Aug. 25, 1942. H. F. ZIMMERMAN 2,293,961

PORTABLE TEMPERATURE-CONTROLLED SHIPPING CONTAINER

Filed Dec. 21, 1939 4 Sheets-Sheet 1

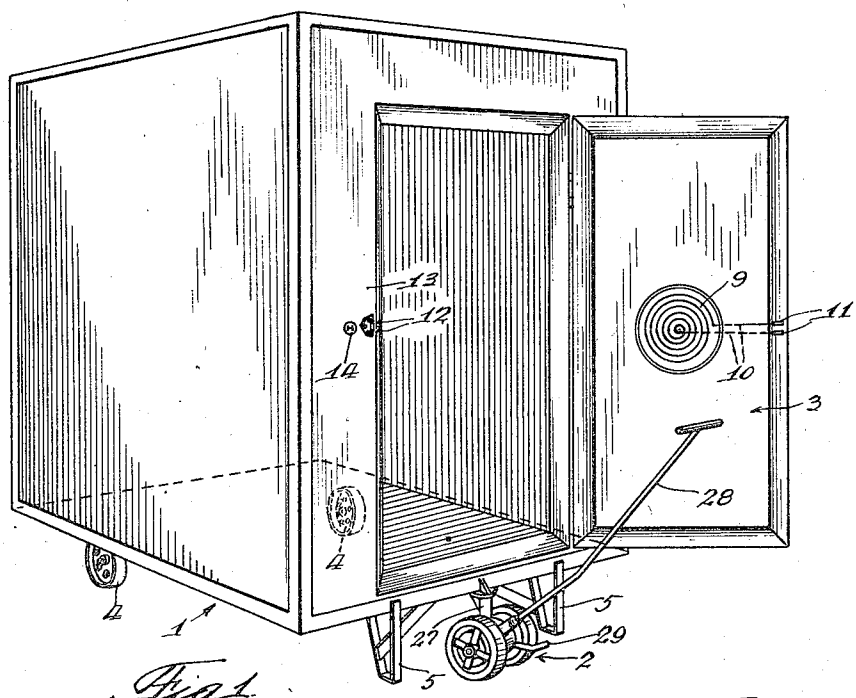


Fig. 1.

Fig. 6.

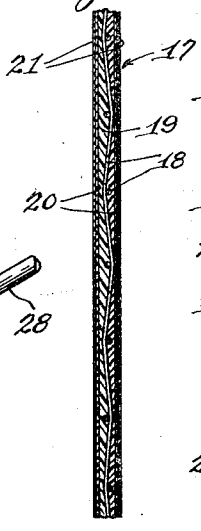


Fig. 5.

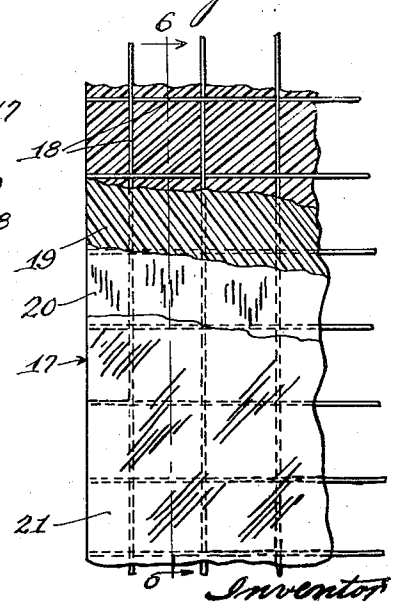
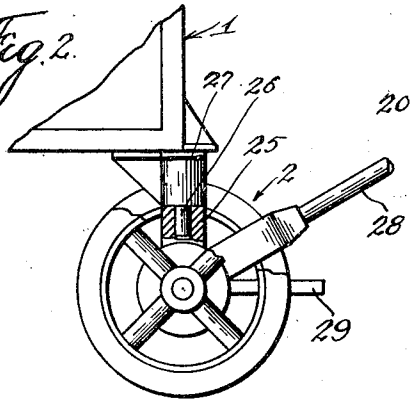


Fig. 2.



Inventor

Howard F. Zimmerman

By: Arthur, Price, Olson & Hochhauser.

Attys.

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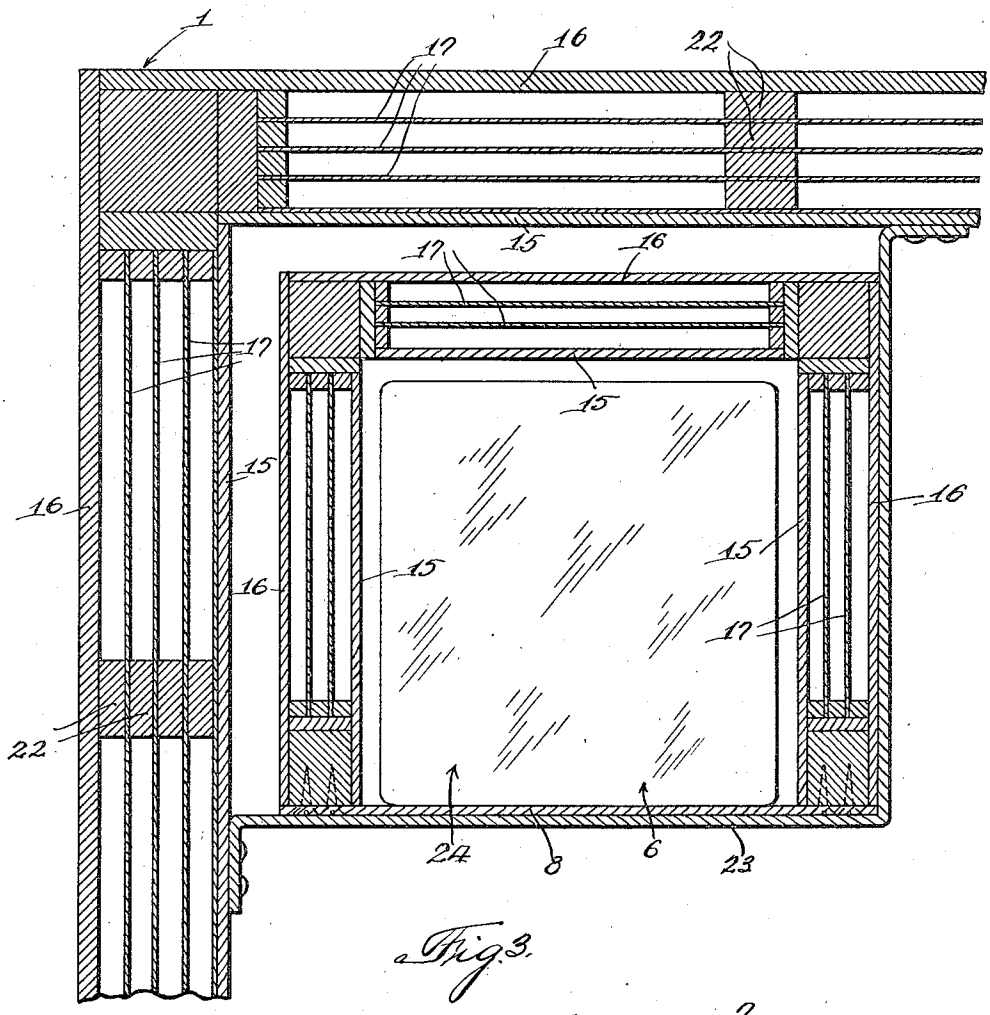


Fig. 3.

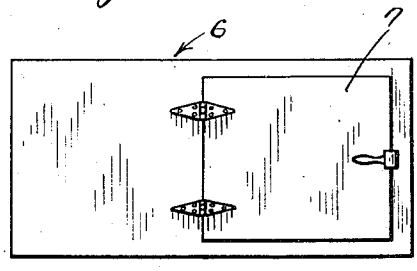


Fig. 4.

Inventor:
Howard F. Zimmerman
By Arnold, Price, Olson & Mecklenburger.
Attys.

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Filed Dec. 21, 1939 4 Sheets-Sheet 3

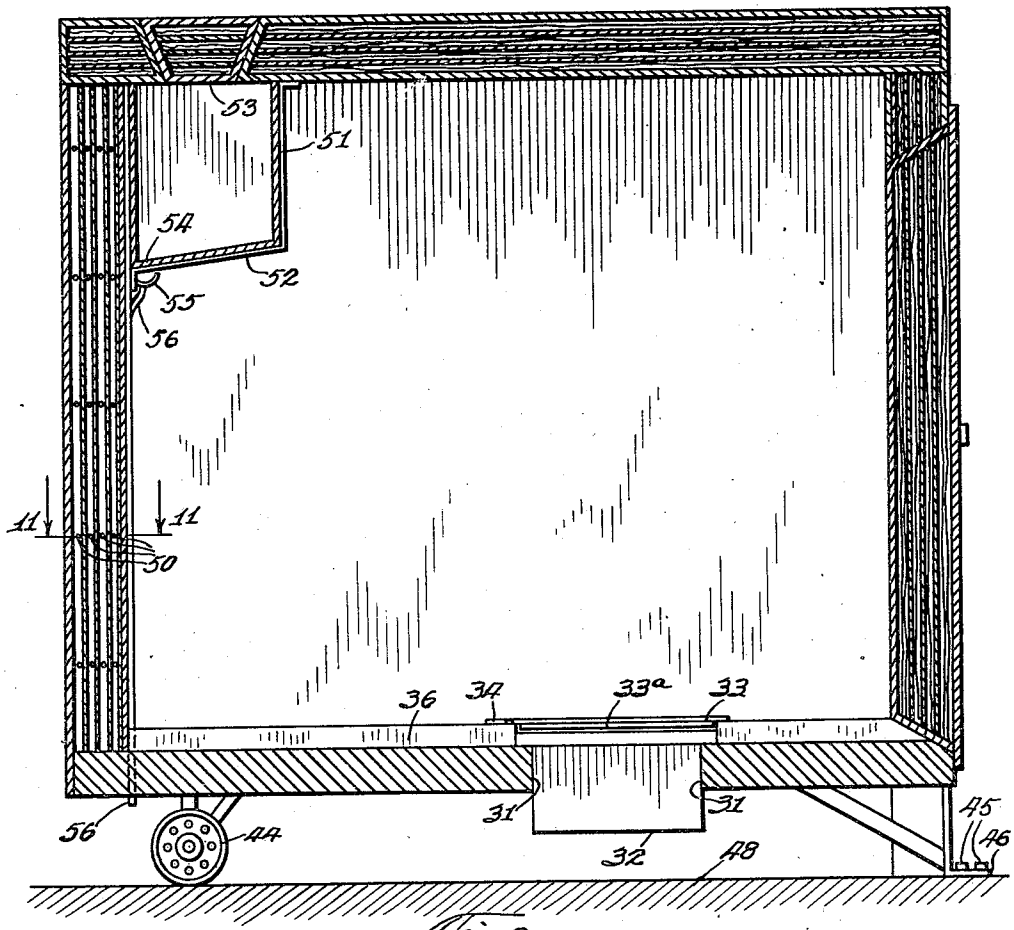


Fig. 9.

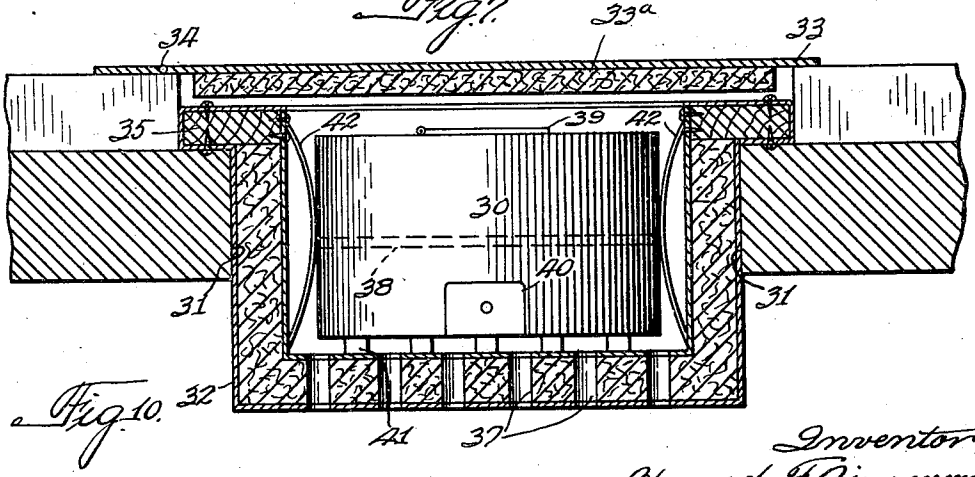


Fig. 10.

Inventor:
Howard F. Zimmerman
By: Amos, Thiess, Olsen & Mecklenburger.
Attys.

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PORTABLE TEMPERATURE-CONTROLLED SHIPPING CONTAINER

Filed Dec. 21, 1939 4 Sheets-Sheet 4

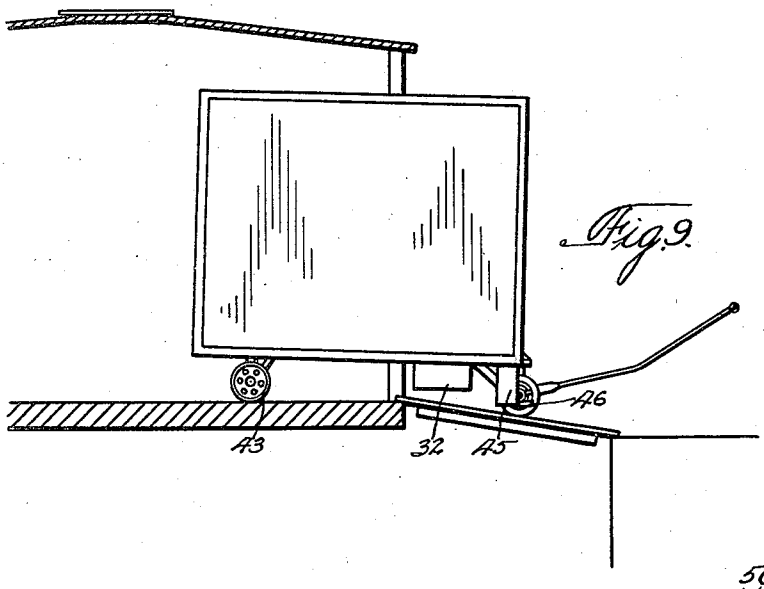


Fig. 9.



Fig. 12.

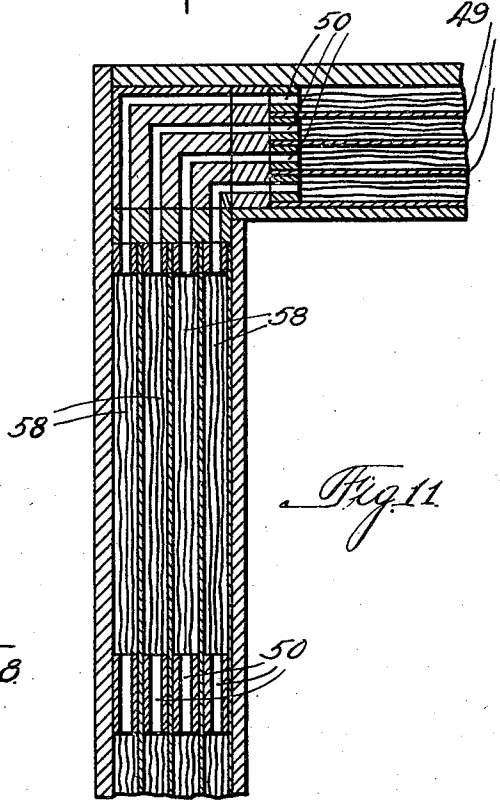


Fig. 11.

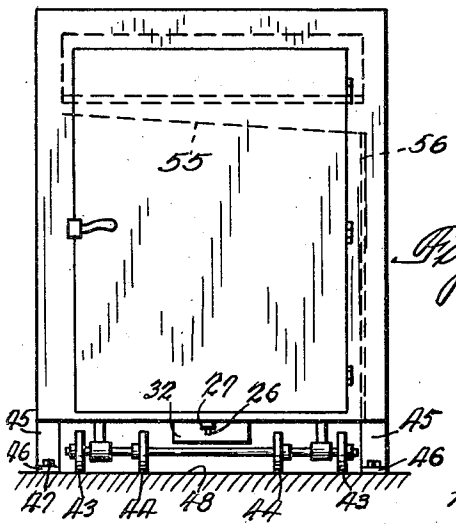


Fig. 8.

Inventor:
Howard F. Zimmerman
By: Amos, Pliss, Olsen & Trueblood
Attys.

Patented Aug. 25, 1942

2,293,961

UNITED STATES PATENT OFFICE

2,293,961

PORTABLE TEMPERATURE-CONTROLLED SHIPPING CONTAINER

Howard F. Zimmerman, Chicago, Ill., assignor to Loretta M. Zimmerman, Chicago, Ill.

Application December 21, 1939, Serial No. 310,380

5 Claims. (Cl. 237—1)

My invention relates to portable temperature-controlled shipping containers and has special reference to a temperature-controlled shipping container wherein it is desired to maintain a predetermined temperature in the storage of perishable commodities during shipment, the container being preferably equipped with detachable rolling supports for the front edge of the container and with non-detachable rolling supports for the rear edge.

This application is a continuation in part of my prior application, Serial No. 165,058, filed September 22, 1937.

The use of a shipping container has many advantages and generally promotes economy and efficiency in railroad shipment for certain classes of freight. Each individual container is small enough to be carried on an automobile truck and preferably is of a size approaching in length the width of an ordinary freight car and is of a height and width such as not to prevent road transportation thereof through city streets.

This container has the advantage that it can be loaded along with other merchandise freight in a box car, and only that portion of the freight within the container needs to be refrigerated.

Further, it is possible to load one of the shipping containers at the source of supply, convey the container to the freight station by truck, ship the container with other like containers on a freight car, and then haul the container from the receiving freight yard to its destination by truck, thus reducing to a minimum the handling of the goods and the danger of the commodity spoiling should the same be perishable.

One of the objects of my invention is to provide an improved container of the type indicated above in which the container is provided with means for quick detachable engagement with a roller-supported lifting jack and is provided with permanently mounted rollers on the edge opposite the connection for the lifting jack whereby the jack may be quickly put in place with respect to the container, the edge of the container elevated by means of the jack, and the roller-supported jack used in transporting the container.

A further object of my invention is to provide an improved arrangement of heating element for maintaining the desired temperature during cold weather.

A further object of my invention is to provide improved heat insulation means for the container.

A further object of my invention is to provide a shipping container having an improved receptacle for the refrigerant.

Further objects and advantages of the invention will be apparent from the description and claims.

In the drawings, in which an embodiment of my invention is shown—

Figure 1 is a perspective view of a shipping container;

Fig. 2 is a detail side elevational view showing the quick detachable connection between the container and portable lifting jack;

Fig. 3 is a vertical sectional view showing the heat insulation for the container and showing the receptacle for the refrigerant;

Fig. 4 is an elevational view showing the front of the refrigerant receptacle;

Fig. 5 is an enlarged detail view showing a layer of heat insulating material used in making the container;

Fig. 6 is a section on the line 6—6 of Fig. 5;

Fig. 7 is a vertical section showing another form of container;

Fig. 8 is a front view of the container shown in Fig. 7;

Fig. 9 is a side view of the container of Fig. 7, showing the container being moved;

Fig. 10 is a vertical section showing the combustion heater;

Fig. 11 is a horizontal section on line 11—11 of Fig. 7; and

Fig. 12 is a side elevation of an insulated block which may be used to replace the heater when it is not in use.

Referring to the drawings in detail, the construction shown in Figs. 1 to 6, inclusive, comprises a generally rectangular portable shipping container 1 which may have any desired loading capacity, for example, 160 cubic feet, capable of sustaining a load limit up to 6,000 pounds, and a roller jack 2 having a quick detachable engagement with the front edge of the shipping container to facilitate moving the container into and out of a car and moving it from place to place.

The portable container is provided with a hinged door 3 in front, with two supporting rollers 4 adjacent its rear edge and with two supporting legs 5 adjacent its front edge. The top, bottom, vertical walls, and door of the container are provided with suitable heat insulation. Adjacent the upper rear edge of the container a refrigerant receptacle 6 (Figs. 3 and 4) is mounted, having a hinged door 7 on the front side for the insertion of a refrigerant, such as

dry ice or ordinary ice, and having heat insulation in its top, vertical walls, and hinged door. The bottom 8 of the refrigerant receptacle is of thin metal or other suitable heat-conducting material so that the air adjacent this lower edge of the receptacle will be kept cool and will descend as it is cooled, thus keeping up the circulation of air inside the container and keeping the entire body of air inside the container uniformly cool.

In order to make the container 1 suitable for use in the winter, when it may be desired to keep the merchandise in the container from freezing, an electrical heating element 9 may be secured to the door 3, the construction being such that when the door is closed the circuit to the heating element 9 will be closed and when the door is open the circuit to the heating element will be broken. For this purpose, the leads 10 for the heating element terminate in suitable contacts 11 on the edge of the door which engage corresponding contacts 12 on the door frame 13 connected with a suitable outlet box 14 on the container. This arrangement automatically prevents loss of current when the door is open and during which time it is of no advantage to maintain current in the heating element.

The heat insulating partitions, both of the refrigerant receptacle and of the container itself, comprise inner and outer sheets 15 and 16 of heat insulating material such as plyboard spaced apart a substantial distance, and a plurality of intermediate sheets 17 of heat insulation material between the inner and outer sheets 15 and 16 parallel thereto and spaced from each other and from the walls. Each of the intermediate sheets 17 comprises a supporting network 18 (Figs. 5 and 6) of fibrous material such as jute, a layer 19 of asphalt or the like in which this network is embedded, two layers 20 of fibrous material such as paper, and two layers 21 of metallic heat-reflecting material, one on each side of the asphalt layer and secured thereto. The metallic heat-reflecting material may be aluminum foil, or any similar suitable material which will reflect the heat rays and prevent their passage through the sheets of heat insulation material.

Suitable spacing strips 22 may be provided between the sheets 17 of heat insulation material and between these sheets and the inner and outer walls 15 and 16. The refrigerant receptacle 6 may be supported in the container 1 by means of straps 23 secured to the top and rear of the container 1, as shown in Fig. 3.

In use, a form of refrigerant, such as a package of dry ice 24, is placed in the refrigerant receptacle 6; the perishable goods to be shipped are placed in the container 1, and the door 3 is closed to enable the refrigerant in the receptacle 6 to maintain the desired temperature within the container 1. The container may be readily moved from one place to another by means of the roller jack 2. To connect the roller jack 2 with the container 1, the socket 25 in the roller jack 2 is brought into registration with the pin 26 on the bracket 27 on the container, and the handle 28 of the jack is worked up and down to cause the pin 26 on the container to enter the socket 25 of the jack and effect a substantial pivotal connection between the roller jack 2 and the container 1. The handle of the roller jack is worked up and down a number of times sufficient to raise the legs 5 of the container off the supporting surface so that the container is then supported by the rear wheels 4 and by the roller jack 2. The container can then be moved from place to place by the use of the roller jack, the handle 28 of the jack being used as a tongue or handle for moving the container around. When the container has been brought to the desired position, the roller jack may be removed by pressing down on the foot pedal 29, causing the lowering of the socket 25 of the jack sufficiently to separate it from the pin 26 on the container.

The construction shown in Figs. 7 to 12, inclusive, is like that just described so far as the roller jack and connections are concerned. In addition, however, the construction of Figs. 7 to 12, inclusive, includes a combustion heater 30, a different arrangement of supporting wheels and legs, a different refrigerant container and associated parts, and a different arrangement of insulation. This container is provided with a combustion heater in order to enable appreciable shipments to be handled in cold weather. For this purpose an opening 31 is made in the floor of the container into which fits a heat insulated receptacle or heater well 32 in which the combustion heater is placed. A door 33 may be provided and be hinged as at 34 to the spacing strips on the floor of the car, affording access to the heater when desired.

The heater container is supported in the opening by means of an outwardly extending flange 35 resting on the floor of the shipping container.

With this construction the heater is supported upon the floor of the car by the outwardly extending flanges 35, the upper edges of which are protected from the weight of the load contained within the container by the upwardly extending sills or spacing strips 36.

This effectively prevents drainage from the bottom of the container into the heater well 32 of any moisture or drippings which might fall from the material being stored. Accidental extinguishment of the heater from this source is thus prevented.

The heater container may be lined inside and out with metal between which suitable insulating material is placed. Openings 37 may be provided in the bottom of this receptacle for the admission of air for combustion.

The heater 30 may comprise a cylindrical drum having a horizontal supporting grate 38 extending thereacross and charcoal, charcoal briquettes or other slow burning combustible material can be placed in the upper part of the drum through an opening in the top closed by a cover 39, and kindling may be placed under the grate through an opening in the lower portion of the heater and which is closed by an adjustable draft controlling door 40. The heater rests on spacer members 41 underneath, and is held against lateral movement by means of spring spacer members 42 embracing its sides. A suitable handle may be provided to facilitate insertion and removal of the heater with respect to the container if desired. The cover 33 has insulation 33a on its under side and is somewhat spaced from the upper edge of the container so that the warm air from the heater may circulate upwardly and thence laterally between the cover and upper edge of the heater well into the spaces between the spacing strips.

It will be noted that the container for the heater is disposed a substantial distance in front of the rear supporting wheels and in close prox-

imity to the front of the container so that when the lifting jack is attached as shown in Fig. 9, and the container is being moved over an up-and-down path, as, for example, from a freight car onto a platform, the heater will be lifted up two or three inches higher than when the jack is not attached so that the heater receptacle is not in danger of striking obstructions as would be the case if the heater were otherwise located. It will also be noted that the top of the heater is underneath the level of the tops of the sills or spacing strips 36 of the shipping container so that it does not interfere with the positioning of articles in the container or their removal therefrom. However, the upper edge of the heater well is positioned sufficiently high above the floor of the container to prevent leakage from the goods into the heater well.

As shown in Fig. 8, a plurality of wheels are provided at the rear of the container so that it may safely be moved over either wide or narrow gangplanks when being transported from place to place as from a box car to a loading platform, etc. The outer wheels 43 are effective to support the load when passing over wide gangplanks while the inner wheels 44 permit the container to be hauled over relatively narrow gangplanks. As shown in Fig. 7, the container may be provided at its front end with a pair of supporting legs 45 upon which the container stands when it is stored and while being transported in a box car, truck or the like, from place to place. These legs may be positioned at the outermost lower corners of the front of the container, as illustrated in Figs. 7 and 8, and are preferably provided with some hold-down means whereby the legs may be secured to the floor upon which the container rests to prevent undesired movement of the container during shipment. In the embodiment illustrated in Figs. 7 and 8, the legs 45 are shown provided with forwardly and outwardly projecting feet 46 which provide a ledge through which securing means 47 may pass and be anchored in the floor 48 upon which the container rests.

The container illustrated in Figs. 7 to 12, inclusive, is similar to that previously disclosed in Figs. 1 to 6, inclusive, except that the air spaces between the multilayer partition 49 of Fig. 11 are interconnected by passages 50 so as to provide continuous interconnected air spaces surrounding the container.

In the upper portion of the container a refrigerant chamber is provided having a side wall 51 and an inclined bottom wall 52. An opening is provided at the top of this chamber and is normally closed by a removable insulated plug 53. Through this opening a suitable supply of refrigerant may be introduced, and it has been found that a container having the aforementioned capacity of 160 cubic feet will be adequately cooled for fresh produce by the use of 400 pounds of wet ice in this hopper, or, where frozen food stuffs are being transported, dry ice in the amount of 200 pounds will sufficiently protect the contents of the container. These figures are based upon a normal period of protection of 72 hours.

The moisture resulting from the melting of the wet ice within the ice chamber is directed by the sloping bottom 52 of the ice chamber to the holes 54 through which it drains to be collected in a subjacent trough 55, from which it is conducted to the outside of the container by any suitable drain pipe 56. The moisture precipitated upon the outside of the wall 51 and bottom 52 is also directed into the trough 55, traveling along the sloping under surface of the bottom 52, whereby leakage upon the floor of the container is prevented.

When so-called dry ice or solidified CO_2 is employed as a refrigerant the gases developed during the melting of the refrigerant may be conducted through suitable connections between the refrigerant chamber and the spaced portions of the container walls. The gas may then circulate around the entire container passing through the openings 50.

As part of the container insulation, sheets of material 58 having heat reflecting properties may be employed.

When it is desired to refrigerate the products being transported in the container and the combustion heater is not employed it may be bodily removed and the insulated block 57 shown in Fig. 12 may be substituted. This effectively blocks the admission of heat through the heater well.

From the foregoing description it will be apparent to those skilled in the art that various modifications thereof may be made without departing from the spirit and scope of this invention and it is desired, therefore, that the same be limited only by the scope of the prior art and the appended claims.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. A shipping container comprising a heat insulated receptacle of a size capable of being moved through the doorway of a standard railway box car and having a substantially flat floor, a door affording access to the container, wheels for supporting the rear end of the receptacle, legs for supporting the front end of the receptacle, a connector adjacent the front end of the receptacle for connection with a roller lifting jack, a well for a combustion heater located adjacent the jack connection substantially beneath the floor line of the receptacle and a substantial distance in front of the axis of the wheels, the bottom of said well being raised by said roller lifting jack sufficiently to clear all customary obstacles such as the end of an inclined ramp, said heater well being accessible from the inside of the shipment receptacle for insertion and removal of the heater.

2. A shipping container comprising a heat insulated receptacle of a size capable of being moved through the doorway of a standard railway box car and having a substantially flat floor, a door affording access to the container, wheels for supporting the rear end of the receptacle, legs for supporting the front end of the receptacle, a connector adjacent the front end of the receptacle for connection with a roller lifting jack, a well for a combustion heater located adjacent the jack connection substantially beneath the floor line of the receptacle and a substantial distance in front of the axis of the wheels, the bottom of said well being raised by said roller lifting jack sufficiently to clear all customary obstacles such as the end of an inclined ramp, said heater well being accessible from the inside of the shipment receptacle for insertion and removal of the heater, said heater well having a removable cover substantially flush with the floor line of the receptacle when in closed position.

3. A shipping container comprising a heat insulated receptacle of a size capable of being moved through the doorway of a standard rail-

way box car and having a substantially flat floor, a door affording access to the container, wheels for supporting the rear end of the receptacle, legs for supporting the front end of the receptacle, a connector adjacent the front end of the receptacle for connection with a roller lifting jack, said floor having spaced horizontal strips to permit air circulation between the cargo and the floor of the receptacle, a well for a combustion heater located adjacent the jack connection substantially beneath the floor line and a substantial distance in front of the axis of the wheels, the bottom of said well being raised by said roller lifting jack sufficiently to clear all customary obstacles such as the end of an inclined ramp, said heater well being accessible from inside of the shipment receptacle for insertion and removal of the heater.

4. A shipping container comprising a heat insulated receptacle of a size capable of being moved through the doorway of a standard railway box car and having a substantially flat floor, a door affording access to the container, wheels for supporting the rear end of the receptacle, legs for supporting the front end of the receptacle, a connector adjacent the front end of the receptacle for connection with a roller lifting jack, a well for a combustion heater located adjacent the jack connection substantially beneath the floor line and a substantial distance in front of the axis of the wheels, the bottom of said well being raised by said roller lifting jack sufficiently to clear all customary obstacles such as the end of an inclined ramp.

5. A shipping container comprising a heat insulated receptacle of a size capable of being moved through the doorway of a standard railway box car and having a substantially flat floor, a door affording access to the container, a well for a combustion heater located substantially beneath the floor line, said heater well being accessible from inside of the shipment receptacle for insertion and removal of the heater, said floor having spaced horizontal strips extending adjacent the edge of the well, a heat insulating cover for the well spaced from the periphery of the well to provide an annular peripheral airflow passage from the well to the spaces between said spaced strips.

HOWARD F. ZIMMERMAN.