This invention relates to the packaging and preservation of perishables, particularly for transportation thereof over long distances and to the preservation of same during handling and storage.

When such goods are transported overland, as by railroads or in motor trucks, it is customarily necessary to house them in refrigerated, humidified or humid, heavily insulated compartments which must, at considerable expense, be maintained refrigerated during transit. All the articles in such a compartment must be entirely of this nature, not susceptible to the detrimental influences of rigidity and humidity, and cannot include a commingling of refrigerated and humidified perishables with goods apt to be damaged by cold and moisture, for example, ferrous articles.

Individual insulated containers for perishable goods have hitherto been proposed for obviating continuously refrigerated compartments and enabling carrying mixed cargos in the same enclosure or compartment, but they ordinarily require the use of brine or other liquid refrigerant, which is continuously circulated at a costly rate of power and refrigerant consumption; are un-economically heavy due to the weight of refrigerant and refrigerant containing and circulating means; and are of a rigid nature and fixed size and hence do not permit variation of the ratio of overhaul capacity or load to backhaul load capacity. They furthermore cannot be left standing for any appreciable length of time on either the loading or the unloading dock without serious injury to the perishables because of the imperfect thermal insulation provided thereby; and will not absorb the repeated heavy impacts occurring during the careless handling such containers receive, to protect the fragile perishable contents from damage. Because of their fixed size and rigid shape, the single layer level which can be built up on the floor of a compartment with these containers is limited strictly by the height of the cargo door, since these containers cannot be collapsed or varied in volume or shape.

By virtue of its collapsible construction, it permits the ratio of the overhaul containers to the backhaul containers to be varied so that the same carrier can be used in both directions of transit inasmuch as it can go outbound in a full condition and return in an empty or partially empty condition ready to be filled on the succeeding overhaul. By the same token it can be employed to carry partial orders either way. Thus, only the one size or dimensional nature of container need be built; that size being the maximum receivable in railway or motor truck or airplane cargo compartments.

Its novel construction of thermal insulating means, precoo ling means and air tight nature enable it to be left standing on the docks without possibility of damage to the perishable containers for sufficient lengths of time to easily coordinate the traffic handling of trucks meeting aircraft at the dock without actually delaying truck schedules to exactly coincide with aircraft schedules which often are delayed because of uncontrollable influences. Since substantially all of the elements of the container are rugged and durable, although put together in a novel manner to enable collapsing and disassembling,
the perishables can be loaded directly into the container for transport therein through every stage of transit including the quite careless and rough treatment often received in bringing them to the railway line, the motor truck or the airplane from the farm, the produce market, or the storage plant in light, partly balanced and sprung trucks. Thus, there is eliminated the necessity for first loading the individual crates or separate perishable items into a container built to withstand this excessively hard handling, followed by transfer thereof into the container to be used for the transit in the railway car, motor truck, or airplane.

Because the container can be partially filled before it is inserted through the cargo door, filling being completed when the container rests on the cargo floor or deck, this being accomplished in one form of the invention through an access flap in the container constructed nonetheless to maintain insulating integrity, the single layer level of cargo achievable within the compartment by means of this container is restricted as heretofore by the height of the cargo door, being limited only by the height and extensibility of the container. Since the container is composed of separable parts, it may be disassembled at its destination if no return load therefor is available, whereas if it can be stored in comparatively, exceptionally small compass in the compartment, thereby to render available on the cargo floor, space that can be used for payload other than the perishables unavailable at this end of the run.

The other concepts, aims, and accomplishments, as well as many other novel features of the invention will either be made manifest or become apparent hereinafter.

Soley for the purposes of further clarifying the inventive concepts and of enabling at least one form of the invention to be reproduced hereafter, one of the presently preferred structural forms of the inventive concepts is shown, by way of example only, in the accompanying drawings and described hereinafter by reference to and in connection with these drawings. It is to be understood that the inventive concepts and principles are limited only to those which are configurationally set forth in the annexed claims, and the ambit of the patent is to be limited only by the scope of these claims interpreted in the light of the drawing and description.

In these drawings, Figure 1 is a perspective of the article in its extended condition ready to be completely or partially loaded and inserted in the transport compartment of either improved or unimproved nature;

Figure 2, which is an enlarged fragmentary detailed sectional view taken transversely of one corner of the container to show the details of construction of the pallet, the preceding and contained and the construction of the Ried bottom of the container;

Figure 3 is a vertical cross-section taken on line 3—3 to show the internal construction of the container lining or retainer member, the container being shown in an extended and the partially collapsed conditions;

Figure 4 is a fragmentary, enlarged detail of the top portion of the section taken on line 3—3 of Figure 1 to illustrate the construction of the refrigerant vent valve or relief valve;

Figure 5 is a longitudinal view of the combined corner post and refrigerant distributing conduit;

Figure 6 is a horizontal sectional view of the container along line 6—6 of Figure 1 sighting in the direction of the arrows;

Figure 7 is an enlarged longitudinal, sectional view taken on line 7—7 of Figure 1 and sighting in the direction of the arrows to show the construction of the tie-down members of the container, and;

Figure 8 is a perspective of the container with its parts disassembled and packed together in a small compass to enable storage thereof in a storeroom or other space in the aircraft not used for cargo transport so that when no perishables are available for transport the container space may be employed for cargo other than perishables.

The exemplifying embodiment illustrated in the aforesaid drawings essentially includes the following principal elements broadly summarized: first, a pallet or double base 10 dually functioning as the vertical-load taking member or rigid bottom of the container and as a lift-member or open framework into which the prongs of a lift truck can be easily inserted and securely held. It further includes a plurality of vertical, telescoping members 12 carried by one of the four corners of the base and outlining and defining the vertical edges of the container. A flexible, tough, and resistant reticulate retainer member 12 lines the container and is carried by loops 12a theremembrance of spiraling the adjacent corner posts in a plurality of vertically spaced stations. The member 12 serves to take all lateral thrust and loads emanating from the shiftable contents of the container. Fluid admitting and conducting means 13, here shown as combined or integral with but one of the corner posts, are provided to entrain a gaseous refrigerant into the container. Valve means 14 is provided for relieving excess refrigerant pressure or to vent any heated refrigerant or warm air rising to the top of the container. A substantially flexible and collapsible, substantially airtight, thermally insulated cover 15, here shown as a cap or dome-member, is fitted down around the outside of all the aforesaid members and is detachably secured at all its lower peripheral edges to the substructure edges of the load base 17. Means 15, here shown as substantially conventional bolts, but of any suitable nature desired, are provided and engaged with the base 17 and the floor for releasably anchoring the container to the floor of the compartment in an improved manner hereinafter particularized. Certain important and useful adjuncts, hereinafter described in detail, are also provided but the basic objects and accomplishments of the invention may be achieved by an alternate design including only the aforesaid essential components.

The bottom or base unit 10 of the container generally constitutes at one and the same time both a pallet or handling member and a rigid container-bottom, and comprises an upper upper compartment or load plate 17 and a lower component or foot 18. The component 17 in the embodiment herein selected for illustrative purposes consists essentially of a single piece of a well known type of sandwich board structural material and here shown as made up of a panel and another laminated on its opposite faces with fibrous or wooden veneer facing sheets 22 as by a phenolic resin or the like. Thereby is provided a thermally non-conducting, thermally impenetrable, substantially rigid, force-resisting load base of an improved nature. This member 17 is spaced vertically from the member 15 at various points of the peripheral regions of both members by short, hollow, flanged tubular spacers or compression
members 21, which if desired, can be made of any material having sufficient compressive strength to resist the action of the load on member 17. A nipple 21a of thermal insulating material, such as Bakelite, or the like, is screwed at its lower end into the upper end of each of the tubular members 21 and extends upwardly substantially airtight through suitable apertures in the outer member 18. The upper end of each nipple 21a is provided with threads to enable it to engage certain socket members 25, later described. By this construction, no rivets, screws or other heat conductors capable of providing a heat path into the interior of the container are employed, the members 21 and 25 instead being clamped in this configuration to the base member 17 and engaging only the member 17 and only through the insulating nipple 21a. In the present embodiment it is preferred that members 21 be constructed of a suitable metal.

The member 16 is made up as a rectangular reticulate framework from a plurality of inverted metallic channels 22 united by a metallic plate 23 provided with lightening holes, not shown. Scuff plates 24 are united in facewise contact with both the opposite faces of member 17. The upper plate 24 serves to prevent the sandwich board bottom of the container from being damaged no matter how long it is used, relieving it of all abrasion, penetration, dents, and the like and the lower scuff plate functions to take the abrasion and impacts of the lift proving of the lift truck.

Detachably mounted at each of the four corners of the rigid bottom member of the container, as by socket members 25 and detachable pins 26, are the four telescoping corner posts 11. Each post is comprised of two hollow concentric tubular members 27 and 28 mounted in mutually axially, slidable relationship. The inner, upper one of the two tubular members of each post is inwardly recurved at its upper end, which is tapered to a small central opening designed to emit a stream of pressurized frigid air or other frigid gas for the application of the initial and sole refrigerating mass for the container. This member, and the lower outer member also is provided at a series of vertical apertures 29, all capable of discharging a pressurized refrigerating gas. A removable lock pin 30 may be provided in the lower one of the tubular members and extends through both tubes in such manner as to maintain them in any desired vertically adjusted relationship.

The reticulate, flexible framework or lining 12, constituting the chief lateral load-taking member of the container, is constructed of a plurality of strips 31 mutually rectangularly disposed and united at their intersections. The retainer thereof formed is suspended by its uppermost strips from the adjacent recurved portions of the corner posts. The lower courses of the retainer are engaged with the adjacent corner posts by means of loops 12a formed integral in the courses at the corners thereof. The retainer 12 has a vertical dimension sufficient to extend from the uppermost limit of the expanded container to the base member 17. The strips of the retainer may be made of canvas, fabric, or rubber, but any suitable flexible but strong, heat insulating material may be employed. A plurality of snap catches 32 such as harness hooks are mounted on the lower portion of this lining member in each of a plurality of laterally separated stations in a plurality of vertically separated rows and each hook is adapted to engage securely but releasably a corresponding hook-eye 33 or the like, attached to the subjacent region of the upper face of the load base 17. The catches of successive courses on the lining 12 are adapted to successively come down into engagement with the eyes 33, in vertical succession as the container is collapsed, and as the lower portion of the lining 12 is folded under and inwardly, the loops 12a slipping down the corner posts to new positions.

The flexible and tensile-resistant lining 12, being anchored at its top and bottom terminals and being supported laterally and vertically at each corner post, serves well to maintain crated perishables in their original stacked arrangement, preventing any lateral shifting thereof and is also capable of serving as a binder to bundle loose perishable items into a relatively tight, secure and substantially unitary package. Additional straps may be passed across the top of the space and connected to straps 31 to resist any vertical displacement of the load.

At one of the corners of the pallet, the spacer 21 is formed with a suitable nipple or eye 35 of any suitable nature for attachment thereto of a frigid air hose or other frigid air conduit. Air or other gas entering nipple 35 is entrained upwardly in the corner post and emerges from the vertically spaced series of outlets 28, the end flow emerging from the hole in the gooseneck at the uppermost end of the combined corner post and refrigerating conduit.

Over and outside all the parts lying above the baseboard fits the aforementioned thermally insulated, flexible, hermetically sealed cap or cover 15. The member 15 is preferably constructed of three layers or laminae, the two outermost layers 35 consisting preferably of a strong, wear-resistant but flexible material such as a canvas tarpaulin or the like. The intermediate layer 37 comprises a blanket consisting of a sabbatical fiber bonded on both faces with a polyvinyl preferably the chloride form thereof, the canvas sheets being quilted or sewn together through the fiberglas to form a unitary sheet. Although the cap may be formed from the one continuous sheet shaped thereto the concave form shown, it is preferable that it be constructed of separate segments or gores united along adjacent edges, as shown. This type of construction facilitates manufacture and enables the cap to be conformed more readily to the outline of the container and its contents and to be more easily fitted and removed. The cap 15 is detachably secured at its lower peripheral edges to the subjacent edges of the load plate 17 by means enabling easy and rapid engagement and disengagement of these two components and thus preferably includes a flap slide fastener 38, such as those manufactured by the B. F. Goodrich Company and commonly referred to in the trade as "flap-type zippers." These fasteners comprise two complemental members, one being held behind around the upper peripheral edges of the load plate and the other being carried by the lower edges of the cap and adapted to co-operate with the first said element in the usual slide fastener manner.

The container may be loaded in either of two ways: the load may be stacked over the load plate 17 before applying the cap, after which the cap may be fitted over and pulled down around it, which is preferable when a large number of bulky, heavy crates are employed; or, on the
other hand, when the load consists of separate smaller items, these may be successively inserted into the assembled container through a loading flap 39 formed in one face and the adjacent ends thereof and securable to the adjacent edges of the cap by means of suitable side fasteners. A valve is provided for relieving over-pressure conditions in the container caused by admitting an excessive amount of refrigerating gas or due to the gaseous contents becoming heated and rising, and is provided and are located preferably in the upper center part of the cap. In one form, these valves suitably comprise a one-way valve of the flap or diaphragm type. The valve shown includes an aperture 40 through the cap laminate. An apertured rubber or other flexible disk 41 is applied around the outer face of this aperture and is united to the outer side of the cap. Its central aperture 42 is of about the same diameter as the aperture 39 and the edges of this aperture lie inwardly adjacent the edges of the aperture 43. A rubber or similar disk 45 is applied over the disk 41 and is thereto united inwardly of its periphery.

Several apertures 44 are provided radially outwardly of the aperture 62. In normal condition, disk 43 lies flat on disk 41 with the apertures out of register, sealing the container against any ingress of warm air. Upon the building up of a slight internal pressure the disk 43 rises in the center, opening a path for the egress of air from the container through apertures 42 and 44.

In order to securely anchor the container to its supporting floor during transit in a manner enabling ready removal thereof at its destination, apertures 45, forming one component of a "hold-down" arrangement, are provided at a plurality of suitable locations around the peripheral edges of the load base. Through these apertures, bolts 50, or other suitable elongate fasteners such as one of the cam locking types, are passed into engagement with a suitable complemental means in the tie-down recesses 48 usually found in the cargo deck of transport vehicles. In the present embodiment the complemental means consists of positioning apertures 46 into which the bolts may be threadedly engaged. The apertures 46 are spaced apart distances correlated laterally and longitudinally with the spacing of the recesses 48 in the compartment floor so that, if desired, containers of varying horizontal dimensions may be suitably fitted together in a pattern made up of a plurality of units laterally and a certain other number of units longitudinally on the deck, these numbers being varied to suit the floor area of various types of cargo, aircraft, motor trucks or similar freight cars. By the construction afore-described, or its equivalent, the vibrations and gyrations of the transporting vehicle are rendered ineffective and are unable to displace the container, and the construction of the latter prevents internal displacement of its contents.

It is believed that the steps of loading and handling the container, the functioning of the container during transit, and the steps of unloading the container at destination will be self-evident from the foregoing description.

To meet the contingency that no return cargo of a perishable nature, or of any other nature making use of these containers worthwhile, is available, it is contemplated that the container can be disassembled, part by part, and stored away in the aft end of the aircraft, or in its overhead or side walls. Floor space is thus cleared for the non-perishable available cargo so that the vehicle may return full. To this end, it is only necessary to unfasten the lower slide fastened edges of the cap member from the base plate 11, whereupon the cap may be bodily removed and configured substantially into the illustrated form shown in Figure 8 as a compacted "G" laterally indented by a reverse accretion platen. Thereafter the fastening pins 30 on the corner posts are removed, allowing the corner posts to telescope downwardly, whereupon they can be removed from the sockets 28 and stored between the upper and lower members of the pallet. The reticulate lining or retainer 12, not shown in Figure 8, occupies a folded position inside the folded cap. The so-stacked elements may be lashed together to constitute a unit after being placed in the condition shown in Figure 8, whereupon the unit may be stowed as aforementioned in some space not being used on the return trip.

I claim:

1. A container comprising: a double-deck pallet having an open-framework lower deck and a continuous thermally insulated upper deck perpendicularly spaced therefrom to inhibit heat transfer theretwixt and to provide a receiver for lift truck prongs; a thermally insulated, flexible cover in the form of an inverted bag detachably attached at its lower peripheral edges to the adjacent edges of said upper deck; means carried by said pallet for precooling said container; and means carried by said pallet and surrounded by said cover for enabling various conditions of vertical extension of said cover to be attained and maintained, thereby to vary the volumetric capacity of said container.

2. A container, comprising: a double deck pallet having an open-framework lower deck and a substantially continuous thermally insulated upper deck perpendicularly spaced therefrom to inhibit heat transfer theretwixt and to provide a receiver for lift truck prongs; a thermally insulated, flexible cover in the form of an inverted bag detachably attached at its lower peripheral edges to the adjacent edges of said upper deck; a lateral-thrust taking liner framework detachably mounted on said upper deck within said cover; means carried by said pallet for precooling said container; and means for effecting variations of the vertical dimension of said framework, thereby to vary the volumetric capacity of said container.

3. A container, comprising: a hollow, substantially airtight enclosure including means in all the walls thereof for substantially precluding heat transfer from the outside to the inside of the enclosure and thermally isolating said hollow from the ambient air and surrounding objects; means for entraining a refrigerant gas into said container and for enabling controlled venting therefrom of excess gases; and means forming a part of said enclosure for providing access to the bottom of said container to enable loading the latter with transportable items; whereby to enable perishable goods to be transported, without detrimental effects, in the same uninsulated, unrefrigerated and unhumidified transport compartment as those susceptible to cold and moisture.

4. A container of the construction set forth in claim 3; said means for entraining said refrigerant gas into said container comprising a dual-function post-and-conduit defining and supporting said one of the corners of said enclosure and including a heat insulating lining in its lower end and terminating at its upper end in a gas outlet and
A container of the construction described in claim 3; said means for venting said container comprising a portion of the upper surface of said enclosure having an aperture therein; an aperture, flexible, thermally non-conductive plate mounted air-tightly thereon, said aperture and perforations thereof lying radially beyond the first said aperture; whereby the gaseous contents of said container may pass outwardly through said aperture and perforations, whereas ambient air seeking entrance merely passes said outer plate air-tightly against said inner plate and is thus prevented from entering said container.

5. A container substantially as described in claim 7, in which the flexible resistant lining member comprises an inverted cap-like member open at the one end and made up of a plurality of rectangularly crossing strips of flexible, tough material mutually united at their crossing points to define a reticulate web; snap catches mounted at the lower few courses of strips at the intersections thereof and disposed to engage downwardly; and a plurality of complementary catches disposed on said base to register with and be engaged by said snap catches when said lining is collapsed thereby to maintain the lateral integrity and resistance of said lining in all vertical conditions of said container.

9. A container for perishable contents, comprising: a hollow, flexible substantially air-tight thermally insulated enclosure including means for entraining a frigid gas thereto and for containing same therein; said enclosure including a corner-defining framework supporting the insulated, relatively flexible walls collapsible therewith on retractive telescoping of said framework and extensible on procurative telescoping thereof; and a pallet detachably attached substantially gastight to said enclosure at said open end and dually constituting a rigid bottom for the container and means for engagement by a lift truck in handling the container; said means for telescopably supporting said enclosure enabling alteration of the interior volume of said container to enable variation of the ratio of said container contents to backhaul contents, thereby to enable one and the same container to function efficiently with variable quantities of contained goods.

10. A container, comprising: a flexible, heat insulated, airtight cap, having the one end open; a rigid member having its peripheral edges disengageably engaged air-tightly with said cap; a vertically telescopic post removable mounted at each of the corners of said rigid member; and a flexible lining carried by said posts within said cap; whereby said posts and lining may be telescoped, removed from said base and stacked thereon in parallelism therewith, and the cap may be removed from said base and folded down on it in compact form, whereby to reduce said container substantially to the minimum compass for storage off the cargo floor.

11. A collapsible shipping container for carrying perishables inundated by a volume of frigid gas, comprising: an open-ended, flexible bag organized and constructed for taking the lateral loads of the container contents; a rigid thermally insulated base adjacent the lower end of said bag; a plurality of vertically telescopic posts framing and defining the vertical extent and the volume of the container and removable carried by said base and collapsibly carrying said flexible bag; and an inverted open-ended flexible and collapsible, thermally insulated cap surrounding the aforesaid parts and detachably attached at its lower peripheral edges to the subadjacent periphery of said base.

12. The method of preserving a perishable during transit in an uninsulated, unrefrigerated and unhumidified transport compartment without substantial deterioration thereof or damage thereto, comprising: segregating the perishable air-tight from the circumambient air while thermally isolating same from said air and surrounding objects, thereby to prevent heat transfer thereto; precooling the segregated perishable before transit thereof; and maintaining the afore-said segregative and thermal conditions during transit independently of further refrigeration and regardless of the changes in temperature and humidity of the transporting compartment.

13. The method of preserving a perishable during transit in a non-humid, unrefrigerated, thermally uninsulated transport compartment, without substantial deterioration thereof or damage thereto, comprising: confining the perishable in a substantially hermetically sealed, heat isolated space: entraining a frigid gas into said space before transit in an amount sufficient to cool and humidify the contents of said space; and maintaining the low heat level and high humidity of said space during transit independently of further refrigeration and regardless of circumambient thermal and humidity conditions and at values sufficient to prevent deterioration of or damage to said perishable.

14. A continuous-refrigeration eliminating perishable cargo transporter, comprising: a substantially air-tight container adapted to physically and thermally segregate the perishable from the circumambient air and surrounding objects; means for inserting thereinto an amount of a frigid gas sufficient to maintain the perishable at a non-deteriorative heat level for a predetermined time and means in the container for thermally isolating said contents of the container and preventing transfer of heat from the circumambient atmosphere and contacting objects to the precooled contents of said container.

15. A container, comprising: a thermally insulated bottom; a thermally insulated flexible and collapsible cover forming the container top and sides and attached at its lower edges to the subadjacent edges of said bottom; vertically tele-
scopable means fixed in upright attitude to said bottom and supporting said cover in various vertical positions of the latter to vary the volume of the container; and means for enabling pre-cooling of said container disposed entirely within the outlines of the container and leaving the exterior of the container free of protuberances, thereby to enable stowage of a plurality of the containers in close juxtaposition to each other.

16. A container, comprising: a double-deck bottom, the upper deck of which is thermally insulated and the lower deck of which is vertically spaced from the upper deck to provide a receiver space for lift-truck, and other prongs; a thermally insulated flexible cover forming the top and sides of the container and attached at its lower edges to the subadjacent edges of said bottom; vertically telescopic means fixed in upright attitude to said bottom and supporting said flexible cover in various vertical positions of the latter to vary the volume of the container; and means for enabling pre-cooling of said container disposed entirely within the outlines of the container and leaving the exterior of the container free of protuberances thereby to enable stowage of a plurality of the containers in close juxtaposition to each other.

BRUCE E. DEL MAR.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>647,113</td>
<td>Burningham</td>
<td>May 14, 1901</td>
</tr>
<tr>
<td>1,470,653</td>
<td>Sullivan</td>
<td>Oct. 16, 1923</td>
</tr>
</tbody>
</table>