

Oct. 30, 1928.

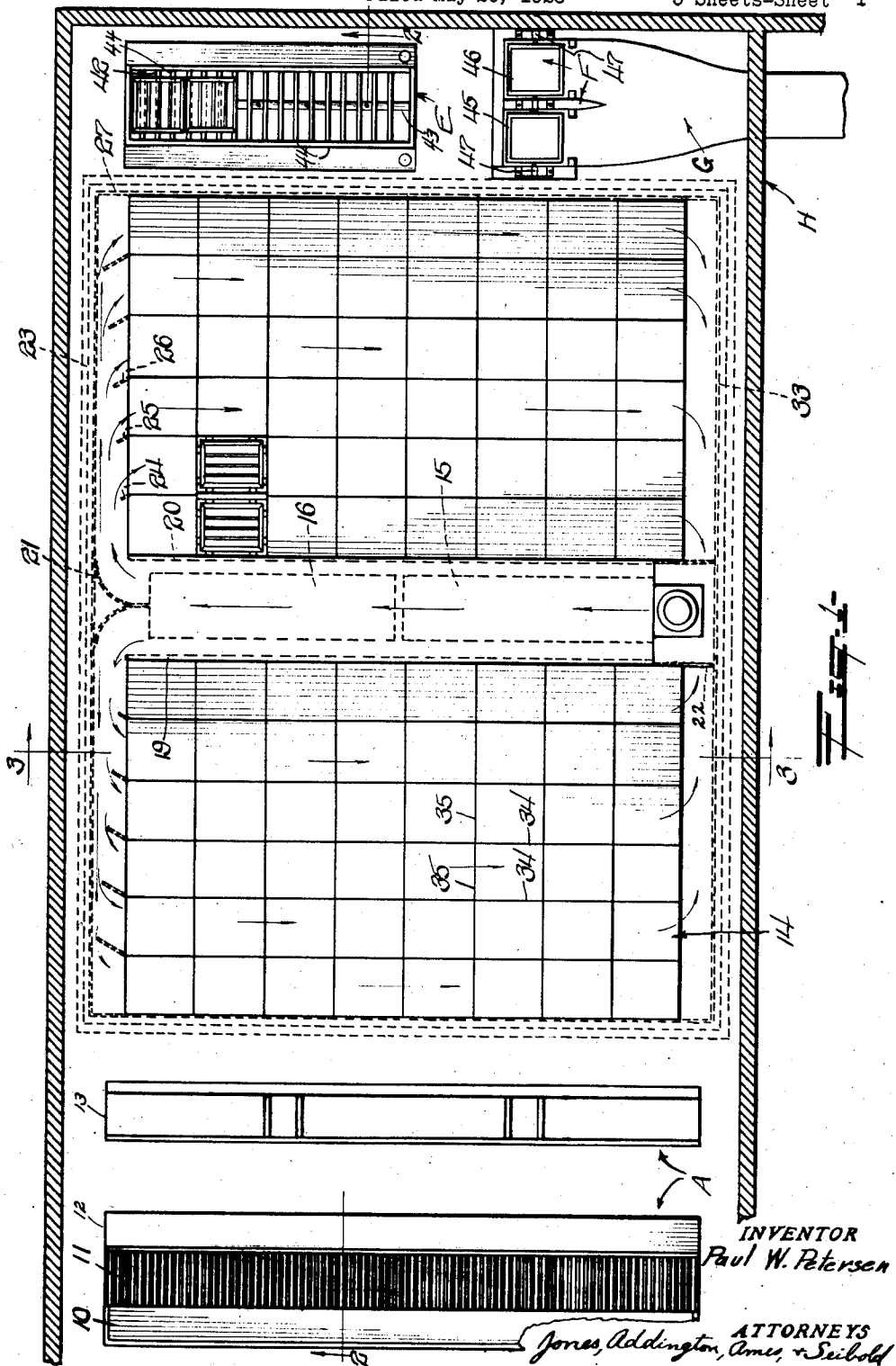
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P. W. PETERSEN

REFRIGERATING METHOD AND APPARATUS

Filed May 26, 1923

3 Sheets-Sheet 1



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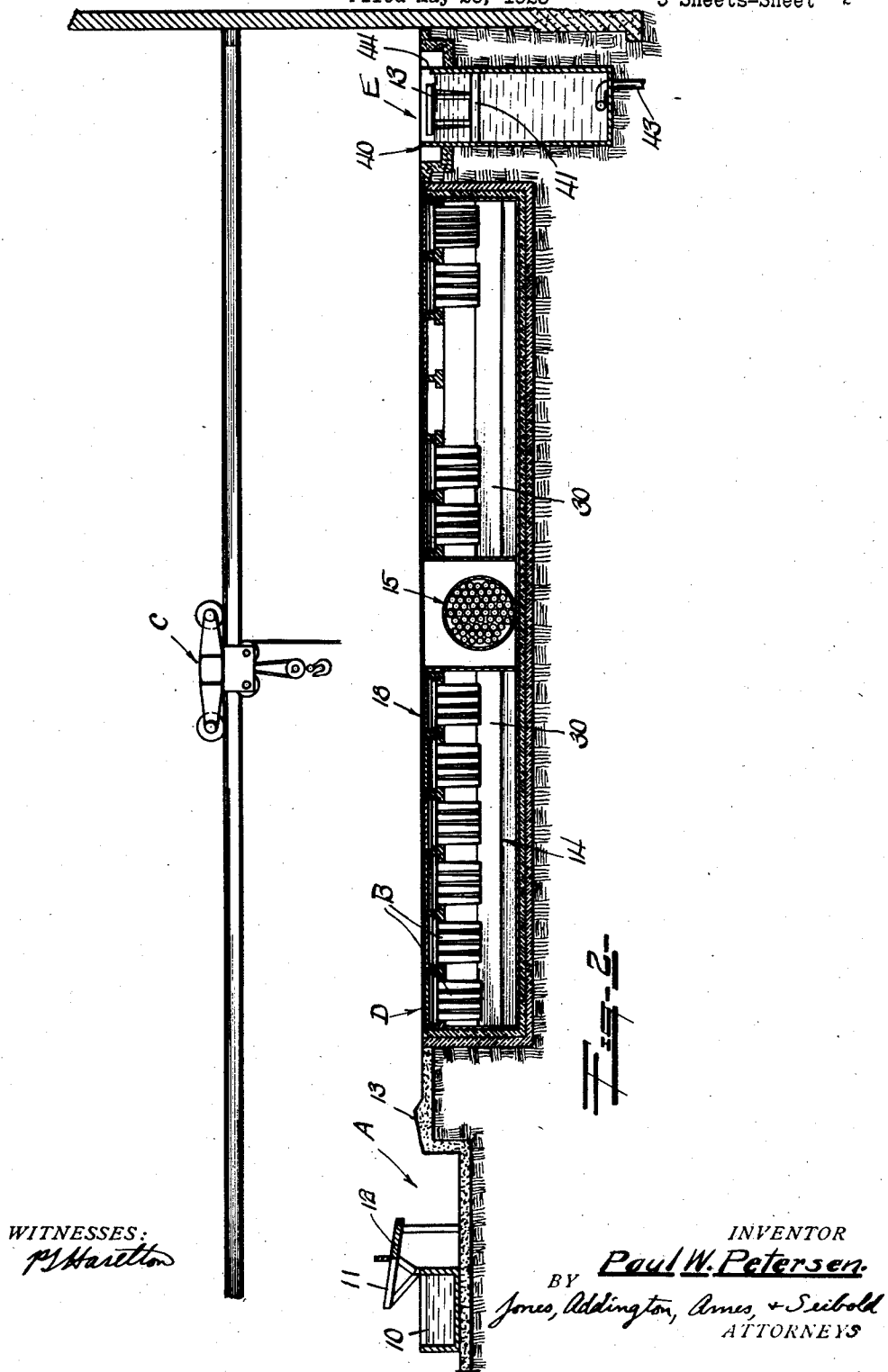
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3 Sheets-Sheet 2



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REFRIGERATING METHOD AND APPARATUS

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3 Sheets-Sheet 3

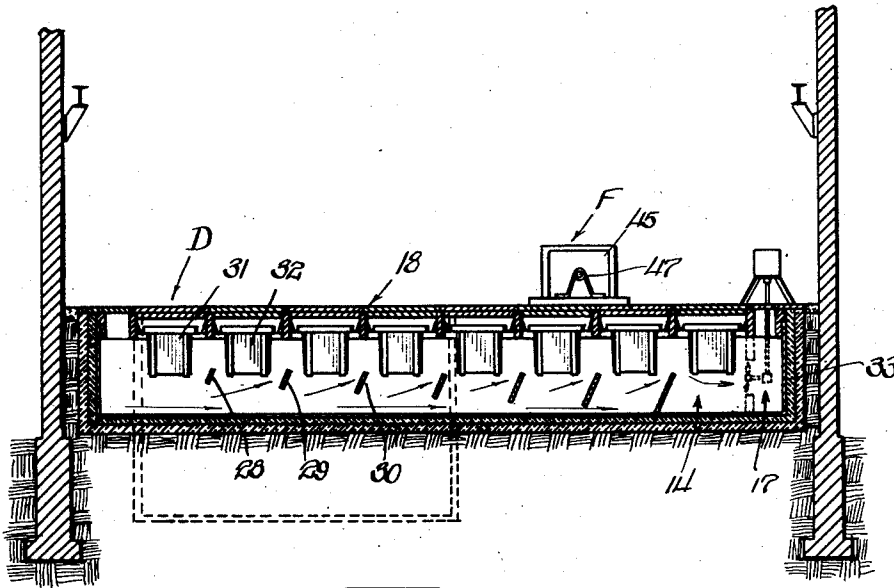


Fig. 3-

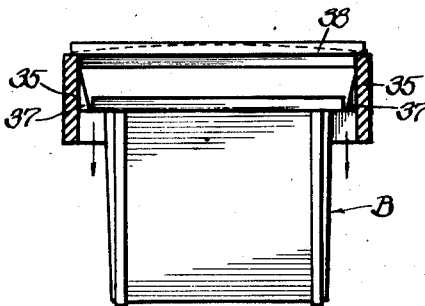


Fig. 4-

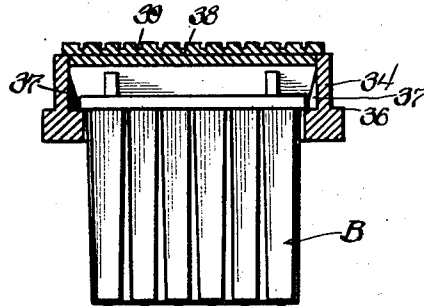


Fig. 5-

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UNITED STATES PATENT OFFICE.

PAUL W. PETERSEN, OF BAY CITY, MICHIGAN.

REFRIGERATING METHOD AND APPARATUS.

Application filed May 26, 1923. Serial No. 641,648.

This invention relates to methods and apparatus for treating comestibles and more particularly to methods and apparatus for refrigerating and handling comestibles.

5 It has been my experience in this field that it is very advantageous to cool or freeze certain comestibles very rapidly, once the process has begun. It is also very desirable to design and arrange the equipment in a manner
10 whereby the various parts of the apparatus are practically continuously in use as is the case when a cyclic form of operation is carried out with the apparatus. Under such conditions very efficient use may be made of
15 both labor and of the refrigerating equipment.

With the above experience in mind, I have accordingly developed a process and apparatus possessing the above desirable characteristics and one particular object of which
20 is to effect a continuous operation of the various steps involved in the refrigeration process and to so proportion the different parts of the apparatus that the operation thereof can be carried out with a substantial saving
25 of expense, time and effort.

Another object of my invention is to provide an improved method and an equipment whereby containers filled with the comestible
30 may be immersed in a refrigerating bath, removed to a warming bath to release the frozen comestible from the container walls and then emptied. I further aim to provide an equipment of this nature whereby all of
35 its parts or elements may be not only practically continuously made use of but also may be made use of in accordance with a carefully determined cyclic operation of the equipment which also contributes to the efficient
40 use of apparatus and of the operator's entire working time.

A further object is to so arrange the apparatus and equipment that a saving in volume and area of space may be effected
45 without in any way detracting from the proper operation of the equipment.

Another object is to provide an improved frame and floor construction for use in connection with the refrigerating trough embodied in this invention for the purpose
50 of eliminating or greatly reducing the possibility for drippings of refrigerating liquid from coming into contact with the comestibles refrigerated.

55 Another object of this invention is to provide an apparatus which permits an ap-

proximately uniform speed of refrigeration at the various parts of a large refrigerating trough wherein the comestibles may be disposed, preferably in containers.

A further object of my invention is to provide a method and equipment of the above indicated character which is especially adapted to the freezing and handling of comestibles of the nature of fish, although it is to be understood that other varieties of comestibles may be treated by this process and equipment, and hence I do not desire to be limited in any way to the use of the invention with this particular comestible.

Another object of this invention is to provide apparatus of the character indicated which shall be convenient and durable in use and economical and simple in construction.

Other objects of the invention will become apparent from the following description, the accompanying illustrations and the appended claims.

For the purpose of illustration and description, one specific embodiment of the invention is shown in the drawings, in which—

Figure 1 is a top plan view of a refrigerating plant including my improved apparatus, which is adapted to be operated in accordance with the method embodied in my invention;

Fig. 2 is a longitudinal sectional view thereof taken on the line 2—2 of Fig. 1;

Fig. 3 is a transverse sectional view of the refrigerating plant taken on the line 3—3 of Fig. 1;

Fig. 4 is a sectional view showing a section or compartment in a refrigerating trough and showing one of the containers therein in which the fish or other comestibles may be enclosed during the refrigerating process; and,

Fig. 5 is a sectional view similar to Fig. 4, but taken at right angles thereto.

In a general way, the equipment embodying the present invention comprises apparatus at —A— by which comestible containers —B— may be conveniently filled or packed with the comestible which is to be cooled or frozen. This apparatus will be hereinafter termed a container filling station. A traveling crane or hoisting device of any suitable and known type is indicated at —C— and provides a means for moving the comestibles and their containers —B— from one point to another in the course of the operation of the equipment.

From the container filling station —A—

the containers —B— may be moved to the refrigerating station —D—, which comprises a tank or trough containing a liquid refrigerant in which the containers are immersed.

5 From the refrigerating station —D— the containers may be moved to a container warming station —E— which comprises a tank or trough of water of a temperature sufficiently high to thaw and release the
10 frozen comestible from the walls of the container. From the warming station —E—, the containers may be taken to an emptying station —F— from which the contents of the containers are allowed to fall into a trough
15 or body of water at —G—. The comestibles may then by floating in the body of water, pass out of the freezing room into a cold storage room at the opposite side of the wall —H—, as indicated in Fig. 1. The emptied
20 containers may then be returned to the filling station by the hoist, as will be later explained more fully.

The container filling station —A— will now be described more in detail. The fish or
25 other comestibles which are to be frozen may be dumped into a trough 10 where they may be washed if necessary and from which they may be removed to a rack 11 composed of spaced slats between which the water may
30 drain into the trough 10. The comestibles may be taken from the rack 11 and packed within the containers —B—. For this purpose, benches 12 and 13 may be made use of in accordance with the process disclosed in
35 the patent to Paul W. Petersen, July 11, 1922, #1,422,126, or in accordance with any other suitable methods. A description of the particular methods of packing the comestibles within the containers is not necessary
40 to the understanding of the present invention and consequently will not be here entered into in detail.

After each of the containers —B— has been filled at the container filling station
45 —A— they may be transported by the hoist —C— to the refrigerating station —D—, which will now be further described in detail.

A refrigerating trough is shown at 14,
50 which may be provided with an insulated base and walls of any suitable type, such for example as commonly used in refrigerating troughs for the manufacture of artificial ice and the like. Cooling devices 15 and 16 may
55 be centrally disposed within the tank 14 and may be of any suitable known construction, such for example as the usual ammonia cooling units. A motor driven propeller 17 (see Fig. 3) may serve to circulate the liquid
60 refrigerant within the tank 14 through and around the cooling units 15 and 16. The path taken by the refrigerating liquid while being circulated is indicated by the arrows in Figs. 1 and 3. As indicated in the illustrations, a frame work 18 may be mounted

over the tank 14 and is provided with a plurality of spaces or openings for receiving the comestible containers —B— and for retaining these containers in their desired position as immersed in the refrigerant during the
70 freezing process.

It will be noted that certain of the containers when placed within the frame work 18 will be at a greater distance than others from the cooling units 15 and 16. Accordingly, it
75 is desirable in order that uniform freezing may take place within the various containers, that suitable means be provided to carefully regulate the circulation of the refrigerant at the various parts of the tank. In
80 practice, the length of time necessary for freezing the contents of the containers has been found to depend upon both the temperature of the surrounding refrigerant and the velocity of the circulation of the refrigerant in the neighborhood of the container. For
85 example, if the refrigerant in close proximity of the container is of an extremely low temperature, rapid refrigeration will take place even though the refrigerant is only slowly
90 circulated. However, in order to accomplish refrigeration during an approximately equal length of time with a slightly higher refrigerant temperature, it is desirable to circulate the refrigerant at a higher velocity in close
95 proximity of the container, and, if possible, to add "unused" quantities of the refrigerant at the original low temperature from time to time.

With the above factors in mind, I have designed a system of baffles for use in the trough
100 14 which permit refrigeration to take place in all of the comestible container spaces or positions at a substantially uniform rate. Transverse partitions 19 and 20 may be provided along each side of the cooling units 15
105 and 16 in order to confine the refrigerant flowing from the propeller 17 to the immediate neighborhood of the cooling units 15 and 16. At the end of the unit 16 a pair of adjacent curved deflectors as at 21 may be provided, as illustrated, for deflecting the refrigerant from the cooling units in substantially equal amounts to each half of the tank
110 14, as indicated by the arrows. If desired, the position of the deflectors 21 may be made adjustable so that they may be moved into alignment with one or the other of the partitions 19 and 20 in the event that but one
115 half of the tank is being used. Removable gates as at 22 (indicated by dotted lines in Fig. 1) may be also provided at the side of the tank adjacent the propeller 17 for use when but one half of the tank is in operation. The two halves of the tank 14 may be each
120 designed in accordance with the same principles. As the refrigerant is deflected from the deflector 21, it will flow along the wall 23 of the trough. A series of baffles 24, 25, 26, etc., may be provided adjacent but spaced
125 130

slightly away from the wall 23, each succeeding baffle being slightly wider and extending into closer proximity of the wall 23. These baffles each serve to deflect a portion of the flow toward their corresponding rows of comestible containers. Each succeeding baffle serves to deflect a small portion of the flow that is not deflected by the preceding baffle, so that at the end 27 of the trough, the entire flow will have become deflected inwardly among the rows of containers with substantially equal amounts of refrigerant deflected against each row.

The refrigerant next flows down along each row of comestible containers in a manner indicated by the arrows in Fig. 3. The velocity and direction of flow of the refrigerant is here controlled by a series of baffles 28, 29, 30, etc. The upper edges of these baffles may be all substantially at an equal height in the refrigerant and in fairly close proximity to the bottoms of the comestible containers; however, each succeeding baffle extends downwardly into closer proximity of the bottom of the tank. Accordingly, each succeeding baffle will force a greater amount of the liquid refrigerant upwardly around and in contact with the comestible containers. Also, the entire stream underneath the comestible containers will remain almost unaltered in temperature by the heat given off by the containers, except as each succeeding baffle deflects more and more of this "unused" refrigerant upwards into the proximity of and in contact with the comestible containers. The last baffle forces the last of the unused stream upwardly between the last containers of each row, thereby insuring that all of the brine is used before being returned to the coolers. At the same time each succeeding baffle being larger than the preceding, the flow of refrigerant will be more and more restricted thus resulting in a higher velocity in the immediate proximity of each succeeding container. This increased velocity is very desirable in view of the fact that as the refrigerant flows past each succeeding container its temperature will be gradually raised even though additional quantities of cold refrigerant are being added from the stream below the containers, and accordingly in order to effect freezing within the same period of time at all of the containers, the increased velocity is utilized in accordance with the principles above pointed out to compensate for the slightly higher temperature of the refrigerant.

For example, in Fig. 3 the container 31 is comparatively near the cooling unit 16 and accordingly the refrigerant in this region is initially of a very low temperature. While passing the container 31 however, the refrigerant temperature will become slightly raised before flowing past the container 32. However, the baffle 28 serves to slightly restrict

the area of the flowing stream of refrigerant and consequently an increased velocity results, especially in the immediate neighborhood of the container since the baffle 28 is placed at an angle such that the refrigerant will be deflected upwardly against the container walls. In a like manner, the velocity of the refrigerant past each succeeding container is increased by the use of wider baffles which result in the circulation of larger and larger portions of the flow at greater velocities upwardly and around each succeeding container. After striking the wall 33 at the side of the trough 14, the refrigerant may return to the circulating propeller 17 to again pass through the above described cycle.

The frame work 18 may comprise transverse stringers as at 34 and longitudinal stringers as at 35. The stringers 34 may be provided with shoulders 36, upon which the top edges of the comestible containers —B— may rest. The stringers 34 and 35 may be provided at each of the container openings with a plurality of tapered spacing blocks as at 37 which serve to space the open top edges of the containers —B— from direct contact with the stringers. This spacing is sufficient to prevent the flow of refrigerant drip from the stringers into the containers —B— and thus possible contamination of the contents of the containers from this source is avoided. The container tops being spaced from the stringers, the drip is permitted to drain from the stringers directly down into the trough, as indicated by the arrows in Fig. 4. In addition, a removable cover as at 38 may be provided over each container and is preferably formed with inclined grooves as at 39, permitting any liquid thereon to drain to the stringers 34 or 35. The covers 38 therefore serve to deflect away any drip that may fall from other containers while being immersed or removed from the tank.

After the comestibles within the containers —B— have been frozen within the refrigerating station —D— the containers may be removed therefrom by the use of the hoist —C— and then carried to the warming or "thawing" station —E— which will now be described in detail.

A deep elongated trough 40 may be provided with a platform 41 at the proper height therein to support the containers —B— without permitting the water to enter the open tops thereof. The platform 41 should preferably be composed of spaced slats as indicated at 42 (Fig. 1) in order to permit the free and rapid circulation of water in the tank. The tank may be filled with ordinary tap water or fairly tepid water from any other desirable source. In order to prevent the rapid cooling of the water within the trough by the cold containers —B—, it is desirable to design the tank 40 with substantial depth as here illustrated in order to pro-

vide a large volume of the warm water and to consequently permit a more uniform temperature of the water even though considerable quantities of the water are displaced at intervals by the cold containers being inserted or removed. Means may be provided as by an inlet 43 and overflows 44 for permitting circulation of water in and out of the trough. The water inlet should preferably be in the form of a pipe as shown, discharging water at the bottom of tank in approximately equal quantities under each container space thus providing uniform circulation throughout the trough and resulting in fairly even thawing in all of the comestible containers. If the water is permitted to become too warm in the tank, excessive thawing of the comestibles may take place, whereas if the water becomes too cold a glazing of ice may form on the exterior of the comestible containers. The overflows 44 should preferably be comparatively large and are here shown as extending along the entire longitudinal upper edges of the trough in the form of gutters. Outlets or overflows of such large linear dimensions are desirable in order to permit the rapid displacement of the body of water equivalent to the size of the container —B— when such a container is immersed therein. If the water is thus allowed to be rapidly displaced, the danger of the overflowing of water into other containers within the tank is greatly lessened.

My experience has shown that it is desirable to immerse the containers in the warming bath to a depth sufficient to bring the water level as close as possible to the tops of the containers without danger of its overflowing into the containers during the immersion or removal of a container. Obviously, by the use of large overflows, this danger may be greatly reduced, and at the same time the container walls may be immersed to practically their entire height. The desirability of immersing the upper portion of the container arises from the fact that if this portion is left exposed, it not only will fail to become warmed sufficiently to thaw and release the comestibles, but quantities of frost from atmospheric moisture will gather thereon and further greatly hinder the removal of the contents. These facts are especially true when the refrigeration is carried out at exceptionally low temperatures, as best suit my processes. It is thus obvious that a warming tank constructed in a manner to embody the above described features may be conveniently and rapidly used and is especially adapted for use with a refrigerating plant wherein a continuous or cyclic plan of operation is carried out as will be hereinafter described.

After the containers have remained within the warming station —E— for a sufficient length of time to release the frozen comes-

tibles from adherence to the container walls, they may be removed by the use of the hoist —C— to the emptying station —F—.

A preferred form of emptying device to be used at the emptying station —F— is fully shown and described in my copending application entitled Methods and apparatus for refrigerating comestibles, Serial No. 631,932, filed April 13, 1923, and consequently will not be here described except in so far as necessary to the proper understanding of the present invention.

The containers —B— may be clamped in any of two or more emptying devices or frames as at 45 and 46. The devices 45 and 46 as indicated in Figs. 1 and 3 may be mounted upon trunnions as at 47 and consequently may be inverted thus permitting the comestibles to drop out into a trough of water —G—. In the trough of water —G— the frozen comestibles may acquire a coating or glazing of ice and at the same time may be floated out of the refrigerating room into a storage room by passing through an opening in the wall —H—.

In designing the refrigerating station —D— I have found it desirable to provide a number of container spaces substantially equal to the measure of the period of freezing divided by the measure of the period of a single cycle of operation of the entire equipment. In other words, at least a sufficient number of spaces is provided to permit substantially continuous operation of the entire equipment by following a defined cyclic operation. The spaces of the refrigerating station preferably may be operated in rotation in a manner which may be termed progressively cyclic. Whenever the hoist operator places a container in the refrigerant he removes the container next adjoining and carries this container with the frozen comestible to the thawing station. The thawing or warming station —E— may be conveniently constructed to accommodate three or more containers simultaneously in order to permit two containers to remain therein at all times. The containers thus may be warmed for a period equal to that required for two complete cycles of operation of the entire equipment. Whenever a container is removed from the refrigerant to the warming station, the container which has been at the warming station the longest is thereupon removed and is carried by the hoist to one unit of the emptying station. An empty container already at the other unit of the emptying station then may be removed and deposited at the filling station. A filled container is then moved from the filling station and deposited in the space just emptied in the refrigerating station, thus completing one cycle of operation of the equipment. It has been found practical for one man operating the hoist to complete such a cycle in approximately two min-

utes or less. Hence if a period of two hours is required for freezing, then approximately 60 spaces would be needed in the refrigerating station to permit continuous operation of the equipment. Each container may then be permitted to remain at the warming station for one, two, or more cyclic periods. In order to adapt the equipment to a longer period of freezing, if desired, a corresponding increase in the number of spaces in the refrigerating station may be provided. However, in actual practice the time of operation is usually somewhat greater as a result of occasional delays. This does not materially interfere with the proper operation of the process, however, but merely permits a longer period of freezing thus insuring a thorough carrying out of the process. If desired, more than one container may be simultaneously transferred by the hoist, in which case corresponding increases in the number of emptying units and warming spaces are made.

While I have described in detail one particular embodiment of the structure comprising my invention and a particular process for using the equipment, it is to be understood that I desire only such limitations placed upon my invention as may be required by the prior art and as are set forth in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent in the United States, is:

1. Apparatus for refrigerating comestibles comprising a plurality of portable open top comestible containers for insertion into a body of refrigerating liquid, frame members having flanges for engaging each container and mounted over the body of liquid for carrying the weight of said containers while immersed in the liquid, and spaced means for holding the top edges of each container horizontally spaced from said frame members whereby refrigerant drip from others of said portable containers is prevented from draining into the open top of the container from said members.

2. Apparatus for refrigerating comestibles comprising a plurality of portable open top comestible containers for insertion into a body of refrigerating liquid, frame members having flanges for engaging each container and mounted over the body of liquid for supporting said containers while immersed in the liquid, removable covers supported by said frame members over each of said containers, said covers being spaced above the tops of said containers, and spaced means for holding the top edges of each container horizontally spaced from said frame members whereby refrigerant drip from others of said portable containers is prevented from draining into the open top of the container from said members.

3. Apparatus for refrigerating comestibles

comprising a plurality of portable open top comestible containers for insertion into a body of refrigerating liquid, frame members having flange elements for engaging each container and mounted over said body of liquid for carrying said containers while immersed in the liquid, removable covers supported by said frame members over each of said containers, said covers being spaced above the tops of said containers and formed to permit drainage of refrigerant drip therefrom onto said frame members, and said flange elements including spaced means for holding the top edges of each container horizontally spaced from said frame members whereby refrigerant drip from others of the portable containers is prevented from draining into the open top of the container from said members.

4. Apparatus for refrigerating comestibles comprising a plurality of portable open top comestible containers for insertion into a body of refrigerating liquid, and means over said body of liquid for removably supporting and covering said containers when in an immersed position in the liquid, said means being formed with channels to permit refrigerant drip to drain therefrom into said body of liquid and to divert refrigerant drip from the open tops of said containers.

5. Refrigerating apparatus adapted for the reception of a refrigerating liquid, cooling means therein, means for circulating the liquid, a series of baffles for separately controlling the volume of liquid circulating to various areas of said apparatus, and a second series of baffles for individually controlling both the local volume of unused liquid and velocity of circulation within various sub-areas in a manner whereby substantially uniform refrigeration may take place at all parts of the body of liquid.

6. Refrigerating apparatus comprising a tank of refrigerating liquid, means for cooling the liquid, a plurality of comestible containers immersed in the liquid and spaced from the bottom of the tank, means for circulating the liquid within the tank to and from said cooling means and around successive containers, and baffles substantially beneath the level of each of said containers, said baffles being inclined to deflect upwardly a portion of the liquid circulating beneath the containers.

7. Refrigerating apparatus comprising a tank of refrigerating liquid, means for cooling the liquid, a plurality of comestible containers immersed in the liquid and spaced from the bottom of the tank, means for circulating the liquid to and from said cooling means and around said containers, and baffles substantially beneath the level of each of said containers, said baffles being inclined to deflect upwardly a portion of the liquid circulating beneath the containers, the baffles at con-

containers remote from said cooling means being of greater area than the baffles at containers near said cooling means whereby a larger amount of the liquid is circulated in the immediate proximity of the remote containers.

8. Refrigerating apparatus comprising a tank of refrigerating liquid, means for cooling the liquid, a plurality of comestible containers immersed in the liquid, means for circulating the liquid to and from said cooling means and around said containers, and baffles for deflecting a portion of the circulating liquid into the immediate vicinity of each of said containers, the succeeding baffles at each container more remote from said cooling means being of greater area whereby the effects of the rising temperature of the circulating refrigerant are substantially compensated for by the resulting increased velocity of the refrigerant past each succeeding container.

9. Apparatus of the character described comprising a tank of refrigerating liquid, means for circulating and cooling the liquid, a plurality of comestible containers immersed in the liquid and arranged in tiers transversely of the tank with a channel for the flow of liquid from said cooling means longitudinally of the tank, and baffles of various different areas at each of the tiers of containers for deflecting between the succeeding tiers a predetermined portion only of the entire flow in the channel.

10. Apparatus of the character described comprising a tank of refrigerating liquid, means for circulating and cooling the liquid, a plurality of comestible containers immersed in the liquid and arranged in tiers transversely of the tank with a channel for the flow of liquid from said cooling means longitudinally of the tank, and baffles at each of the tiers of containers for deflecting toward the containers a portion of the flow in the channel, the succeeding baffles at each tier of containers more remote from said cooling means being of greater area whereby the effects of the decreasing flow of refrigerant

along the channel are substantially compensated for by the deflection of larger portions of the remaining flow by each succeeding baffle.

11. Apparatus of the character described comprising a tank of refrigerating liquid, means for circulating the liquid, means disposed transversely of said tank and substantially centrally thereof for cooling the liquid, transverse partitions at either side of the cooling means, and an adjustable baffle member at the ends of said partitions for deflecting at right angles to said partitions a predetermined amount of the circulating liquid toward either end of the tank.

12. Refrigerating apparatus comprising a subdivided tank with comestible containers and refrigerating liquid therein, means for cooling the liquid and circulating the liquid in a channel to and from the cooling means and around successive containers, and means adjacent each container for restricting said channel by an increased amount at each successive container, whereby the velocity of flow is increased in the immediate vicinity of successive containers.

13. Apparatus of the character described comprising a tank of refrigerating liquid, means for circulating and cooling the liquid, a plurality of comestible containers immersed in the liquid and arranged in tiers transversely of the tank with a channel for the flow of liquid from said cooling means longitudinally of the tank, the effective area of said channel being different adjacent each succeeding tier of containers, whereby a predetermined portion only of the entire flow is diverted between succeeding tiers.

14. Refrigerating apparatus comprising a subdivided tank with refrigerating liquid therein, cooling and circulating means therein, and means for controlling the effective area of the circulating channel for each subdivision of the tank.

In witness whereof, I have hereunto subscribed my name.

PAUL W. PETERSEN