

Nov. 3, 1942.

R. B. WINSHIP

2,300,719

REFRIGERATOR CAR CONSTRUCTION

Filed March 22, 1940

3 Sheets-Sheet 1

Fig. 1

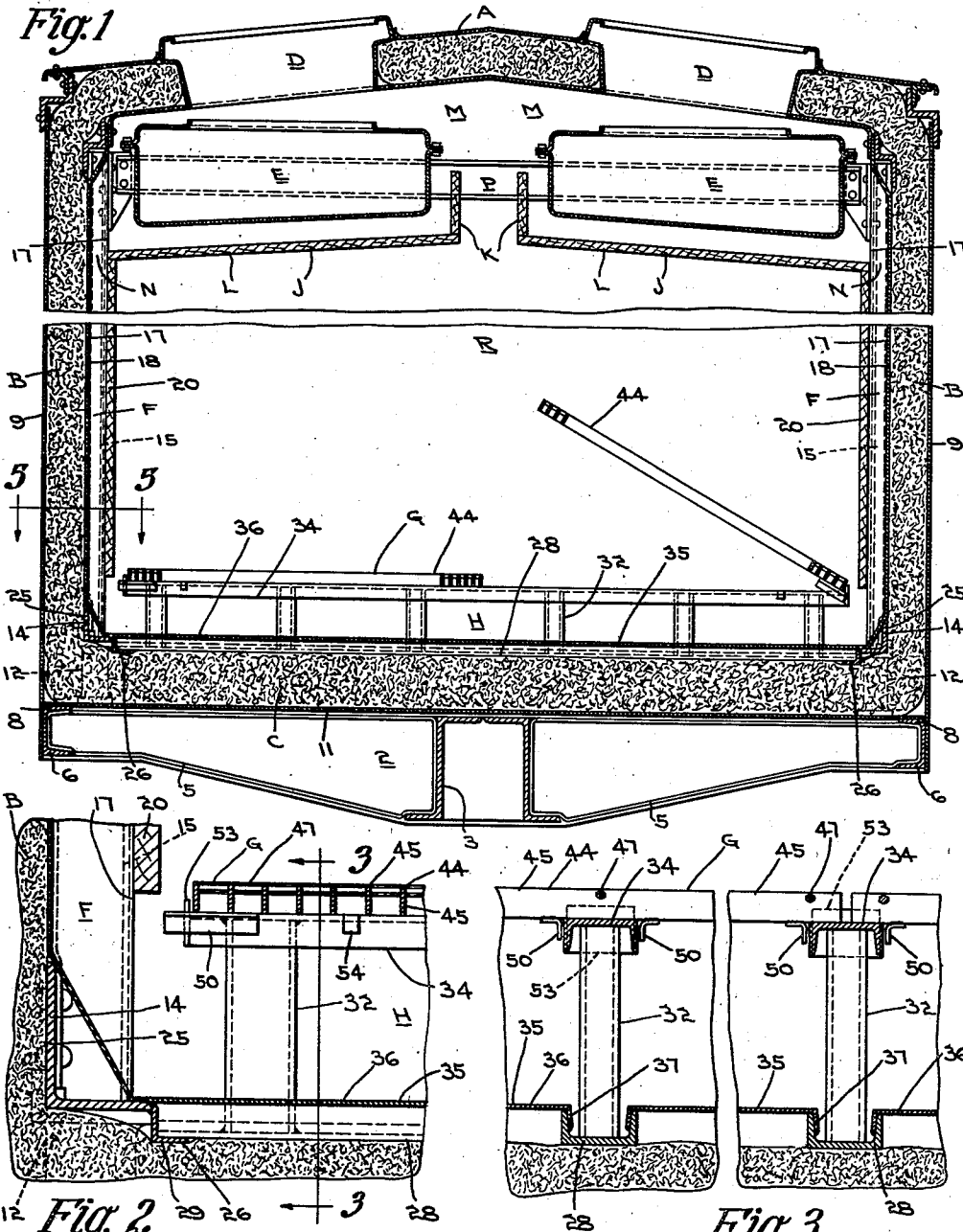


Fig. 2

Fig. 3

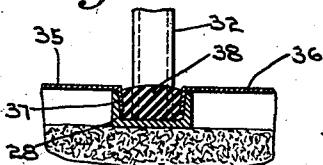


Fig. 4

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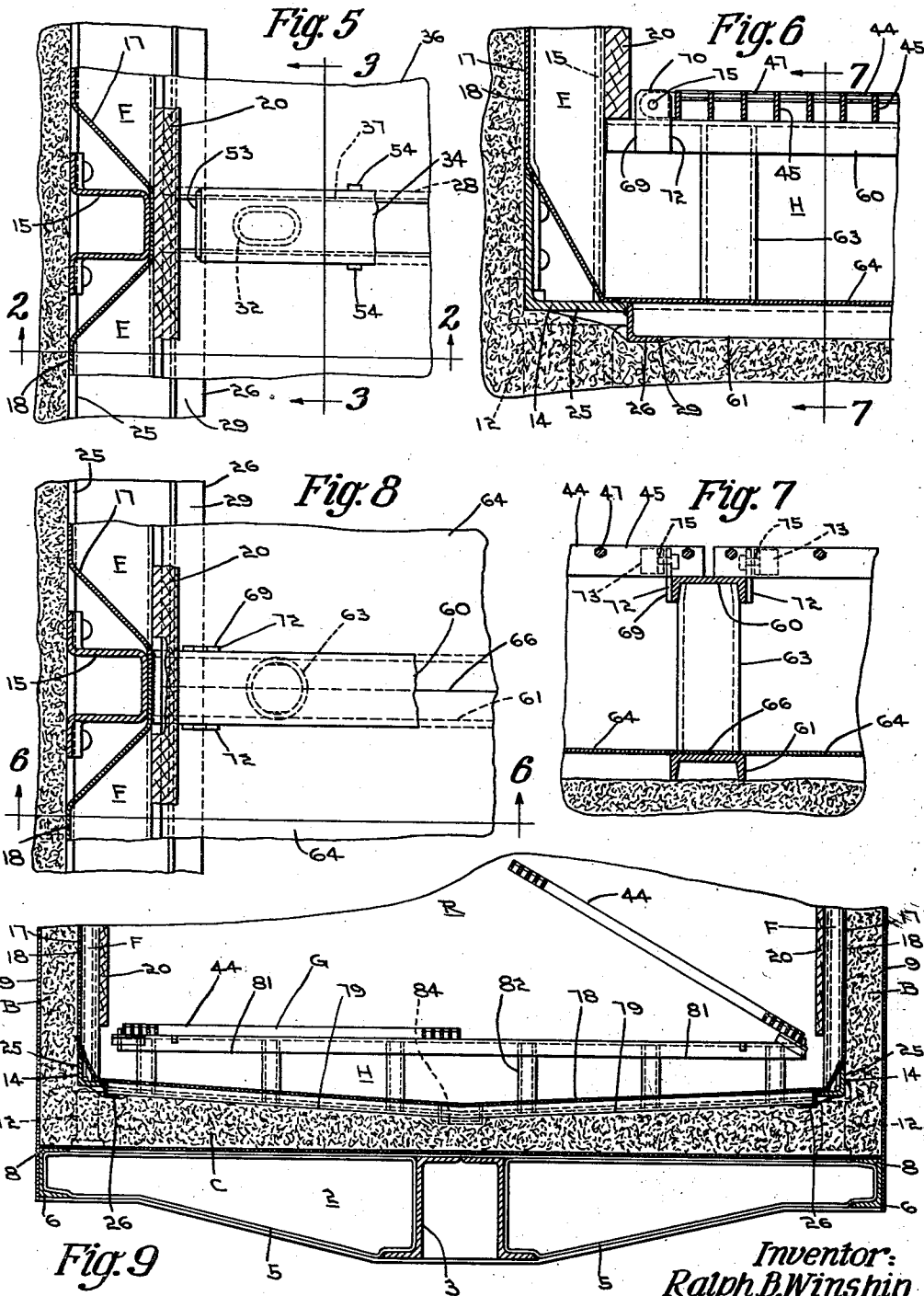
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3 Sheets-Sheet 2



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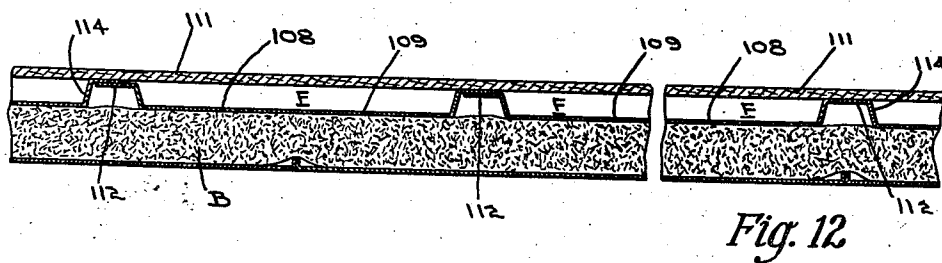
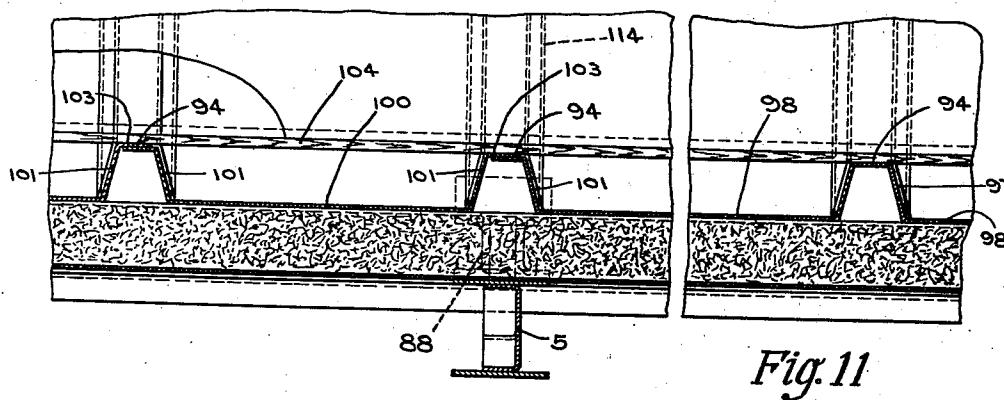
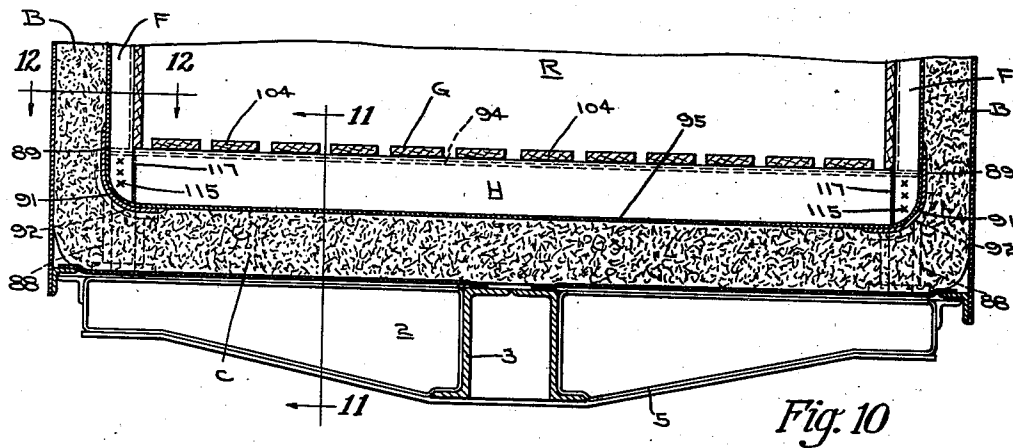
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REFRIGERATOR CAR CONSTRUCTION

Filed March 22, 1940

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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REFRIGERATOR CAR CONSTRUCTION

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Application March 22, 1940, Serial No. 325,289

16 Claims. (Cl. 105—375)

The invention relates to railway refrigerator cars and refrigerating automotive trucks used for transportation of perishable commodities, such as fruits, vegetables and meats which require refrigeration while in transit. The invention relates more particularly to the type of refrigerator car or truck wherein wet ice, dry ice, eutectic ice or other refrigerating means is positioned adjacent the upper part of the lading compartment of the car or truck so as to cause a circulation of cooled air thru vertical flues associated with the walls thereof to a space below a secondary foraminous floor, thru which it flows upwardly to contact and refrigerate the lading.

The invention relates more particularly to the floor construction of such cars or trucks and also to the association of such floor construction with the wall construction.

The object of the invention is to obtain a relatively light floor construction by combining the floor supporting members with the secondary foraminous floor supporting members to provide a plurality of composite beams extending between the side walls of the car or truck to transmit the weight and impact of the lading directly to these side walls independently of the center sills of the car or truck. In my arrangement, the car or truck body is supported by the car underframe or truck chassis under the side walls. Such a construction permits the use of a continuous uninterrupted insulation from side wall to side wall between the floor and the underframe or chassis. Such continuous insulation is very desirable due to the fact that when a train is running at sixty miles per hour over a roadbed having an air temperature of 80 degrees Fahrenheit, the air temperature adjacent the under side of the floor may reach 120 degrees. The inside temperature of refrigerator cars and trucks varies from zero to 45 degrees; therefore, a temperature of 120 degrees below the floor creates a wide temperature differential which increases heat transmission through the floor. Any support for the floor above the center sills would provide a conduit for transmission of heat to the interior of the car.

Another object of the invention is to provide a metallic flooring and to rigidly secure such metallic flooring to the flooring supports and to some parts of the side walls of the car so that the metallic flooring cooperates with flooring supports to form the lower members of the aforementioned composite beams.

The usual steel frame side wall construction of a car or truck comprises an upper chord called

a plate, a lower chord called a sill and vertical posts or struts extending between and secured to said chords to provide a truss or girder supporting the car and lading between the truck bolsters. Another object of the invention is to attach the aforesaid composite beams to the vertical posts of the car or truck walls to provide cooperation therebetween; that is, the attachment of the composite beams to the posts restrains said beams against downward and lateral deflection (causing them to function as restrained beams). Furthermore, such attachment provides a heel for each post to strengthen it against lateral deflection and thereby strengthens the vertical wall truss.

Another object is to form the struts of the trusses so that they will not interfere with the free movement of the circulating air in any horizontal direction under the foraminous floor so as to obtain substantially equal distribution of the cooled air under the lading, thereby obtaining a more even temperature of the lading.

Another object is to provide a lower chord or sill of such formation and construction as to provide means of attachment of the aforesaid composite beams thereto to obtain the desired objects of the invention as hereinbefore defined.

Another object of the invention is to utilize the aforementioned trusses to support a foraminous floor, preferably a metallic grating, in spaced relation to the main floor. The foraminous floor provides a support for the lading, the main floor is a waterproof protection for the floor insulation and the space between the foraminous and main floors distributes cold air through the foraminous floor to the lading.

A further object is to hinge the foraminous floor, or otherwise arrange it, so that it may be swung upwardly and retained substantially in flatwise relation to the walls of the car. A further object is to provide means to prevent shifting of the foraminous floor relative to the trusses, which tendency to shift is caused by service movements of the car or truck.

Another object of the invention is to form the floor supporting beams integral with the main floor sheets and to support the foraminous floor upon said beams. Said beams may comprise upwardly projecting corrugations in the floor sheets or unstanding flanges at the margins of the sheets.

Other objects and advantages of my invention will be apparent from the following detailed description by referring to the accompanying drawings.

In the drawings:

Fig. 1 is a transverse section of a refrigerator car embodying my invention.

Fig. 2 is an enlarged view of a portion of Fig. 1.

Fig. 3 is a section on line 3—3 of Fig. 2.

Fig. 4 is a view similar to a portion of Fig. 3 showing a modified construction.

Fig. 5 is a section on line 5—5 of Fig. 1 drawn to an enlarged scale, the grating having been omitted for clarification.

Figs. 6, 7 and 8 are views similar to Figs. 2, 3 and 5, respectively, showing a modified form of my invention.

Fig. 9 is a view similar to the lower part of Fig. 1 showing another modified form of my invention.

Fig. 10 is also a view similar to the lower part of Fig. 1 showing a still further modification.

Fig. 11 is a section on line 11—11 of Fig. 10.

Fig. 12 is a section on line 12—12 of Fig. 10.

The general parts of the refrigerator car shown in Fig. 1 are insulated roof A; side walls B; floor C; hatches D; refrigerant containers E; side wall flues F; foraminous floor G and space H between rack G and floor C. A refrigerant container E is positioned directly below the roof A and adjacent a side wall B. A drip pan J is provided below the container E and a partition K is secured in an up-standing position at the edge of the drip pan J. The drip pan J and partition K cooperate with the roof A and side wall B to form an enclosing structure L around the container E, an air inlet opening M being provided by spacing the partition K from the roof A. An air discharge opening N which leads to the flue F is formed by spacing the drip pan J from the wall B. Cars of this type commonly have a row of refrigerant containers E near each side wall B and spaced apart at the center of the car. The partitions K are also spaced apart to form a duct P which communicates between the lading compartment R and openings M.

Air circulation is as follows: Air in the lading compartment R is warmed by contact with the lading and rises through the duct P to enter the enclosing structures L through the air inlet openings M. The air is cooled by contact with the refrigerant containers E and falls by reason of its greater density through the discharge openings N and flues F to the space H whence it rises through the rack G to the lading compartment R.

As shown in Fig. 1, the underframe 2 of the car is comprised of the usual center sill 3 with cross members 5 extending transversely thereto, such as bolster, cross bearers and cross ties. The outer side sill 6, as shown, consists of a channel member 8 secured to the outer ends of the cross members 5 and extending continuously longitudinally of the car. The outer sheathing 9 is secured at its lower edge to the outer side sill 6 and the sub-floor 11, preferably a metallic sheet, rests upon and is supported by the center sill 3, cross members 5 and the outer side sills 6.

The inner structure of the car is preferably supported by spaced apart pedestals 12 which rest upon certain of the cross members 5 of the underframe 2. The pedestals 12 are preferably made of metal, which is usually cast, and have a relatively small cross sectional area so that the heat transmission from the outside to the inside of the car, or vice versa, is relatively small. Inner side sills 14 are supported on top of the pedestals 12 and extend continuously longitudinally of the car. The inner posts 15 are secured in an up-standing position to the inner side sills 14 and the panel flue sheets 17 are secured to side posts 15

and to the inner sills 14. The panel flue sheets 17 have formed therein outwardly projecting panels 18 which, in combination with the lining 20, form the flues F for air circulation.

The inner side sills 14 preferably each comprise a large angle 25 and a smaller angle 26 secured, preferably by welding, to the large angle 25 so as to form a substantially W-shape sill. The lower channel members 28 extend transversely of the car and are secured to the inner side sills 14, preferably being supported by the horizontally extending legs 29 of the small angles 26. The lower channel members 28 are spaced apart longitudinally of the car and may be positioned on centers of approximately four feet. Spaced apart, substantially vertical struts 32 nest in and are secured to the lower channel members 28 and upper channel members 34 in inverted positions rest upon and are secured to the top portions of the struts 32. The struts 32, for convenience, may be made from commercial pipe, which is usually round. However, if the diameter of the pipe is greater than the width of the channels 28, 34, the pipe may be slightly flattened as shown in Fig. 5, so that it nests in said channels. The main floor 36, preferably metallic sheets 35, extends between the inner side sills 14 and between adjacent lower channel members 28. The main floor sheets 35 preferably have depending flanges 37 formed on the transverse margins thereof, which flanges 37 project into the lower channels 28 and are secured thereto. The sheets 35 may be seam welded to the channels 28 or some intermittent securing means, such as tack welds, rivets, or screws may be used and the channel 28 then filled with some plastic material, such as Referite 38, to form a watertight joint, as shown in Fig. 4.

The lading is supported on top of the upper channel 34 by some type of foraminous floor G, preferably metallic grating 44. Any type of grating may be used but the type shown in the accompanying drawings comprises a plurality of spaced apart slats 45 arranged on edge and extending longitudinally of the car; that is, spanning the distance between adjacent upper channel members 34. The slats 45 are held in this position by rods 47, preferably of hexagonal section, extending transversely of the slats 45 and secured thereto, such as by welding. This forms a rigid grating unit for supporting the lading, which unit may be of any convenient size. For example, the unit may be exactly of a length equal to the distance between adjacent channel members 34, in which case edges of the grating will rest upon each channel, as shown at the right of Fig. 3. If desired, a grating may be made in larger units so that joints do not occur at each channel, but rather the unit spans several channels continuously, as shown at the left of Fig. 3.

It is preferable to hinge the grating 44 to the upper channels 34 or to provide the mechanical equivalent of a hinge in order that the grating 44 may be raised for the purpose of cleaning the main floor 36. In the modification shown in Figs. 1 to 5 inclusive, guide members 50 secured to the bottom of the grating 44 straddle the upper channel members 34 so that the grating may be lifted, as shown at the right of Fig. 1, and disposed against the side wall B. A vertical plate 53 is secured to the end of each upper channel member 34 to prevent the grating 44 sliding off the end of the channels 34 when in an upright position and lugs 54 are secured to the sides of the upper channel members 34 to prevent the grating 44 from sliding toward the center of the car when

in an upright position. There is thus provided a floating hinge arrangement between the grating 44 and the upper channel members 34.

The structure hereinabove described forms a composite beam for supporting both the foraminous floor 44 and the main floor 36. A structure comprised of a plurality of beams, disposed one above another and secured together by ties connected thereto by pin joints, has a strength equal to the sum of the strength of the individual beams. In the structure disclosed in the accompanying drawings, however, the upper channels 34 are secured to the lower channels 28 by the struts 32, which struts are tubular and are rigidly secured to the channels 28, 34. Any load sufficient to cause a vertical deflection of said channels induces a bending stress in the struts 32. The struts 32, by reason of their form and rigid attachment to the channels 28, 34 stiffen and strengthen the composite beam by inducing interaction between the upper channels 34 and lower channels 28.

Figs. 6-8 inclusive show a modification somewhat similar to that above described but differing in certain details. The upper channel member 60 is shown welded, or otherwise secured, to the posts 15 which provides a somewhat more restrained composite beam and also prevents said beam from collapsing due to the tendency of the lading to move longitudinally of the car during service movements thereof. In this modification the lower channel 61 is shown in an inverted position, in which case the struts 63 are shown round, and may be welded to the lower channel 61 by a simple butt weld. The struts 63 may be flattened slightly at the top, as shown in Fig. 8, so that they may nest in the upper channel 60, which is also in an inverted position similar to that of Figs. 1-5. The main floor sheets 64 substantially abut at their adjacent edges 66 and are secured to the lower channel member 61, preferably by a seam weld extending between the inner side sills 14 at opposite sides of the car. The edges 66 may be notched to clear the struts 63.

In Figs. 6-8 inclusive there is shown a positive hinge arrangement in place of the floating hinge hereinabove described. The butt 69 of the hinge 70 is formed by plates 72 secured in flatwise relation to opposite sides of the upper channel member 60 and extending thereabove. Angle shape clips 73 are secured to a margin of the grating unit 44, which clips 73 are pivoted to the plates 72 by a pin 75, thereby forming a hinge 70 for upwardly swinging the grating 44 as a unit.

Fig. 9 shows my invention adapted to a refrigerator car having a floor 78 sloping downwardly toward the center of the car. The underframe 2 and means for supporting the inner structure are similar to those shown in Fig. 1. The lower channel member 79 is also supported in a similar manner, but is pitched downwardly toward the center of the car, whereas the upper channel member 81, which is shown in an inverted position, is substantially horizontal. The struts 82 which connect the upper (81) and lower (79) channels are shown vertical, but may be inclined normal to the lower channel member 79 without changing the function of the structure. It is pointed out that the composite beam which is comprised of the upper (81) and lower (79) channel members and the struts 82 has the greatest depth at the center. A beam supported at its ends and loaded uniformly over its span has the greatest stress induced therein at the center thereof. A greater depth at the center tends to

provide a beam of uniform strength, which beam has the least weight consistent with strength. The sloping floor 78 also is advantageous, in that liquid flowing from the side wall flues F is drained toward the center of the car where it may be trapped by a gutter 84 or other draining means.

In Figs. 10-12, the underframe 2 of the car shown is substantially similar to that shown in Fig. 1. Pedestals 88 are provided to support the inner structure and each inner side sill 89 comprises an angular member formed with a large radius 91. The curved part of the sill rests upon the pedestals 88, which pedestals have an upper surface 92 complementary to the curved part 91 of the sill 89 to provide a solid support. In this modification, the beams 94 for supporting the floor C of the car are formed integral with the floor sheets 95 and disposed thereabove. The beams 94 may be corrugations 97 formed integral with the floor sheets 98, as shown at the right of Fig. 11, or the floor may be formed of a plurality of sheets 100 extending transversely of the car and having upstanding flanges 101 and outstanding refflages 103 formed on the transverse margins thereof. The refflages 103 may be secured together in flatwise relation, thereby forming the mechanical equivalent of the corrugation 97 shown at the right of Fig. 11. The corrugations 97 or flanges 101, as the case may be, extend between and rest upon the inner side sills 89 and spaced apart slats 104, preferably extending longitudinally of the car, rest upon and are supported by the corrugations 97 or refflages 103 to provide the foraminous floor C.

The side wall B comprises a sheet 106, or a plurality of sheets, having outer portions 109 spaced from the lining 111 and inner portions 112 adjacent the lining 111. The inner portions 112 are connected to the outer portions 109 by webs 114 so that the webs 114 and inner portions 112 cooperate to form vertical frame members of the car. A flue F for circulation of air is formed between the lining 111 and the outer portions 109 of the sheets 106. At the lower parts of the sheets 106, the inner portions 112 may be coped out so that the wall sheets 106 straddle the corrugations 97 or flanges 101 of the floor sheets 98, 100 and are secured thereto, preferably by welding. The welding may be either spot welds 115, as shown in Fig. 10, or seam welding 117 also shown in Fig. 10, or a combination of spot welds and seam welding.

It is understood that my invention is not restricted to use with an overhead bunker refrigerator car as shown in Fig. 1, but may be equally well adapted to use with the so-called end bunker car or with any car or truck requiring a foraminous floor to be supported in spaced relation to an insulated floor.

The accompanying drawings illustrate the preferred form of the invention, though it is to be understood that the invention is not limited to the exact details of construction shown and described, as it is obvious that various modifications thereof, within the scope of the claims, will occur to persons skilled in the art.

I claim:

1. In a refrigerator car having spaced apart walls, spaced apart beams extending between and secured to said walls, flooring supported by said beams and spaced below the upper parts thereof, and a foraminous floor supported by the upper parts of said beams in spaced relation to said flooring.

2. In a refrigerator car having spaced apart

walls, spaced apart beams extending between and secured to said walls, flooring supported by said beams substantially in the plane of the lower parts thereof, and a foraminous floor supported by the upper parts of said beams in spaced relation to said flooring.

3. In a refrigerator car having spaced apart walls, spaced apart beams extending between and secured to said walls, flooring supported by said beams and spaced below the upper parts thereof, and a foraminous floor supported by the upper parts of said beams in spaced relation to said flooring and hinged for swinging about a horizontal axis.

4. In a refrigerator car having spaced apart walls, spaced apart beams extending between and secured to said walls, flooring supported by said beams and spaced below the upper parts thereof, and a foraminous floor removably supported by the upper parts of said beams in spaced relation to said flooring, and means to prevent lateral movement of said foraminous floor relative to said beams.

5. In a refrigerator car having spaced apart walls, spaced apart beams extending between and secured to said walls, flooring supported by said beams and spaced below the upper parts thereof, said beams having openings for flow of air there-through, and a foraminous floor supported by the upper parts of said beams in spaced relation to said flooring.

6. In a refrigerator car having spaced apart walls, each having a sill, a lower member extending between and secured to said sills, flooring supported by said member, an upper member disposed in spaced relation above said lower member, spaced apart struts extending between and secured to said members, and a foraminous floor supported by said upper member in spaced relation to said flooring to provide a space therebetween.

7. In a refrigerator car having spaced apart walls, each having a sill and a post secured thereto, a lower member extending between and secured to said sills, flooring supported by said member, an upper member disposed in spaced relation above said lower member, said upper member being secured at the ends thereof to said posts, spaced apart struts extending between and secured to said members, and a foraminous floor supported by said upper member in spaced relation to said flooring to provide a space therebetween.

8. In a refrigerator car having spaced apart walls, each having a sill, a lower member comprising a channel shaped element extending between and secured to said sills, metallic floor sheets supported by said member, the adjacent margins of said sheets having depending flanges which nest in and are secured to said channel element, plastic material in said channel element, an upper member disposed in spaced relation above said lower member, spaced apart struts extending between and secured to said members, and a foraminous floor supported by said upper member in spaced relation to said floor sheets to provide a space therebetween.

9. In a refrigerator car having spaced apart walls, each having a sill, a lower member comprising a channel shaped element extending between and secured to said sills, flooring supported by said member, an upper member disposed in spaced relation above said lower member, said upper member comprising an inverted channel shaped element, spaced apart struts comprising

tubular elements extending between and secured to said members, said tubular elements nesting in and being rigidly secured to said channel elements, and a foraminous floor supported by said upper member in spaced relation to said flooring to provide a space therebetween.

10. In a refrigerator car having spaced apart walls, each having a sill, a lower member comprising an inverted channel shaped element extending between and secured to said sills, metallic floor sheets supported by said member, the adjacent margins of said sheets being welded in abutting relation to said member, an upper member disposed in spaced relation above said lower member, spaced apart struts extending between and secured to said members, and a foraminous floor supported by said upper member in spaced relation to said floor sheets to provide a space therebetween.

11. In a refrigerator car having spaced apart walls, each having a sill, a lower member extending between and secured to said sills, flooring supported by said member, an upper member disposed in spaced relation above said lower member, said upper member comprising an inverted channel shaped element, spaced apart struts comprising tubular elements extending between and secured to said members, said tubular elements nesting in and being rigidly secured to said upper channel element, and a foraminous floor supported by said upper member in spaced relation to said flooring to provide a space therebetween.

12. In a refrigerator car having spaced apart walls, each comprising a sill, metallic floor sheets extending between and supported by said sills, the adjacent margins of said sheets having up-standing flanges, means to secure said flanges together, said flanges extending substantially between said sills to form a support for the car floor, and a foraminous floor supported by said flanges.

13. In a refrigerator car having spaced apart walls, each comprising a sill, metallic floor sheets extending between and supported by said sills, the adjacent margins of said sheets having up-standing flanges provided with outstanding re-flanges secured together in overlapping relation, said flanges extending substantially between said sills to form a support for the car floor, and a foraminous floor supported by said flanges.

14. In a refrigerator car having spaced apart walls, each comprising a sill, a metallic floor sheet extending between and supported by said sills, said sheet having formed therein an upwardly projecting corrugation which extends substantially between said sills to form a support for the car floor, and a foraminous floor supported by said corrugation.

15. In a refrigerator car having spaced apart sills, a plurality of spaced apart beams extending between and supported by said sills, a main floor supported by the lower parts of said beams, and a foraminous floor supported by the upper parts of said beams in spaced relation to said main floor.

16. In a refrigerator car having spaced apart walls, spaced apart beams extending between and secured to said walls, flooring supported by said beams below the upper parts thereof, floor insulation below said flooring substantially unencroached upon by said beams, and a foraminous floor supported by the upper parts of said beams in spaced relation to said flooring.

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