe 30 which connects to either or both of the containers 6 and 7 at a different level. At the ends of the double walled partition 22 are pipes 23 which connect the space thereof with the tanks 6 and 7 and at the top is a connection 32 which connects the high point of the space with either or both the containers 6 and 7. The connections 31 and 32 are likewise made to the containers at different levels. The space between the pan 24 and the bottom 33 is connected to container 6 by the pipe 34 and container 7 by the pipe 35 and at different levels as indicated. Connected near the top of the container 6 by means of a pipe 40 is an expansion tank 36 which is provided with a filler and/or overflow connection 37. As indicated in Figures 2 and 3, the storage space for holding the cans 26 is accessible through a door or removable closure member 38 in the side of the cabinet.

In the use of the device the secondary refrigerant, which may be any one of a number of liquids suitable for the purpose, is filled into the system through the connection 37. The level of the liquid at normal temperatures is such as to

leave room for expansion thereof into the tank 36 if the temperature should rise above that normal level. The liquid fills containers 6 and 7 and the spaces in the double walled partitions 18, 20 and 22 and the space between the pan 24 and the bottom 33, as well as the various connecting pipes. The solid refrigerant 11 is placed upon the conducting walls 9 and 10, if desired, and in accordance with knowledge in this art a layer of insulating material of suitable thickness may be interposed between these walls and the refrigerant block. In accordance with well known principles of thermosyphonic action, the secondary refrigerant will circulate between the containers 6 and 7 and the spaces in the double walled partitions and the space between the pan 24 and the bottom 33 to transfer heat from those spaces and the adjacent walls to the solid refrigerant where it is given up in accomplishing the work of heating up the solid refrigerant.

The milk or other liquid to be refrigerated is poured onto the pan 16 and the cover replaced. This liquid escapes onto the cold partition 18 through the apertures 16'. It flows down over this partition in a thin sheet and escapes into the lower partition through the apertures 19. It flows to the center apertures 21 in a thin sheet and then down into the lower partition 22 and outwardly in a thin sheet to and through the apertures 23. From these it falls onto the bottom of pan 24 and flows in a thin body to and through the spout 25 onto the cans 26. In traversing these cold surfaces the milk is gradually lowered in temperature from the normal temperature of 100° to 105° F. of raw milk to the suitable storage temperature of about 40° F. It will be noted that the cooling surfaces 18, 20 and 22 are progressively colder because their connections to the containers 6 and 7 are at progressively lower levels. As is well known, because of the tendency of the secondary refrigerant to circulate the colder liquid will be at the bottom of the containers 6 and 7 and will be progressively warmer to the top. As will be apparent from the drawings, the secondary refrigerant will pass to the space in the double walled partition 18 through the connections 27 and travel upwardly and back again through the connection 28. In the case of the double walled partition 20 the fluid will pass to the space therein through pipe 30 and return upwardly to and through the connections 29. In the case of the double walled partition 22 the secondary refrigerant will enter the space through the connections 31 and return through the pipe 32.

It is, of course, apparent that the cooled liquid when collected in the cans 26 may be removed for any use, or may be left in the refrigerator. The storage space in this refrigerator will be maintained at approximately 40° F. by reason of the thermosyphonic circulation of the air in the space carrying the heat of the space to the metal wall 33 where it is absorbed by the circulating secondary refrigerant in contact with that wall.

From the above description it will be readily apparent to those skilled in the art that the invention herein disclosed may be embodied in other physical forms without departure from the scope thereof. I do not therefore, desire to be strictly limited to the disclosure as given for purposes of illustration but rather to the scope of the appended claims.

What I desire to secure by Letters Patent is:

1. A refrigerating apparatus as described comprising a heat insulated container, a plurality of metal partitions disposed one above another within said container, said partitions alternately sloping in opposite directions so that fluids may flow successively thereover, refrigerating means comprising a closed circulatory system for a secondary refrigerant arranged to circulate the secondary refrigerant in heat exchange relation with said partitions, and means within said container for supporting a primary refrigerant in heat exchange relation with the circulatory system.

2. A refrigerating apparatus as described comprising a heat insulated cabinet, a plurality of double walled metal partitions within said cabinet disposed one above another and arranged so that fluids may flow thereover in succession, a container for a secondary refrigerant, connections between said partitions and said container, and means within said cabinet for supporting a solid refrigerant in heat exchange relation with said container.

3. A refrigerating apparatus as described comprising a heat insulated cabinet, a plurality of double walled metal partitions disposed one above another and arranged so that fluids may flow thereover in succession, a container for a secondary refrigerant, connections between said partitions and said container, and means for supporting a solid refrigerant in heat exchange relation with said container, said connections including supply and return conduits between each partition and the container and arranged respectively at different levels whereby the partitions are maintained at different temperatures.

4. In a refrigerating apparatus as described, the combination comprising a heat insulated cabinet, a pair of sealed containers within said cabinet each adapted to support a solid refrigerant in contact therewith, a plurality of double walled sloping partitions mounted within said cabinet, supply connections from said containers to said partitions, and return connections from said partitions to said containers whereby a secondary refrigerant may be circulated from the containers to and through the double walled partitions.

5. A refrigerating apparatus as described comprising a heat insulated cabinet, a plurality of sloping partitions disposed within the cabinet and arranged in spaced relation one above another, means comprising a closed circulatory system for a secondary refrigerant arranged to circulate the secondary refrigerant in heat exchange relation with the partitions and maintain them at progresssively decreasing temperatures from the top to the bottom and a container within said cabinet for a primary refrigerant in heat exchange relation with said closed circulatory system.

6. A refrigerating apparatus as described comprising a heat insulated cabinet, a plurality of sloping partitions disposed within the cabinet and arranged in spaced relation one above another, means comprising a closed circulatory system for a secondary refrigerant arranged to circulate the secondary refrigerant in heat exchange relation with the partitions and maintain them at progressively decreasing temperatures from the top to the bottom, a container within said cabinet for a primary refrigerant in heat exchange relation with said closed circulatory system, and a receptacle mounted above the partitions to receive a liquid to be refrigerated and arranged to gradually discharge it onto the uppermost partition.

7. A refrigerating apparatus as described comprising a heat insulated cabinet, a plurality of sloping partitions disposed within the cabinet

and arranged in spaced relation one above another, means comprising a closed circulatory system for a secondary refrigerant arranged to circulate the secondary refrigerant in heat exchange relation with the partitions and maintain them at progressively decreasing temperatures from the top to the bottom, a receptacle mounted above the partitions to receive a liquid to be refrigerated and arranged to gradually discharge it onto the uppermost partition, a container within said cabinet for a primary refrigerant in heat exchange relation with said closed circulatory system, and a receptacle arranged below the lowermost partition and forming part of said circulatory system.

8. A refrigerating apparatus as described comprising a heat insulated cabinet, a plurality of sloping partitions disposed within the cabinet and arranged in spaced relation one above another, means comprising a closed circulatory system for a secondary refrigerant arranged to circulate the secondary refrigerant in heat exchange relation with the partitions and maintain them at progressively decreasing temperatures from the top to the bottom, a container within said cabinet for a primary refrigerant in heat exchange relation with said closed circulatory system, a receptacle mounted above the partitions to receive a liquid to be refrigerated and arranged to gradually discharge it onto the uppermost partition, and a refrigerated receptacle arranged below the lowermost partition, said receptacle having a discharge spout for delivering the liquid to a point therebelow.

9. A refrigerating apparatus as described comprising a heat insulated cabinet, a plurality of sloping partitions disposed within the cabinet and arranged in spaced relation one above another, means comprising a closed circulatory system for a secondary refrigerant arranged to circulate the secondary refrigerant in heat exchange relation with the partitions and maintain them at progressively decreasing temperatures from the top to the bottom, a container within said cabinet for a primary refrigerant in heat exchange relation with said closed circulatory system, a receptacle mounted above the partitions to receive a liquid to be refrigerated and arranged to gradually discharge it onto the uppermost partition, and a refrigerated receptacle arranged below the lowermost partition, said receptacle having a discharge spout for delivering the liquid to a point therebelow, the refrigerated receptable below the lowermost partition having connections with and forming part of said circulatory system.

10. A refrigerating apparatus as described comprising a heat insulated cabinet, a plurality of partitions mounted in said cabinet one above the other so that a fluid may flow successively thereover from the top partition to the bottom partition, a closed container for a liquid secondary refrigerant adapted to support a primary refrigerant in heat exchange relation therewith and means for circulating the secondary refrigerant from and to said container in heat exchange relation with said partition for maintaining the partitions at successively lower temperatures from the topmost partition to the bottommost partition.

11. In a refrigerating apparatus as described, the combination comprising a heat insulated cabinet, a plurality of double walled metal partitions disposed one above the other within said cabinet so that fluids may flow thereover successively downwardly, a container of liquid secondary refrigerant adapted to be maintained at a desired temperature and a plurality of conduits comprising supply and return connections from said container to said partitions for maintaining the partitions at successively lower temperatures from the topmost partition downwardly, said supply connections being made to said container at points of inherently different temperature.

12. A refrigerating apparatus as described comprising a heat insulated container having a compartment therein, a plurality of metal partitions disposed one above the other within said container, said partitions alternately sloping in opposite directions and having means to direct liquids so that they may flow successively thereover to a point of discharge, and a refrigerating means comprising a closed circulatory system for a secondary refrigerant arranged to circulate the secondary refrigerant in heat exchange relation with said partitions, a portion of said closed circulatory system being exposed to said compartment to refrigerate it, and means within said container for supporting a primary refrigerant in heat exchange relation with said circulatory system.

CLARA E. QUINN.