Oct. 14, 1924. 1,511,451

H. C. FOLGER

REFRIGERATING APPARATUS

Filed Oct. 20, 1922 4 Sheets-Sheet 1

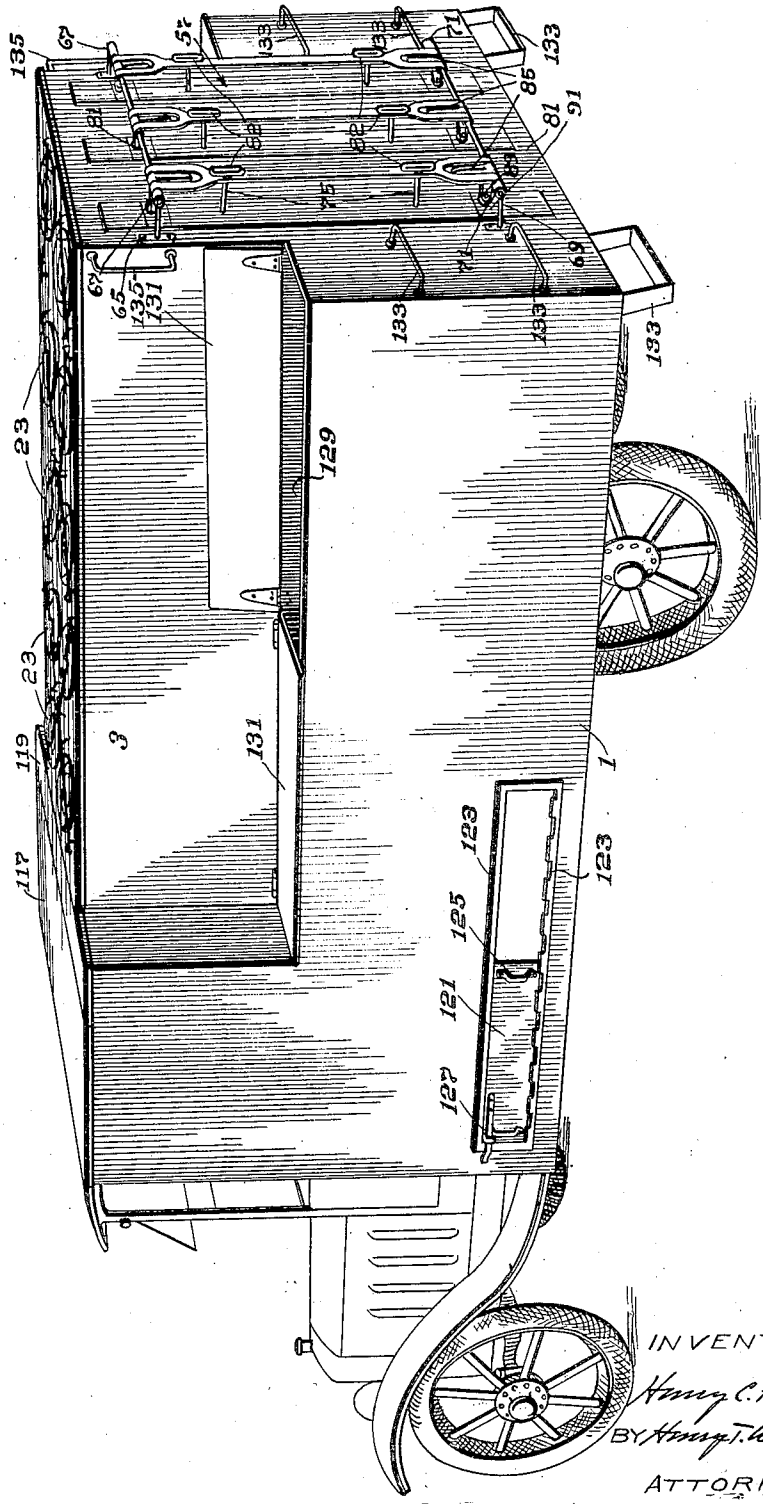


Fig. 1

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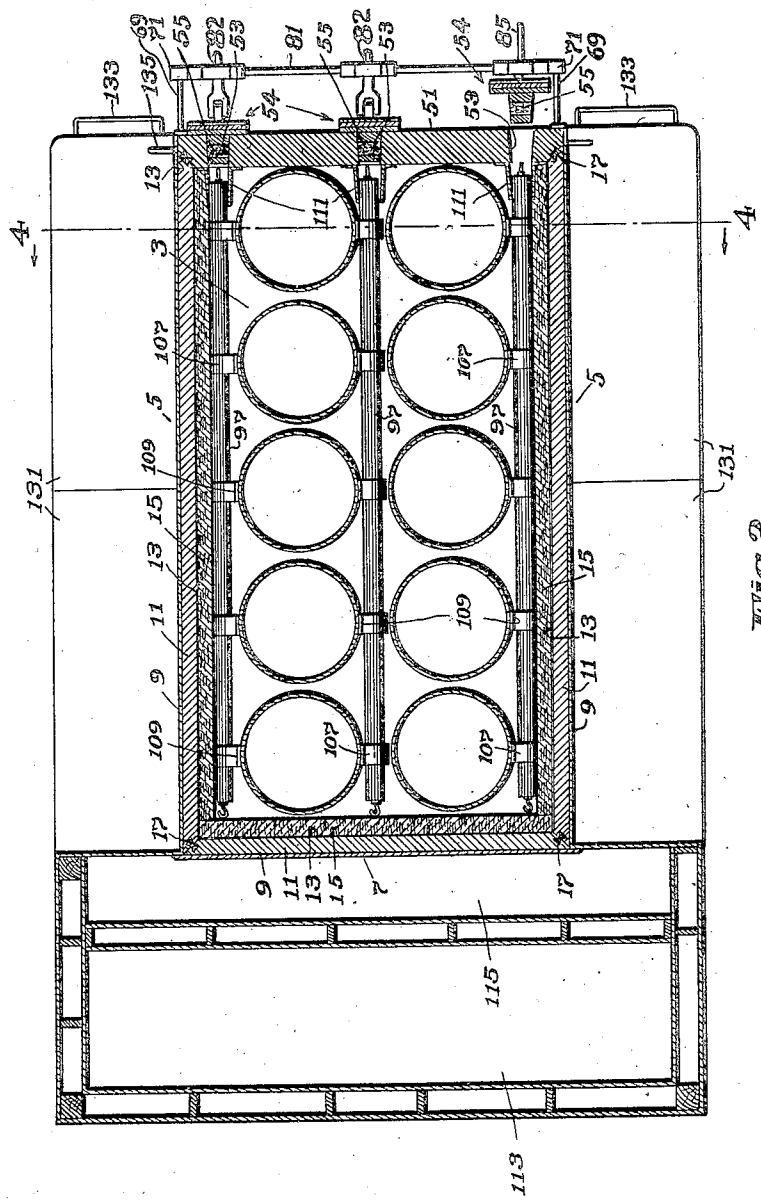


Fig. 2

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REFRIGERATING APPARATUS

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Fig.7

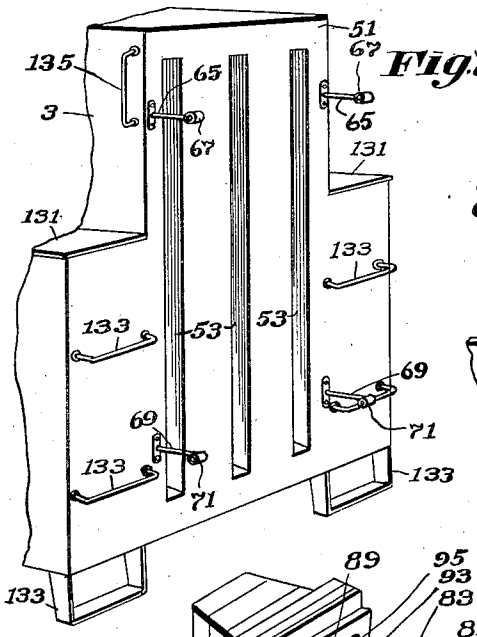


Fig.8

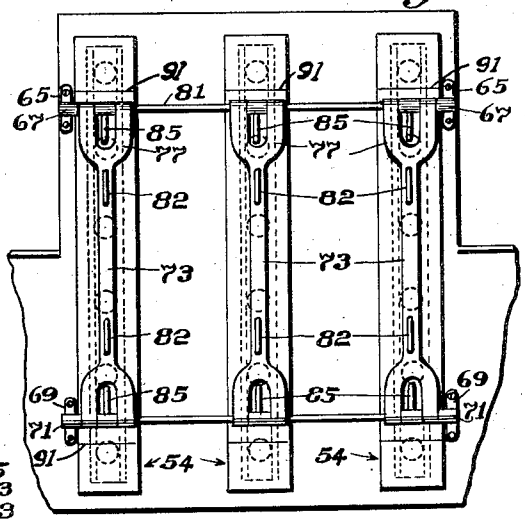


Fig.9

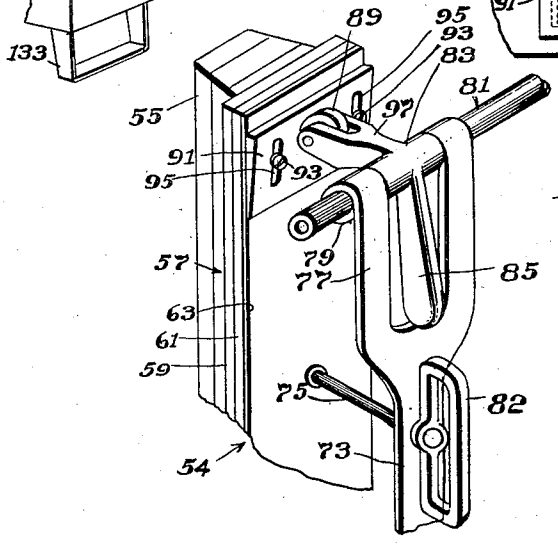
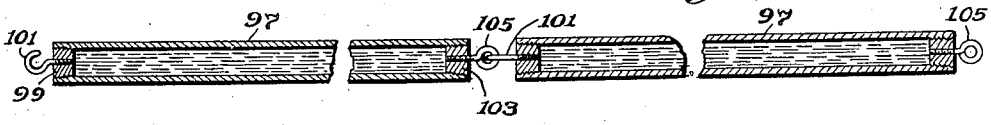


Fig.3



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REFRIGERATING APPARATUS

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Fig.4

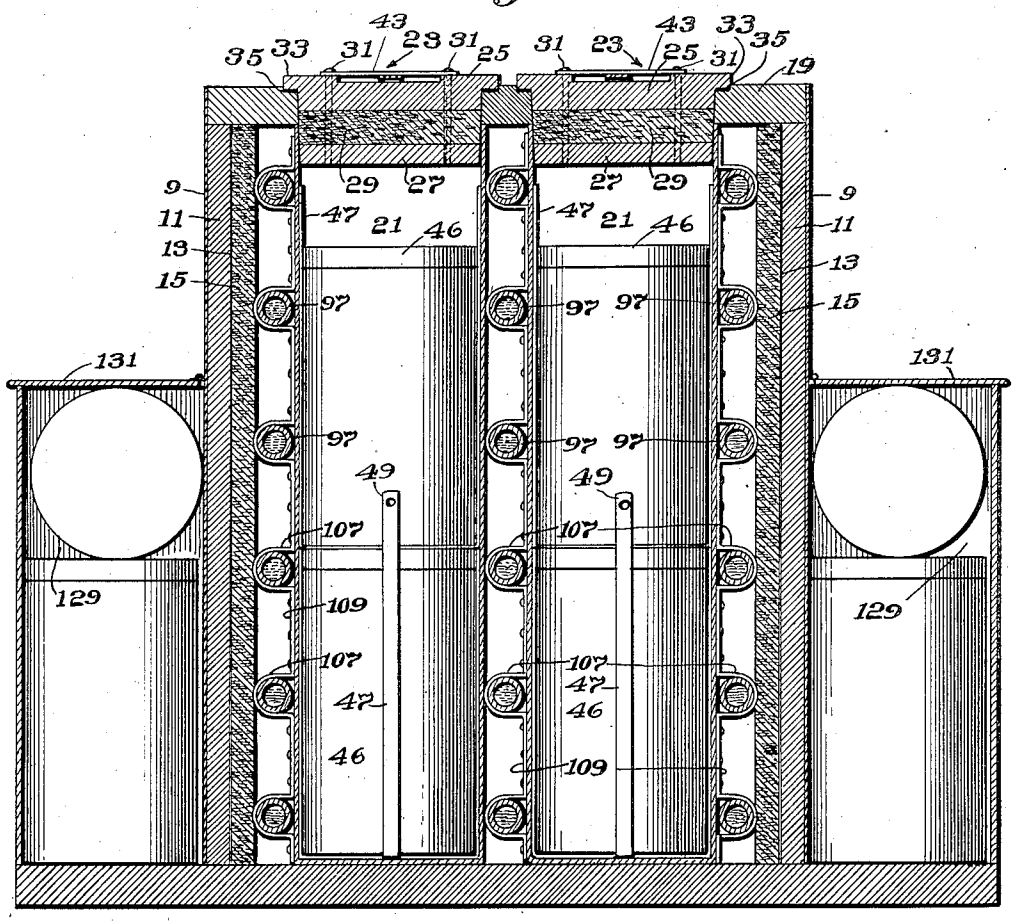


Fig.5

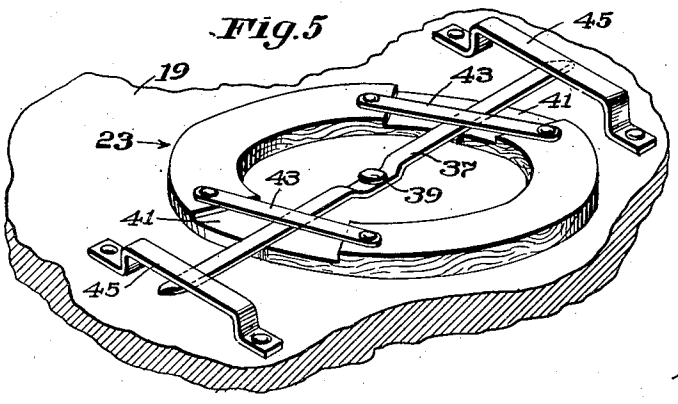
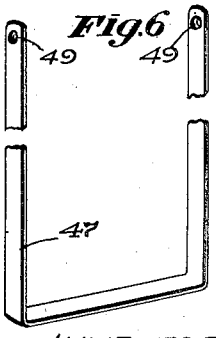


Fig.6



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Patented Oct. 14, 1924. 1,511,451

UNITED STATES PATENT OFFICE.

HENRY C. FOLGER, OF WAVERLY, MASSACHUSETTS, ASSIGNOR TO HOUSING COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

REFRIGERATING APPARATUS.

Application filed October 20, 1922. Serial No. 595,840.

To all whom it may concern:

Be it known that I, HENRY C. FOLGER, a citizen of the United States, residing at Waverly, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Refrigerating Apparatus, of which the following is a specification.

The invention to be hereinafter described relates to refrigeration apparatus.

The refrigeration apparatus may be employed for a variety of uses, but for purposes of illustration, in the present instance, it is described more particularly with respect to a refrigerating body mounted on a motor truck which may be used for conveying ice cream or other materials requiring refrigeration.

Heretofore, motor truck bodies for this purpose have been provided with a chamber in which is mounted a tank or a tank and piping containing a brine solution of salt and ice for cooling the chamber. This piping is usually mounted near the top of the chamber, leaving a space beneath the same for receiving the cans of ice cream or other materials. These cans are introduced into the chamber and removed therefrom through a large door in the side of the chamber. The consequence is that each time the door is opened to allow removal of a can of ice cream, the warm outside air rushes into the chamber and objectionably raises the temperature therein. As a result, the tank or piping containing the cold brine solution quickly loses its cooling effect, and frequent replenishing of the ice and salt is required. This is an inefficient, expensive and unsatisfactory method of refrigeration for the purposes. Also, the cooling apparatus is very heavy and objectionably adds to the weight of the truck and the expense of transportation.

The present invention overcomes the objections to the method described. In carrying the present invention into practical effect, a container, desirably of metal and of tubular form may be nearly filled with water or other suitable liquid to be frozen, and preferably with a solution which may be salt and water, or alcohol and water, or calcium chloride and water, all of which have a low freezing point.

After the container has been supplied with the appropriate solution, it is closed and subjected to a temperature sufficiently low to freeze the solution. This may be accomplished in the same room which is employed to harden or freeze the ice cream, or in a special room for the purpose as desired.

Then a container or containers holding the frozen solution may be transferred into the chamber which is desired to be cooled thereby. Preferably, this chamber is closed and remains closed until it is desired to remove the container or containers therefrom.

The chambers which are to receive the ice cream containing cans or other materials to be refrigerated, are cooled by the chamber receiving the containers, but are separate therefrom and not in communication therewith. The consequence is that when the ice cream cans or other materials are inserted into or removed from the chambers therefor, the cooling chamber in which the refrigerating containers are located is not opened to the outside air, and the temperature thereof is not raised thereby.

By this apparatus, the temperature of the chambers may be kept lowered to the desired degree of coolness for substantial periods of time, which are much longer than obtainable by previous methods.

The character of the invention may be readily understood by reference to the following description of one good form of apparatus embodying the invention disclosed in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a motor truck having a body provided with refrigerating apparatus embodying the invention;

Fig. 2 is a horizontal section through the body;

Fig. 3 is a longitudinal section showing the construction of the tubular container and the means for detachably connecting containers mounted in tandem relation;

Fig. 4 is a vertical section taken on line 4—4 of Fig. 2;

Fig. 5 on an enlarged scale is a perspective view of a portion of the top of the body and illustrating the cover for one of the cells and the means for locking the same in closed position;

Fig. 6 is a perspective view of a stirrup

for facilitating insertion of cans into the cell and their removal therefrom, and

Figs. 7, 8 and 9 are details to be referred to.

Referring to the drawings, a suitable truck may be provided having a body 1 wherein is a cooling chamber 3 having side walls 5 and a front wall 7. Each of these walls may be constructed for insulating effect, and in the present instance, comprises an outer finishing layer 9 of suitable wood, a layer 11 of balsa wood, a layer 13 of blotting paper, and another layer 15 of cork. The ends of the balsa wood layers meeting at the corners of the chamber may have mitred joints connected by dove-tailed key strips 17 inserted longitudinally into dove-tailed grooves at the joints. The cork layers 15 may be fitted tightly into the box formed by the balsa wood layers. Walls constructed as described have desirable insulating effect in resisting entrance of warmer outer air through said walls into the cooling chamber.

The top 19 of the chamber may be formed of balsa wood or other suitable material. The top may be provided with a plurality of apertures for registration with openings in the upper ends of chambers which may desirably be in the form of cells 21 made of galvanized iron or other suitable material and projecting down into the cooling chamber with the lower ends of the cells resting on the bottom of said chamber. These cells may desirably be disposed in rows which are spaced apart and also spaced from the side walls of the chamber.

The apertures in the top of the chamber and the openings in the cells may be provided with covers 23, each comprising an outer layer 25 and an inner layer 27 of balsa wood, and a cork layer 29 interposed between the wood layers, the three layers being secured in assembled relation by through bolts 31. The top layer 23 may be formed to present a flange 33 adapted to overlap the marginal portions of the top surrounding the apertures for receiving the covers, and a felt washer 35 may be introduced beneath the flange 33.

To detachably secure the covers in closed position, each may have a lock lever 37 (Figs. 4 and 5) pivotally connected intermediate the ends thereof to the cover by a bolt 39. The end portions of this lever may project through recesses 41 in the cover, bridged by bars 43, and the ends of the lever may project into locking relation with bails 45 secured to the top. The lever has a resilience and is so formed that it tends to spring upward from the cover, and is limited by the bridge bars 43. The ends of the lever 37 are adapted to project into and press up against the bails 45 to hold the cover down in closed position. The construction is such that when it is desired to release the cover, the lever 37 is rocked sufficiently to withdraw its ends from the bails 45, thereby allowing the cover to be lifted up out of the aperture at the top of the chamber and the opening in the top of the cell to permit ice cream containing cans 46 or other materials to be introduced into the cell or removed therefrom.

To facilitate lowering of the cans into the cells and their removal therefrom, stirrups may be provided, such, for example, as the stirrup 47 (Fig. 6) having a width substantially corresponding to the internal diameter of the cell and a length somewhat greater than the height of one of the cans. At the upper ends of the stirrup, eyes 49 may be provided, into which suitable hooks may be inserted to facilitate lowering and lifting of the stirrups. If two cans are to be introduced into the cell, the bottom can may be lowered into the cell by means of the stirrup and the hooks connected therewith, and then the upper can may be lowered into the cell and rest upon the lower can. When the cans are to be removed, the stirrup for the upper can is raised to lift the upper can from the cell, and then the operator may reach the hooks down into the cell so as to engage the eyes 49 of the lower stirrup, and then the lower can may be lifted from the cell.

The rear end 51 (Figs. 2 and 7) of the cooling chamber or box may be formed of balsa wood or other suitable material, and said end may have elongated, vertical apertures 53 therein registering with the spaces between the cells and the side walls of the chamber and the space between the two rows of cells, for a purpose to be described.

Each of these vertical apertures 53 may be normally closed by a door 54 comprising an elongated bar 55 (Figs. 8 and 9) desirably of balsa wood mounted on a back 57 which may be formed of two layers of wood 59 and 61 disposed with their grain running transversely to each other, said layers being covered by a metal plate 63 secured thereto.

Suitable means may be provided to secure the door to the rear end of the body. To accomplish this, in the present instance, the body has an upper pair of brackets 65 secured thereto provided with eyes 67. Also secured to the body is a lower pair of brackets 69 having eyes 71. A vertical bar 73 is carried by studs 75 secured on the door 54, and has forks 77 (Fig. 9) at opposite ends thereof terminating in bosses 79. The upper bosses 79 register with the eyes 67 of brackets 65, and the lower bosses 79 register with the eyes 71 of the lower brackets 69. Tubular rods 81 may be inserted through the bosses and the eyes. The studs 75 enter freely through the bar 73 and have

handles 82 which may be grasped to facilitate insertion of the bar 55 into the vertical aperture 53 and removal therefrom.

Pivotally mounted on the rods 81 are bell cranks 83, each having a handle 85 and an arm 87 carrying a roller 89. Mounted on the door are wedges or shims 91 which may be adjustably secured thereto by screws 93 entered through elongated slots 95 in the wedges. The bell cranks may be rocked to cause their rollers 89 to ride along the wedges and press the bar 55 firmly into the elongated aperture and hold the same therein.

When it is desired to unlock the door, the bell cranks are rocked to release the rollers 89 from engagement with the wedges. Then the handles 82 may be pulled out to withdraw the bar 55 from the aperture 53. Then the door may be moved out of registration therewith by sliding the door laterally as permitted by sliding movement of the fork bosses 79 along the rods 81. It will be observed that the box or chamber described is of air tight construction, and therefore, will prevent entrance of outside warmer air therein.

Having described the cooling chamber or box, next will be described means for effecting the cooling thereof. This means, in the present instance, comprises a container or containers which may be variously formed to serve the purposes. Each container may be in the form of a cartridge 97 (Fig. 3) conveniently made from standard steel tubing. One end of the cartridge may be closed by a plug 99 threaded or otherwise secured therein, and tapped to receive the shank of a hook 101. The opposite end of the cartridge may have a plug 103 threaded or otherwise secured therein and tapped to receive the shank of an eye 105.

These cartridges may be nearly filled with a suitable liquid to be frozen, such, for example, as water or a solution which may be salt and water, or alcohol and water, or calcium chloride and water, or any other suitable solution. The solutions mentioned are desirable, since each has a low freezing point.

The liquid or solution may be introduced into the cartridge on removal of the plug 103 therefrom. To introduce the liquid or solution into the cartridges, they may be supported in an upright position, preferably with the hook end uppermost, and then a hose may be connected to the lower end of each cartridge, and the upper end of the hose may lead from a tank containing the liquid or solution, said tank being mounted above the level of the cartridges. The solution may gravitate downward from the tank and rise upward in the cartridges until it reaches a level spaced somewhat from the hook plugs of the cartridges, and the level of the solution may be observed by means of a suitable gage.

After the cartridges have been supplied with the solution, the eye plugs are returned to position to close the cartridges, and they are in readiness for the freezing operation.

The temperature of the liquid in the cartridges may be lowered to the freezing point or below said point if desired. Under certain conditions it may be desirable to carry the temperature down to 32° F., and under other conditions it may be desirable to carry the temperature down to 10° F., and sometimes as low as 15 or 20 degrees below zero.

The freezing of the liquid in the cartridges may be accomplished in the same room or chamber in which the ice cream is frozen or hardened, but preferably the freezing of the liquid in the cartridges is accomplished in a separate chamber.

It is customary to employ the ammonia system in the hardening room for the ice cream, and the piping of this room may desirably be extended into an adjacent and separate room adapted to receive the cartridges containing the liquid to be frozen. Thus, the liquid in the cartridges may be frozen without devoting any of the space in the hardening room to this purpose, and the cartridges may be inserted into the special room therefor and removed therefrom without the necessity of opening the door for the ice cream hardening room, and hence raising of the temperature in the latter room such as would be occasioned on introduction of the cartridges into and removal from the same is avoided.

After the liquid in the cartridges has been frozen, the cartridges are transferred from the freezing chamber therefor to the truck body, and may be introduced into the cooling chamber therein through the elongated apertures 53 in the rear end of the body.

Suitable means may be provided to support the cartridges in the cooling chamber. To accomplish this, in the present instance of the invention, brackets 107 (Figs. 2 and 4) may be provided and formed from a steel ribbon 109 which may be riveted to the sides of the cells. The brackets are spaced at intervals, and project into the spaces in the cooling chamber which register with the elongated apertures 53 in the rear end of the body. The cartridges may be inserted through the elongated apertures into the brackets 107. To facilitate this, funnel-shaped tubes 111 (Fig. 2) may be provided having flanges secured to the rear end of the body.

The length of the cartridges may vary, but in the present instance, the length of the cartridges is such that two cartridges may be inserted in tandem or end-to-end relation into the body. In introducing the cartridges into the body, the advancing car-

tridge of the tandem may be inserted through one of the elongated apertures 53 to the first bracket, and then be slid on in to the second bracket. Preferably the hook end of the cartridge is first introduced, and then the second cartridge of the tandem is presented to the first cartridge, and its advancing hook 101 is connected to the trailing eye 105 of the first cartridge. Then the two cartridges are thrust on inward until the advancing cartridge reaches the forward end of the cooling chamber.

After all of the cartridges have been transferred from the freezing chamber into the cooling chamber, the doors 54 are closed as described.

Preferably the cartridges are so supported in the cooling chamber as to expose substantially their entire surfaces to the air in the chamber for efficient cooling effect. The bands of the brackets are relatively small as compared to the size of the cartridge, and therefore, they do not interfere with the efficient cooling effect thereof.

These cartridges will efficiently serve to lower the temperature of the cooling chamber, and will maintain their cooling effect for substantial periods of time which are much longer than obtainable by previous methods. This is due to several factors including the character of the cooling cartridges, the mounting thereof with substantially their entire surfaces exposed to the air for cooling effect, and the fact that after the cartridges have been introduced into the cooling chamber, the latter is closed and remains closed until it is desired to remove the cartridges from the cooling chamber.

Whenever an ice cream can or other article is removed from one of the cells, it is not necessary to expose the cooling chamber to the warming effect of the outside air, since the cells are separate from and do not communicate with the cooling chamber. When it is desired to remove the can or other article from one of the cells, it is merely necessary to lift the cover from such cell without exposing any of the other cells. Since the opening in the cell is at the top thereof, the warm outer air does not materially reduce the temperature of the air in the cell, owing to the fact that warm air tends to rise, and therefore, it will not tend to move downward into the cell and replace the cool air therein.

Eventually the frozen liquid holding cartridges will lose their substantial cooling effect, and then they may be removed from the cooling chamber and be returned to the freezing room for the purpose of again freezing liquid therein. If it is desired to continue the refrigeration of the cooling chamber, other cartridges containing frozen liquid may be introduced into the cooling chamber of the truck body, and take the places of those removed. Preferably, two sets of cartridges are provided for each truck, one set to be in the freezing chamber in readiness to be substituted for the set in the truck body when required.

The cartridges may be readily inserted into the cooling chamber of the truck body and removed therefrom without substantial loss of time. The number of cartridges employed may vary according to the size of the cooling chamber and the degree of refrigeration required.

The truck body may also be constructed to provide a chamber 113 (Fig. 2) adapted to receive broken ice, and a chamber 115 adapted to receive salt. The ice chamber 113 may have a door 117 at the top thereof, and the salt chamber 115 may have a door 119 at the top thereof, through which the ice and salt may be introduced into said chambers.

At one side of the body is a discharge door 121 (Fig. 1) mounted in guides 123, said door being provided with a handle 125 and a latch 127.

The door 121 may be opened to enable broken ice and salt to be taken from the chamber 113 and 115 for the purpose of packing the ice cream cans in tubs to keep the cans cold when transferred from the truck to the customer.

To accommodate empty cans, the body may be constructed to provide chambers 129 located at opposite sides of the cooling chamber 3. Hinged covers 131 at the tops of the chambers 129 may be opened to permit insertion of empty ice cans into said chambers and their removal therefrom.

Preferably, the chambers 129 project upward to a sufficient height so that their covers may serve as steps on which the operator may stand and have convenient access to the top of the cooling chamber in inserting ice cream cans into the cells, and in removing the same therefrom.

To enable the truck driver to reach the cover steps, the rear end of the body may be provided with steps 133 and handles 135.

It will be understood that the invention is not limited to the apparatus disclosed herein, and that various deviations may be made therefrom without departing from the spirit and scope of the appended claims.

What is claimed is:—

1. Refrigeration apparatus comprising, in combination, a cooling chamber having means normally closing the same, portable containers in said chamber containing a solution which freezes at a temperature substantially below 32° Fahrenheit, and a refrigerating chamber without communication with the cooling chamber and having an air space about the same exposed to the refrigerating effect of the portable containers, said refrigerating chamber having pro-

vision for receiving materials for refrigeration.

2. Refrigeration apparatus comprising, in combination, a cooling chamber having walls of heat insulation material to resist the warming influence of outside air on said chamber, a refrigerating chamber received by the cooling chamber, said chambers being spaced to provide an air space between them, and a portable metal closed container in the cooling chamber and containing a solution which freezes at a temperature substantially below 32° Fahrenheit, said refrigerating chamber being adapted to receive materials for refrigeration, and said portable container being adapted to transmit its cooling effect through the air space of the cooling chamber to the outer surface of the refrigerating chamber, thereby to refrigerate materials in the latter.

3. Refrigeration apparatus comprising, in combination, a cooling chamber having heat insulation walls, a refrigerating chamber projecting into the cooling chamber, said chambers being in spaced relation and without communication with each other, the refrigerating chamber having an opening through which materials for refrigeration may be introduced into and removed from said chamber, means normally closing said opening, the cooling chamber having an opening and means normally closing said opening, and a portable metallic container holding a solution which freezes at a temperature substantially below 32° Fahrenheit, said container being adapted to be introduced into the cooling chamber and removed therefrom through the opening for said chamber, and said container serving to transmit refrigerating effect from the cooling chamber through the space between the chambers to the refrigerating chamber.

4. Refrigeration apparatus comprising, in combination, a cooling chamber having walls of heat insulation material, refrigerating chambers projecting into the cooling chamber, said refrigerating chambers having openings through which materials for refrigeration may be introduced into and removed from said chambers, means normally closing said openings, the cooling chamber having an opening and means normally closing said opening, and portable metallic cartridges containing a solution which freezes at a temperature substantially below 32° Fahrenheit, said cartridges being in the cooling chamber and adapted to be introduced into and removed from said chamber through the opening thereof, and said cartridges being adapted to transmit refrigerating effect through the cooling chamber to the exterior surfaces of the refrigerating chambers, thereby to refrigerate materials in said chambers.

5. Refrigeration apparatus comprising, in combination, a cooling chamber, a plurality of chambers mounted in, but without communication with, the cooling chamber and having openings through which materials for refrigeration may be admitted therein, covers for said openings, and closed containers mounted in said cooling chamber and each adapted to hold a frozen liquid for cooling said chambers.

6. Refrigeration apparatus comprising, in combination, a cooling chamber having insulated walls, a chamber projecting into said cooling chamber, permanently closed therefrom and adapted to receive materials for refrigeration, and removable closed containers mounted in said cooling chamber and adapted for holding a frozen liquid for cooling said chambers.

7. Refrigeration apparatus comprising, in combination, a cooling chamber, a plurality of cells mounted in said chamber having openings through which materials to be refrigerated may be introduced into said cells, covers for said openings, and removable closed containers mounted in the cooling chamber and each adapted to hold a frozen liquid for cooling said chambers, said cells being without communication with the cooling chamber.

8. Refrigeration apparatus comprising, in combination, a cooling chamber, spaced cells mounted in the cooling chamber and having openings through which materials for refrigeration may be admitted into said cells, covers for said openings, and removable closed containers mounted in the cooling chamber in spaces unoccupied by the cells and each adapted to hold a frozen liquid for cooling said chamber and cells, said cells being without communication with the cooling chamber.

9. Refrigeration apparatus comprising, in combination, a cooling chamber, a plurality of spaced cells mounted therein and having openings through which materials to be refrigerated may be admitted into said cells, covers for said openings, supports mounted on the cells, and removable closed containers mounted on said supports and each adapted to hold a frozen liquid for cooling said chamber and cells, said cells being without communication with the cooling chamber.

10. Refrigeration apparatus comprising, in combination, a cooling chamber, a plurality of cells mounted therein and spaced from the walls of said chamber, each of said cells having an opening therein through which materials to be refrigerated may be admitted and a cover for said opening, and removable closed containers mounted in the cooling chamber in spaces between the cells and walls of said chamber and each adapted to hold a frozen liquid for cooling said chamber and the cells therein, said cells

being without communication with the cooling chamber.

11. Refrigeration apparatus comprising, in combination, a cooling chamber, a chamber mounted therein having an opening in the upper end thereof through which materials to be refrigerated may be admitted into the latter chamber, a cover for said opening, and a removable closed container mounted in the cooling chamber and adapted to hold a frozen liquid for cooling said chambers, said chambers being without communication with each other.

12. Refrigeration apparatus comprising, in combination, a cooling chamber, a plurality of cells mounted in said chamber and having openings through which materials for refrigeration may be admitted into said cells, covers for said openings, closed containers mounted in the cooling chamber and each adapted to hold a frozen liquid for cooling said chambers, said cooling chamber having a wall provided with an aperture through which the containers may be inserted into the cooling chamber and removed therefrom, and means normally closing said aperture.

13. Refrigeration apparatus comprising, in combination, a cooling chamber, a plurality of cells mounted therein and having openings through which materials to be refrigerated may be admitted into said cells, covers for said openings, closed containers mounted in said chamber and adapted to hold a frozen liquid for cooling said chamber and cells, and means to support certain of said containers in tandem relation in said chamber.

14. Refrigeration apparatus comprising, in combination, a cooling chamber, a plurality of cells mounted therein and having openings through which materials to be refrigerated may be admitted into said cells, covers for said openings, closed containers mounted in said chamber and adapted to hold a frozen liquid for cooling said chamber and cells, means to support certain of said containers in tandem relation in said chamber, a wall of said chamber being apertured to allow insertion of said containers into said chamber and their removal therefrom, and means detachably to connect the containers which are in tandem relation to facilitate their removal from said chamber.

15. Refrigeration apparatus comprising, in combination, a cooling chamber having a wall provided with an aperture through which cooling means may be introduced into said chamber, a door removably mounted in said aperture, a pair of rods mounted on the chamber adjacent said aperture, a bar slidably mounted on said rods, locking devices mounted on said rods and adjustable to lock the door in the aperture or release the same therefrom, and studs connected to the door entered through said bar and provided with handles for adjusting the door into and out of the aperture, said bar being adapted to slide along said rods to carry the door out of registration with said aperture.

16. Refrigeration apparatus comprising, in combination, a cooling chamber having a wall provided with a plurality of apertures through which means for cooling the chamber may be introduced therein, doors for said apertures, brackets mounted on the chamber, rods carried by the brackets, hangers on said rods carrying said doors, and devices for locking the doors in the apertures, said doors being adjustable toward and from said hangers for insertion into and removal from said apertures, and said doors and hangers being adjustable along said rods to move said doors into and out of registration with said apertures.

17. Refrigeration apparatus comprising, in combination, a cooling chamber having a plurality of cells therein for receiving materials for refrigeration, said cells being disposed to provide spaces in said chamber, closed containers mounted in said spaces and each adapted to hold a frozen liquid, a wall of the chamber having apertures through which the containers may be inserted into and removed from the chamber, doors removably mounted in said apertures, and locking devices for holding the doors in said apertures.

18. Refrigeration apparatus comprising, in combination, a cooling chamber having insulated walls for resisting the warming influence of outside air on said chamber, a refrigerating chamber in the cooling chamber and adapted to receive material for refrigeration. said chambers being formed to provide an air circulation space about the refrigerating chamber, and a removable, portable closed refrigerating container mounted in said space and containing a solution which freezes at a temperature substantially below 32° Fahrenheit, said refrigerating chamber having an opening provided with a normally closed cover located externally of the cooling chamber that it may be opened without exposing the refrigerating container to the warming effect of the outside air.

HENRY C. FOLGER.