May 27, 1941. W. H. MUSSEY ET AL 2,243,113

LIGHT WEIGHT BOXCAR

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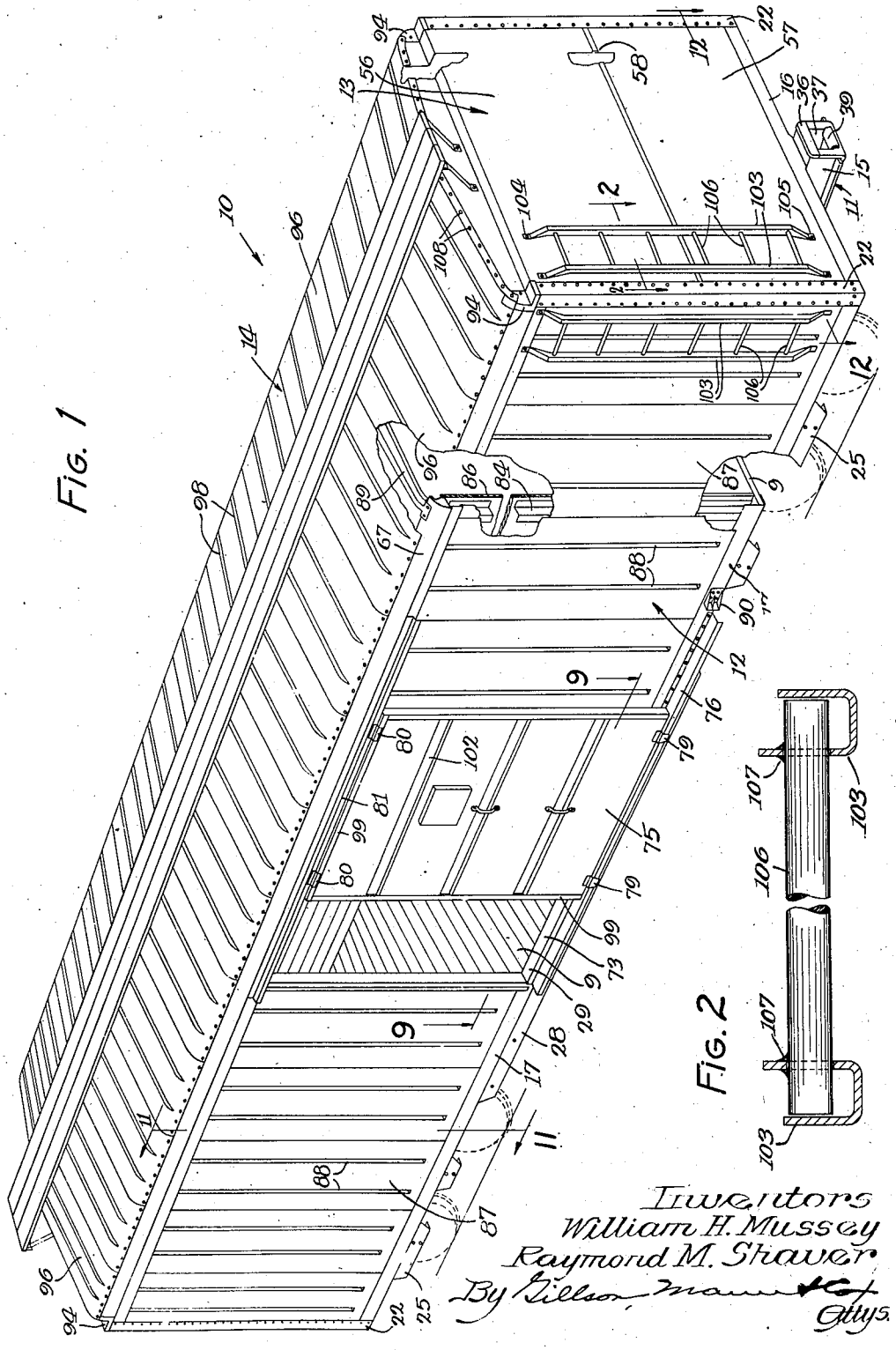


Fig. 1



Fig. 2

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LIGHT WEIGHT BOXCAR

Filed Feb. 15, 1937 7 Sheets-Sheet 2

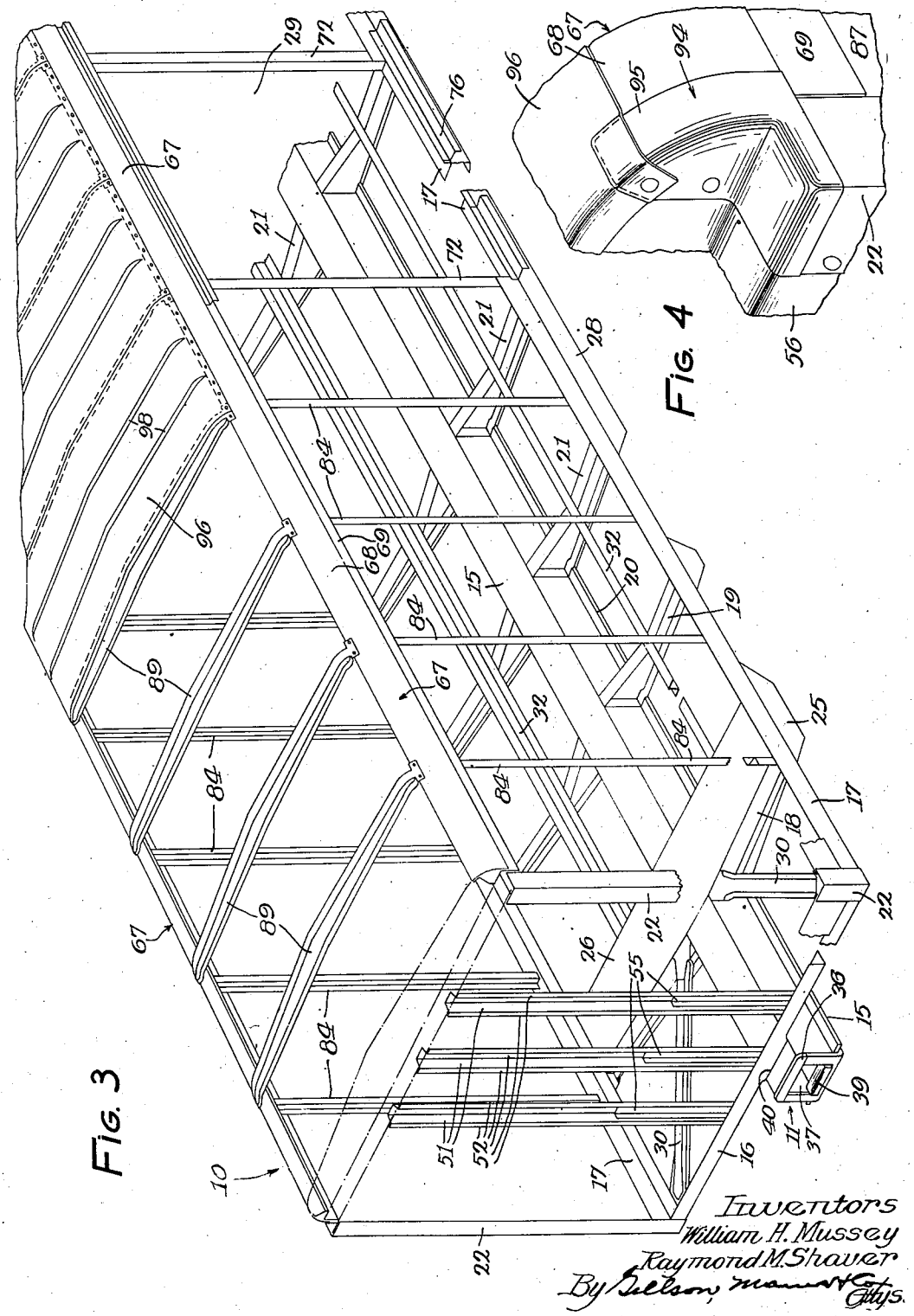


Fig. 3



Fig. 4

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LIGHT WEIGHT BOXCAR

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FIG. 5

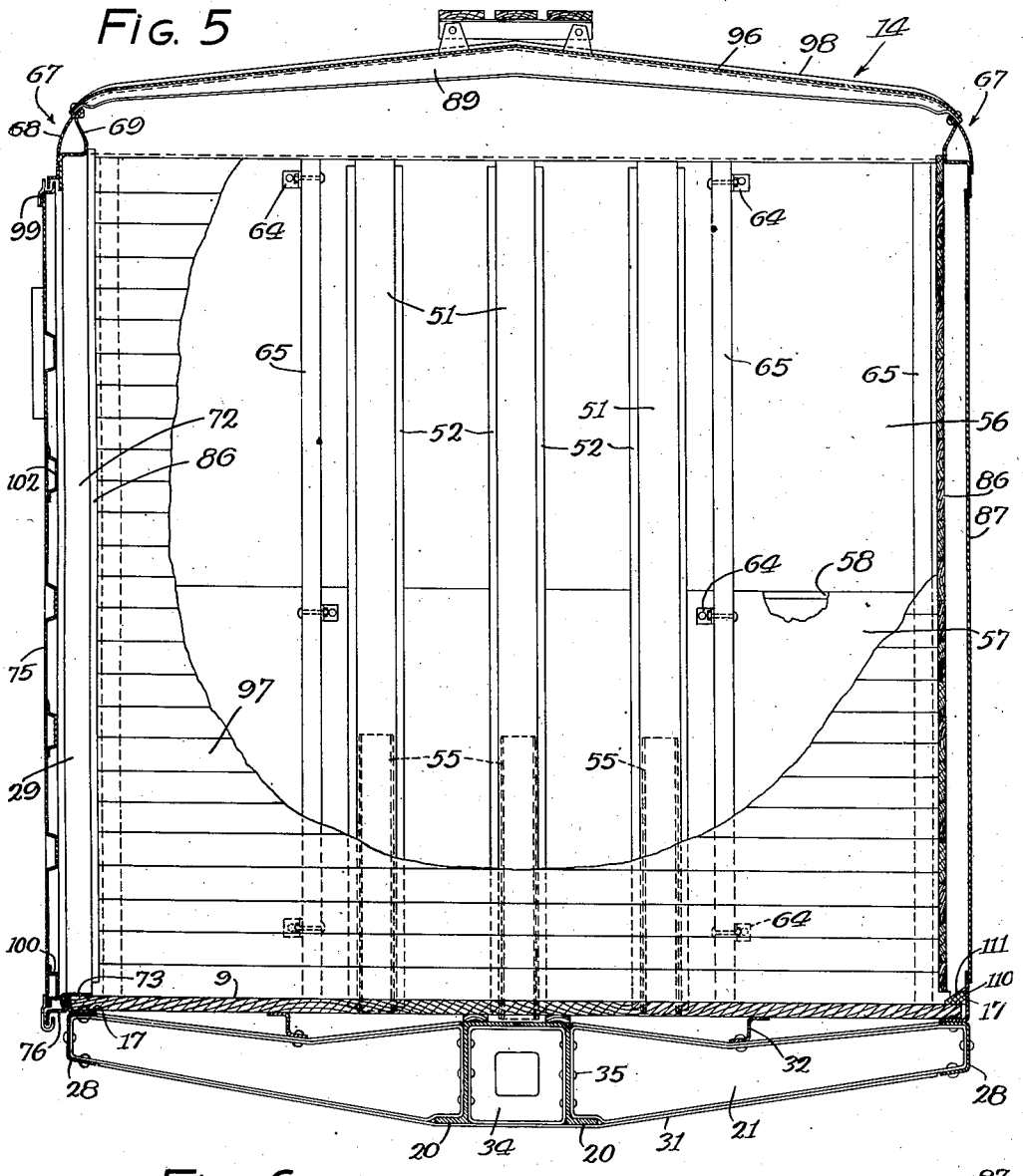
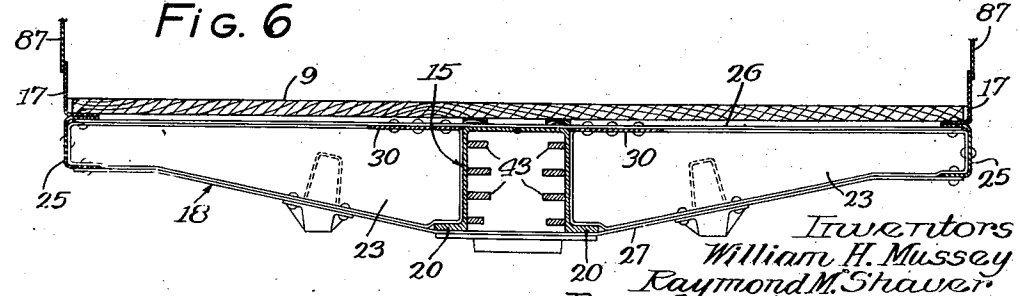



FIG. 6




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LIGHT WEIGHT BOXCAR

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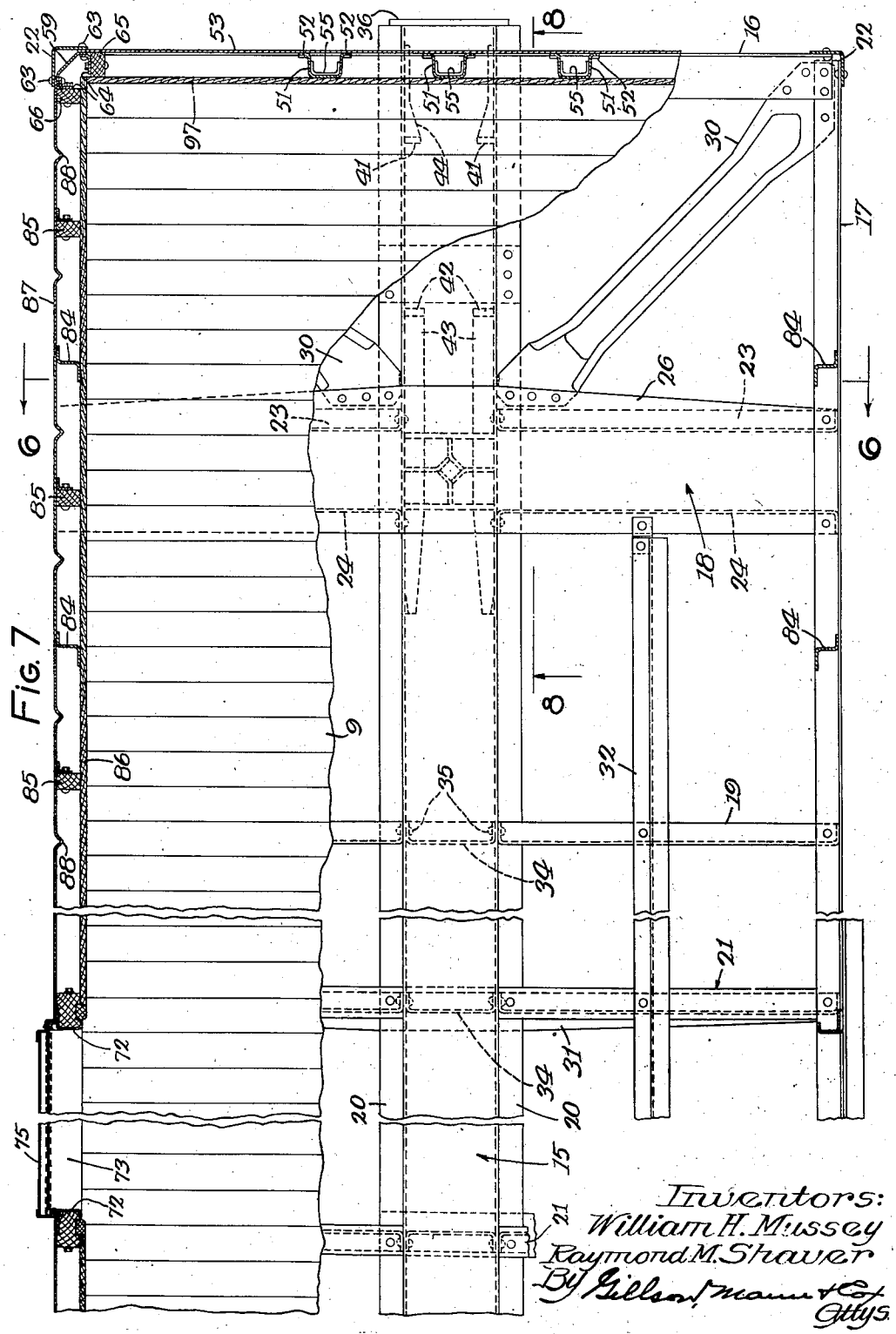


Fig. 7

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May 27, 1941. W. H. MUSSEY ET AL 2,243,113

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Filed Feb. 15, 1937 7 Sheets-Sheet 5

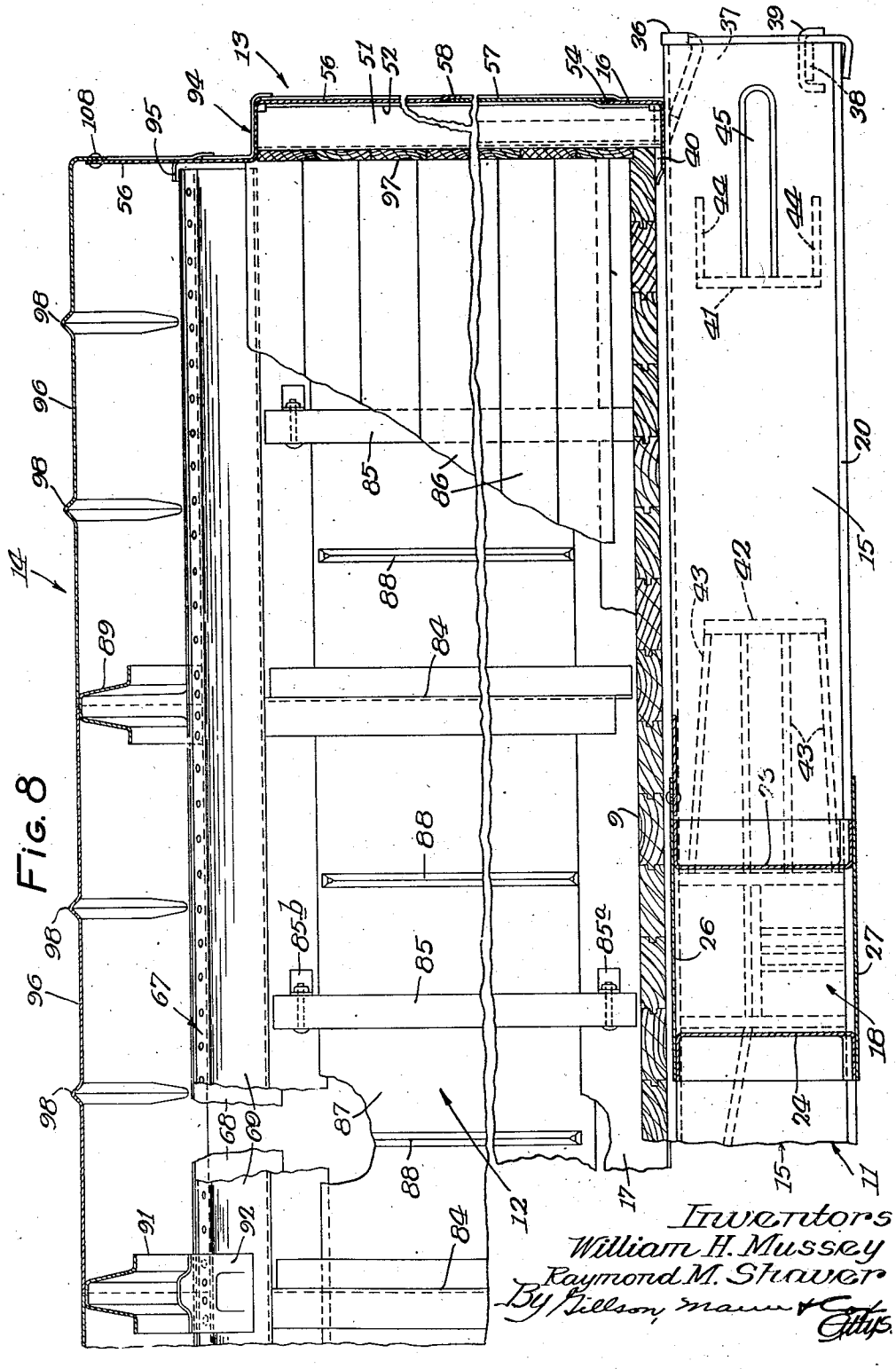


Fig. 8

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LIGHT WEIGHT BOXCAR

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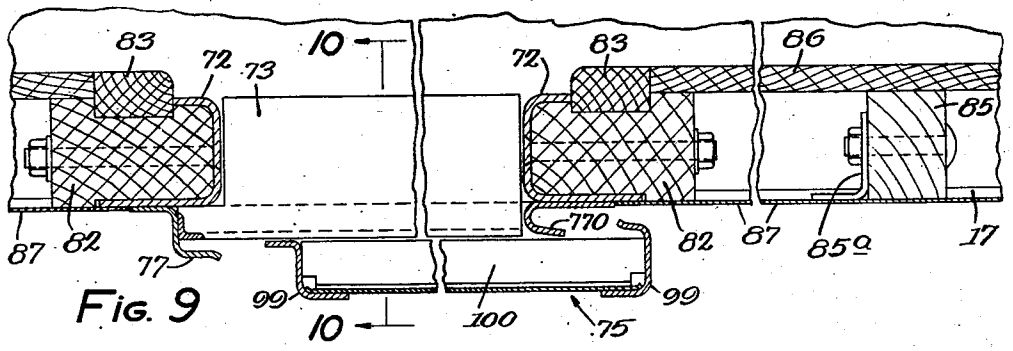



Fig. 9

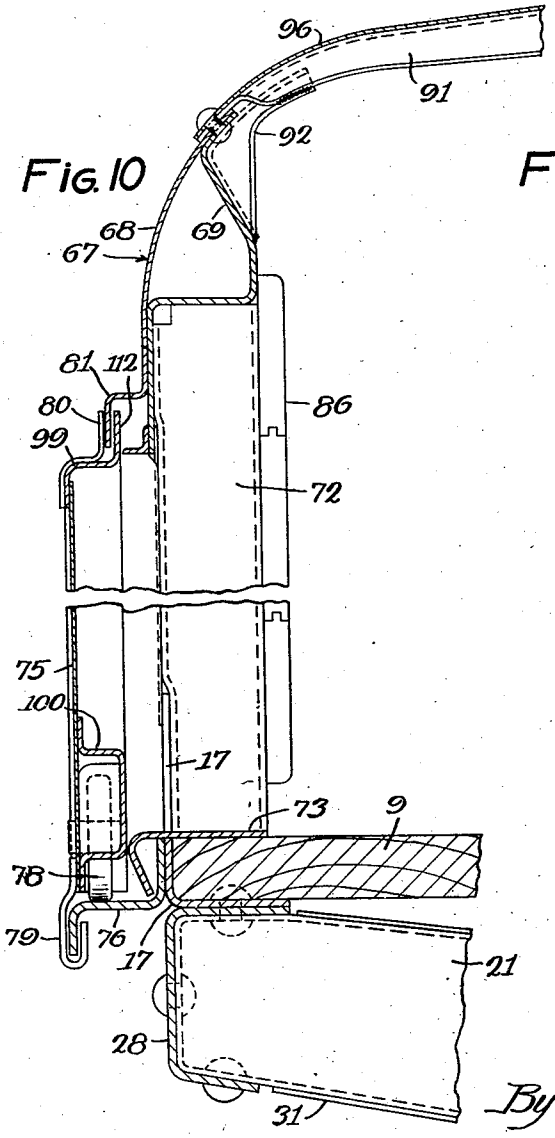



Fig. 10

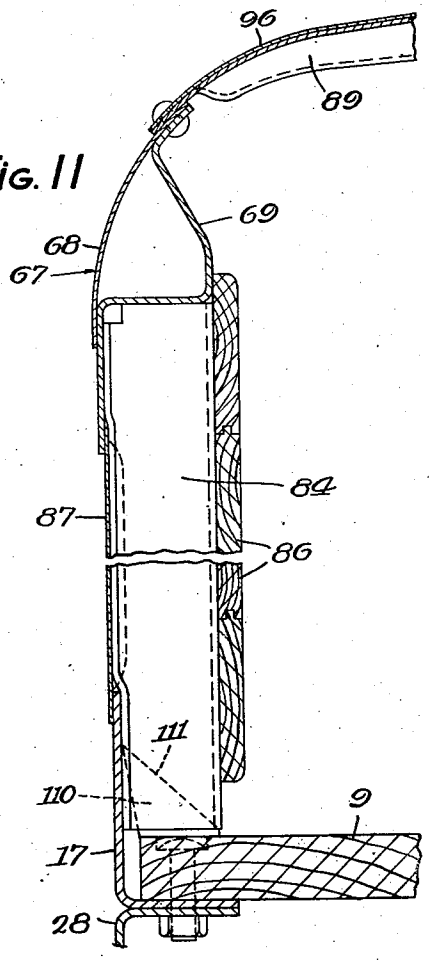



Fig. 11

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LIGHT WEIGHT BOXCAR

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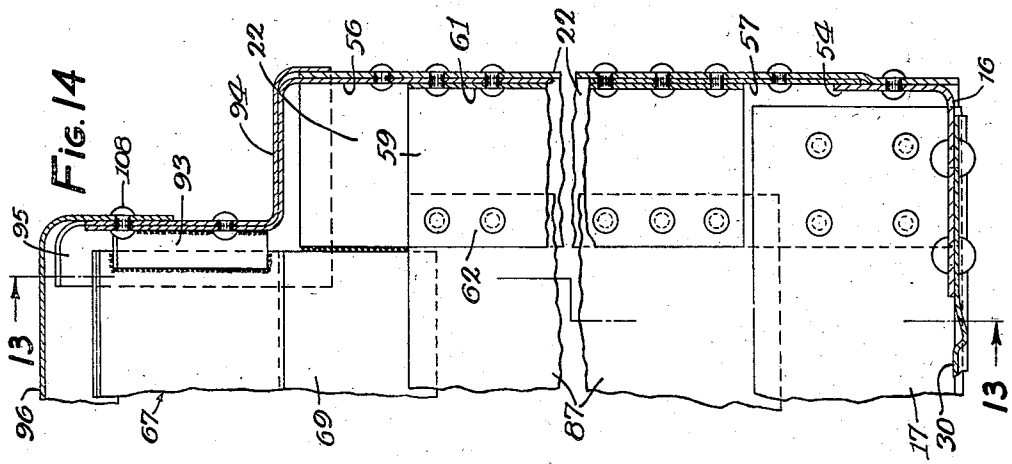


Fig. 14

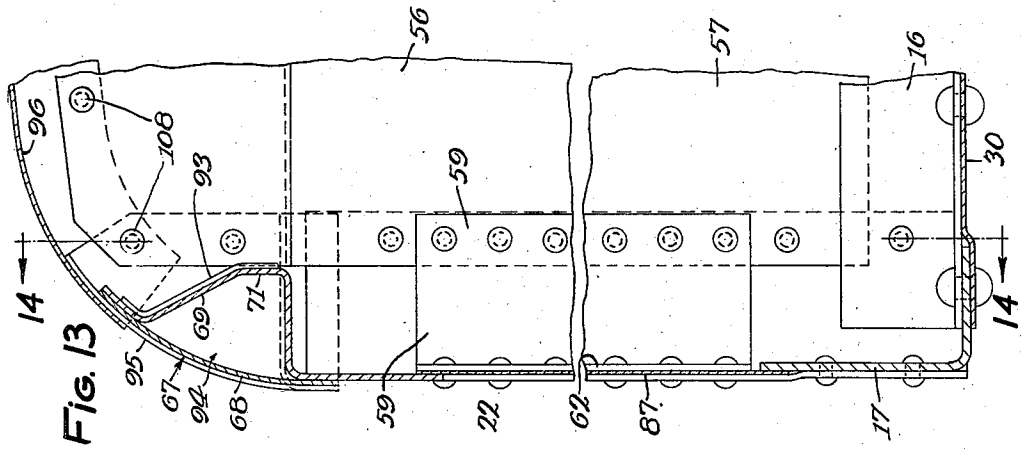


Fig. 13

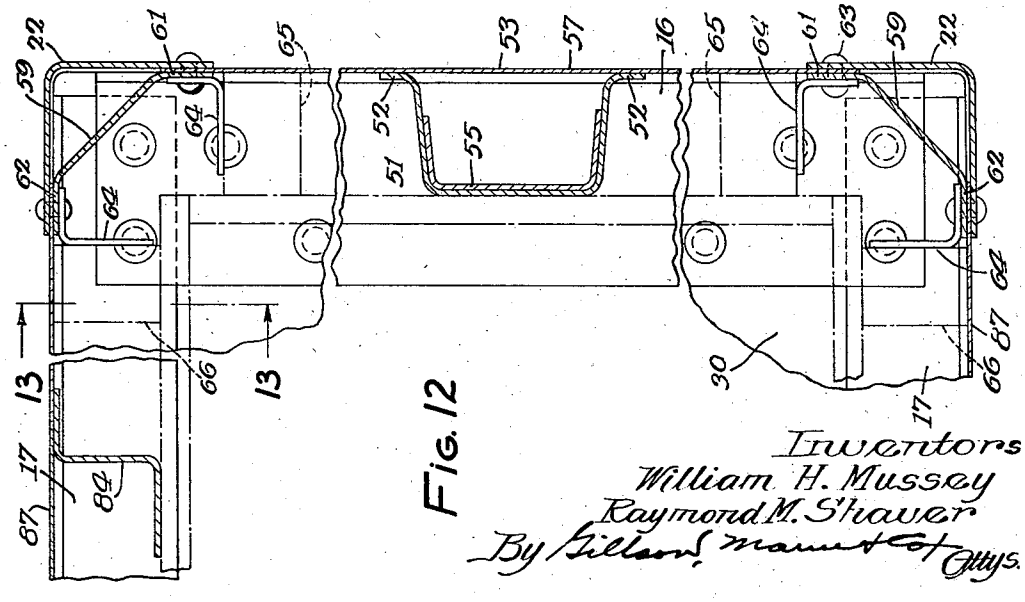


Fig. 12

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Patented May 27, 1941

2,243,113

# UNITED STATES PATENT OFFICE

2,243,113

## LIGHT WEIGHT BOXCAR

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Application February 15, 1937, Serial No. 125,688

10 Claims. (Cl. 105—404)

This invention relates to railway cars and more especially to the construction thereof.

One of the objects of the invention is the provision of a new and improved railway car that is so constructed that its weight is materially reduced from that of the conventional car of the same or like dimensions.

A further object of the invention is the provision of a new and improved car having novel end and side wall constructions.

A further object of the invention is the provision of a new and improved car construction having novel end and corner posts.

A still further object of the invention is a new and improved corner and end frame construction for railway construction.

Another object of the invention is the provision of new and improved car body having novel side plates so constructed as to provide a minimum of weight with a maximum of strength.

A further object of the invention is the provision of a car body that is relatively light in weight, simple in construction, efficient in use and that, for the most part, is constructed from sheet metal which, for the most part, is of comparatively light gauge.

Other and further objects and advantages of the invention will appear from the following description taken in connection with the accompanying drawings, in which

Fig. 1 is a perspective view of a railway car embodying the invention;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a perspective view of a portion of the frame of the car body;

Fig. 4 is a perspective view of one of the upper corners of the car body;

Fig. 5 is a transverse section of the car body, with parts broken away;

Fig. 6 is a section on the line 6—6 of Fig. 7;

Fig. 7 is a horizontal section of a portion of the car, with parts broken away;

Fig. 8 is a longitudinal vertical section of a portion of the car, with parts broken away, and with the underframe in section along the line 8—8 of Fig. 7;

Fig. 9 is a section along the line 9—9 of Fig. 1;

Fig. 10 is a section on the line 10—10 of Fig. 9;

Fig. 11 is a section on the line 11—11 of Fig. 1;

Fig. 12 is a horizontal section of an end portion of the car similar to Fig. 7 but showing the parts on an enlarged scale, with parts broken away;

Fig. 13 is a section on the broken line 13—13 of Figs. 12 and 14; and

Fig. 14 is a section on the line 14—14 of Fig. 13.

In the building of railway cars designed for interstate traffic, the structure must conform to certain requirements and specifications of the A. A. R. In the construction of the conventional railway car, commercial angles and channel bars together with rolled, cast and forged parts are most generally used and assembled by bolts and rivets, and, as a result, the weight of the completed car is very great, indeed.

The present invention seeks to materially reduce this weight by the use of a special steel alloy. All or practically all the car body parts and underframe structure are of sheet metal of comparatively thin gauge. In practice, it has been found, for instance, that the corner posts, the door posts and bolster diaphragms may be made of $\frac{3}{32}$ inch sheets; the corner posts of $\frac{1}{8}$ inch material; the top end sheets $\frac{3}{32}$ inch; the bottom end sheets $\frac{1}{8}$ inch; the side sheathing .05 inch; and the remaining parts of similar gauges. By so arranging and constructing the parts that sheet metal of comparatively thin gauge, pressed to form, may be used, and by the use of extensive welding, the resulting structure is materially lightened. It has been estimated that with trucks of special steel alloy, a car embodying the features disclosed above will weigh substantially 30% less than a conventional car of the same class or capacity. And this has been demonstrated on a car of 50 ton capacity class that has recently been built.

Referring now to the drawings, the reference character 10 designates the car in general which is provided with the underframe 11, side walls 12, end walls 13, the roof section 14, and floor 9.

The underframe comprises a center sill 15, end sills 16, side sills 17, bolsters 18, floor members 19, cross bearers 21, and diagonal braces 30 at each end of the car. The end and side plates are pressed angle bars as shown in Figs. 3, 5 and 6 of the drawings and are connected together at their ends and attached to corner posts 22, Fig. 7. Each of the corner posts is angular in cross-section. The center sill is formed of two members, pressed to Z-shape in cross-section and having their upper flanges, which are wider than the lower, extended inwardly and rigidly connected together as by being welded, as clearly shown in Figs. 5 and 6 of the drawings. Their lower flanges 20 extend laterally outwardly in opposite directions.

The bolsters 18 each comprises a pair of outer

diaphragms 23, Fig. 7, one at each side of the center sill and resting on the flange 20 thereof, and secured thereto by welding and a pair of inner diaphragms 24 which extend between channel members 25 at each side of the car and the center sills and rest on the flange 20 thereof and welded thereto. The channel members 25 are rigidly connected to the side sills 17 at each end of the bolster and beneath said side sills. The diaphragms 23 and 24 extend at their outer ends into the channel members 25 and are rigidly connected thereto as by rivets or the like. The bolster is provided with a top cover plate 26 and a bolster bottom cover plate 27 which extends from the channel bar 25 at one side of the car beneath the center sill to the corresponding channel bar 25 at the other side of the car and is rigidly connected thereto. Likewise, the top cover plate 26 extends entirely across the car and is secured to the side sills, channel member and diaphragms as by being riveted thereto. The central portion of the top cover plate is rigidly attached to the upper flange of the diaphragms as shown in Fig. 6.

Each of the cross bearers 21 comprises a pressed pan or diaphragm at each side of the center sill and is secured thereto. These diaphragms rest on the lower outturned flanges of the center sill. They extend outwardly into the channel of sub-side sills 28 which are rigidly secured to the side sill 17 beneath the same at points beneath the doorways 29 of the car body, see Fig. 3. The cross bearers 21 are each provided with an undercover plate 31 which extends from a point adjacent one end of the cross bearer to a point adjacent the other end beneath the center sill. Each cross bearer is also provided with upper cover plates extending from the center sill to the sub-side sill 28 at each side of the car, see Fig. 5.

The central portion of the diaphragms forming the cross bearers 21 are each depressed and a floor support 32, extending longitudinally of the car at each side of the center sill, is secured to the cross bearers in the depression. They are secured at their ends to the bolsters by suitable brackets. These supports are preferably Z-shaped in cross-section and are adapted to assist in supporting the flooring 9, as shown more clearly in Fig. 5 of the drawings. The flooring boards are supported at their ends on the inwardly extending horizontal flanges of the side sills. Between the diaphragms forming the floor members 19 and cross bearers 21, a reinforcing pan or separator 34 is preferably inserted in the girder formed by the center sills between these diaphragms and is secured to the center sills and diaphragms as by means of the rivets 35, Fig. 7.

The outer ends of the center sill are extended to form the draft sills for the car, that is, the draft sills are the outer ends of the center sills. The outer ends of these draft sills are provided with a strike plate 36, Figs. 3 and 8, having an opening 37 therethrough for receiving the shank of the coupler butt. The central portion of the plate at the lower marginal edge of the opening is bent inwardly as at 38 for forming a support for the wear plate 39 rigidly secured thereto. The center sill or draft sill portion thereof is provided with draft lugs 41 and buffer lugs 42 which are rigidly connected to the web portions of the center sill members as by being welded thereto. Suitable brace members 43 are provided for reinforcing the buffer lugs 42. The brace members 44 are also provided for reinforcing the draft lugs 41. The opening for the draft gear key is shown at 45.

The body of the car comprising the end and side walls 12 and 13, the roof portion 14 and floor 9 will now be described.

The end walls of the car each comprises a plurality of end posts 51 which are U-shaped in cross-section, the flanges of each of which extend outwardly and have laterally extending feet 52 which are connected to the end outside sheathing 53 by any suitable means as by welding, Figs. 7 and 12. These posts, of which there are three adjacent to the central portion of the end wall, are secured at their lower ends to the horizontal and also to the vertical flange 54 of the end sill 16 as shown in Fig. 8. These posts are offset inwardly at their lower ends to accommodate the flange 54. Each of these end posts is provided with means for strengthening or reinforcing the same. As shown, each has nested therein a channel bar 55, Fig. 7, which is attached at its lower end to the end sill 16 and extends upwardly only a portion of the length of the end posts 51, as shown more clearly in Fig. 5.

The outside sheathing of the end walls is composed of upper and lower sheaths or strips of sheet metal 56 and 57, Fig. 1. The upper sheath 56 extends, or is offset, over the tops of the corner posts and is secured to the forward end of the roof section as will presently appear. Its lower edge is offset outwardly for receiving the upper edge of the lower sheath or strip 57 as shown at 58 in Fig. 8 and indicated in Fig. 1.

The end sill 16 has its bottom flange portion offset downwardly above the draft sills as shown at 40 and is rigidly secured thereto as by being welded. The center end post is supported on this downwardly offset portion as shown more clearly in Figs. 5 and 8 of the drawings.

Each of the corner posts 22 is secured at its lower end to the outer side of the end and side sills 16 and 17, respectively, as indicated in Fig. 1. These posts are preferably of pressed metal and in order to rigidify or strengthen or reinforce the same, suitable plates are employed for forming the posts into a column or triangular boxlike structure. In the construction shown, plates 59 are employed for this purpose. These plates extend longitudinally of the corner posts 22 for a major portion of its length above the side sills 17 and are arranged diagonally across from one flange to the other of the corner posts. The side edges of the plates are bent to form feet 61 and 62, Fig. 12, which extend parallel with the end and side walls, respectively. These walls are secured between these feet and the flanges of the corner posts by any suitable means as the rivets 63 as will presently appear, Figs. 7 and 13.

A plurality of angle members or clips 64 are provided for attaching wooden posts or fillers 65 and 66 to the corner members as shown more clearly in Fig. 7 of the drawings. The end or inner sheathing for the end wall is preferably of wood and is secured to the end fillers 65 and end posts 51 in any suitable manner. The clips 64 are preferably secured to the corner posts 22 by the rivets 63 which secure the reinforcing member 59 to the corner posts 22, Fig. 7. The end sheathing 53 is attached to the corner posts by being clamped between the feet 61 and the corresponding flange of the corner posts 22. By means of this arrangement, a strong, rigid, reinforced end wall is provided for the car body.

The side walls of the car body comprise side plates 67 which extend the full length of the car and are attached at their ends to the corner posts and end walls or outer sheathing of the car as will presently appear. These side plates are also of comparatively light sheet metal pressed to form. Each comprises an outer arcuate plate 68 which forms the lower curved portion of the roof, an inner plate 69 which, in cross-section, is of special form having its upper edge bent to extend parallel with the upper edge of the outer plate 68 and rigidly secured thereto as by being welded and having its intermediate portion extending downwardly and laterally inwardly and then horizontally outwardly in contact with the plate 68 and then perpendicularly downwardly along the lower edge of the plate 68 and downwardly below the same, as shown more clearly in Fig. 13. The lower edge portion of the plate 68 is rigidly connected to the downwardly extending portion of the lower edge of the plate 69 as by being welded thereto. It will thus be seen that the plate 68 and the offset portion of the plate 69 form a boxlike structure or girder to which the side sheathing is adapted to be attached. The horizontal portion of this plate extends over the side posts of the car and is rigidly connected thereto.

Door posts 72, which are preferably in the form of channel bars, are provided on each side of the car intermediate the ends thereof. These posts 72 for each door have flanges extending parallel with the car wall and the channels are arranged back to back, Figs. 9, 10 and 11. These posts have their outer flanges offset inwardly at the lower ends of the posts to accommodate the upwardly extending flanges of the side sills 17, Fig. 10, and are rigidly secured thereto as by rivets, welding, or the like. The inner flange of the side sill 17 is foreshortened across the doorway and a threshold plate 73 is rigidly secured thereto and extends along the upper surfaces of the floor 9 of the car.

The outer end of the plate 73 is bent downwardly and inwardly to form a guide or spacer for the sliding door 75. A track 76 is rigidly secured to the upwardly extending flange of the side sill 17 and has a horizontally extending portion or track 77 on which the door supporting rollers 78 are adapted to travel in opening and closing the door. The lower downwardly extending end of this track plate is embraced by the door guide 79 for preventing lateral movement of the lower edge of the door 75.

A suitable guide 81 loosely engaging between clips 80 and a flange 112 on the door frame 99 is provided above the doorway for guiding the upper edge of the door. Since these guides are of the usual or well known construction, it is not thought necessary to further illustrate or describe the same.

Suitable keepers 77 and 770 are provided on the door posts for receiving forwardly extending flanges on the door frame when the door is closed, Fig. 9, and a stop 90 limits the opening movement of the door, Fig. 1.

Suitable filler members 82, Fig. 9, for the door posts 72 are provided. These fillers extend into the channels of the door post and are secured therein in any suitable manner. If desired, these fillers may be provided with grooves in which are secured suitable trim or face plates 83, as is usual in such constructions.

A suitable number of side posts 84, extending along each side and being attached at their upper ends to the side plates and at their lower ends to the side sills in a suitable manner as by riveting or welding, are provided. These posts are preferably, though not necessarily, Z-form in cross-section as shown more clearly in Fig. 7. A suitable number of wooden filler posts 85, to which the inner wall or sheathing 86 is adapted to be attached, are provided. The posts 85 are secured in position by any suitable means as by means of angle brackets 85*a* and 85*b* which are adapted to be welded to the vertical flange of the side sill 17 and to the side plate 67. These posts are secured to these brackets by suitable bolts or the like as shown in Fig. 8.

The inner wall 86 is adapted to be of wood and is secured to these filler posts by nails or bolts in the usual manner.

The outer sheathing 87 of the side walls is composed of a number of sheets or strips extending vertically and having their meeting edges engaging the outer flange of the side posts 84 to which they are welded as well as being butt-welded to each other. These sheets may, if desired, be provided with vertically extending, strengthening ribs or corrugations 88 in their intermediate portion, see Fig. 7. The vertical edges of the outer sheathing 87 at the car ends are adapted to be clamped between the corresponding flange of the corner post and the stiffening member 59 as clearly shown in Fig. 7 of the drawings.

The roof structure 14 comprises a plurality of carlines 89 and 91 of material pressed to channel form and curved to support a curved roof sheet. The ends are flattened, Fig. 3, and are secured at their ends to the arcuate plate 68. Certain of these carlines, as the carlines 91, have gussets or reinforcing plates 92 welded thereto and extend across the upper or riveted portion of the side plate and are secured to the inner offset portion of the side plate 69 as shown in Figs. 8 and 10 of the drawings. A metal covering or roof member 96, formed of a plurality of roof-sheets, extends over the carlines and is rigidly connected thereto as by welding. The side edges of the roof member 96 are bent over on the side plate member 68 and are connected to the same by rivets or the like as shown in Fig. 3. The roofing at the ends of the car is formed to extend over the end sheathing 56 and is rigidly secured thereto by means of rivets 108 as shown in Figs. 8 and 13. These roof sheets may, if desired, be provided with outwardly extending ribs or corrugations 98 which extend along the side and across the top of the roof structure. The meeting edges of the roof sheets are welded to the carlines, Fig. 8.

The ends of the side plates 67 do not extend to the end sheathing 53, as clearly shown in Fig. 7. The end and side sheathings are connected together by the corner post and stiffener member 59 as has already been described.

The side plate 67, which does not extend beyond the side sheathing, is connected to the end walls of the car by plates 93 which are welded to the side plate and end sheathing 53 as shown more clearly in Fig. 14 of the drawings.

A corner cap 94 is also provided, Fig. 4, which is pressed to form to extend over the upper end of each corner post and is provided with a flange 95 which extends over the arcuate portion 68 and downwardly on the outer sides of the corner post 22 and is rigidly secured to the parts as by riveting or welding. The upper portion

of the corner cap 94 extends beneath the roofing member 96.

The end wall 53 may also be provided with an inner wooden lining or inner wall 97 which may be secured in the usual manner to wooden filler members.

The doors for the car are formed from strips of sheet metal extending horizontally as shown in Fig. 1. The doors for the car each comprises a frame 99 extending across the side edges and top thereof and a U-shaped channel member 100 extending across the lower portion thereof. This member 100 has a downwardly extending flange to which the door sheathing is attached. The body portion of the door is of sheet metal and is provided with horizontally arranged channels or corrugations 102 for strengthening the same. Certain of these corrugations are formed in the lower edges of the sheets and are slightly offset inwardly to form a rabbet for receiving the upper straight edge of the next adjacent sheet below as shown in Fig. 5.

Preferably, though not necessarily, fillet members 110 having inclined upper surfaces 111. may be secured in the corners formed by the floor and outside sheathing between the side posts as shown in Fig. 5.

Suitable ladders are provided for the car. Each of these ladders comprises a pair of side bars 103 which may be of pressed channel form and have their ends flattened as at 104 and 105 for rigidly attaching the same to the ends or side of the car as shown at Fig. 1. The inner flanges of the side bars 103 are longer than the outer flanges and are provided with openings for receiving the rungs 106 as shown in Fig. 2. These rungs are held rigidly in position by welds 107 or the like.

It is thought from the foregoing taken in connection with the accompanying drawings that the construction and operation of our device will be apparent to those skilled in the art, and that changes in size, shape, proportion and details of construction may be made without departing from the spirit and scope of the appended claims.

We claim as our invention:

1. A railway car construction comprising side posts, side plates of hollow box section secured to the upper ends of the side posts on each side of the car, each of said side plates comprising inner and outer members of sheet metal, said inner member comprising a substantially horizontal web that rests on and extends continuously across the tops of said side posts, a depending outer side marginal flange that overlaps the outer faces of said side posts and an upstanding inner side marginal flange disposed in substantially flush alignment with the inner faces of said side posts, said outer member comprising a flat depending outer side marginal portion that overlaps and is rigidly secured to said depending outer side marginal flange of said inner member and a portion that is transversely bent on a curve that spans from side flange to side flange of said inner member and is rigidly secured to the top of the upstanding inner side marginal flange thereof, and merges into said flat outer side marginal portion of said outer member, and metal roof sheets spanning the car from side plate to side plate with their eaves end portions supported on top of and secured to the outer members thereof.

2. A railway car construction comprising side posts, side plates of hollow box section secured to the upper ends of the side posts on each side of the car, each of said side plates comprising inner and outer members of sheet metal, said inner member comprising a substantially horizontal web that rests on and extends continuously across the tops of said side posts, a depending outer side marginal flange that overlaps the outer faces of said side posts and an upstanding inner side marginal flange disposed in substantially flush alignment with the inner faces of said side posts, said outer member comprising a flat depending outer side marginal portion that overlaps and is rigidly secured to said depending outer side marginal flange of said inner member and to said side posts, a flat inner side marginal portion that is rigidly secured to and extends inwardly beyond the top of said upstanding inner side marginal flange of said inner member and an intermediate portion that is transversely bent on a curve that spans from side flange to side flange of said inner member and merges into said flat inner and outer side marginal portions of said outer member, and metal roof sheets spanning the car from side plate to side plate with their eaves end portions supported on top of and secured to the outer members thereof and curved in conformity therewith.

3. As an article of manufacture, a railway car side plate of hollow box section comprising inner and outer members of sheet metal, said inner member comprising a substantially horizontal web, a depending outer side marginal flange and an upstanding inner side marginal flange, said outer member comprising a flat depending outer side marginal portion that overlaps and is rigidly secured flatwise to said depending outer side marginal flange of said inner member, a flat marginal portion that is rigidly secured to and extends inwardly beyond the top of said upstanding inner side marginal flange of said inner member and an intermediate portion that is transversely bent on a curve that spans from side flange to side flange of said inner member and merges tangentially into said flat inner and outer side marginal portions of said outer member.

4. In a railway car, corner posts of hollow triangular cross section fabricated from sheet metal and comprising sides extending lengthwise and crosswise respectively of the car and a third side connecting and bracing said two first named sides, side posts along each side of the car, and a hollow side plate of sheet metal at each side of the car extending continuously from end to end of the car, said side plate being substantially triangular in cross section and having a horizontal base extending laterally inwardly of the car over said side posts and secured thereto and having a flange depending from the outer edge of said base alongside the outer sides of said side posts and having its ends engaged with and secured to the lengthwise extending sides of the adjacent corner posts.

5. A railway car construction comprising a pair of triangular corner posts at each side of the car, each having a vertical slot facing the opposite end of the car, a side sill having an upwardly extending flange secured at its end portions in engagement with the sides of the corner posts, a side plate of triangular cross section having a depending flange secured at its end portions in engagement with the sides of the corner posts, side posts rigidly secured to said flanges, and side sheets having their upper and lower edges welded to said flanges and having their end edges secured in the slots in the corner posts.

6. A railway car construction comprising side posts, hollow sheet metal corner posts triangular

in cross section, a sheet metal side plate of hollow box section including a horizontal web portion resting on and rigidly secured to the upper ends of said side posts and having a depending portion extending downwardly along the outer sides of said side posts and rigidly secured thereto, a roof section extending over said car and having its side edge rigidly secured to the outer side surface of said side plate, and cap members extending over and rigidly secured to said corner posts and side plate and extending beneath said roof section and rigidly secured thereto.

7. A railway car construction comprising side posts, hollow triangular sheet metal corner posts, sheet metal side plates of hollow box section including horizontal web portions resting on said side posts and rigidly secured thereto and having portions extending down alongside said posts and rigidly secured thereto, corner plates extending over said corner posts and side plates and rigidly secured thereto, and side sheathing of vertically extending plates having their vertical edge portions welded together and to said side posts, said sheathing being rigidly secured to said corner posts.

8. A railway car construction comprising side posts, hollow corner posts, side plates of hollow box section seated on the upper ends of said side posts and rigidly secured thereto, at each side of the car and extending continuously from one end of said car to the other, each of said side plates having upstanding and depending flanges, said depending flanges being connected to said side posts, said corner posts each comprising an outer angular member having a flange extending longitudinally of the car and one extending transversely thereof, a stiffening member arranged diagonally across from one flange to the other, extending vertically, and having flanges parallel with, and spaced from, the flanges of said angular member, outside sheathing for said car comprising sheet metal plates welded together and to said side posts and having vertical edges extending between the parallel flanges of said corner posts and secured thereto, and a roof section rigidly connected to the upstanding flanges of said side plates.

9. A railway car construction comprising side posts, hollow sheet metal corner posts, side plates of hollow box section having horizontal portions resting on said side posts and rigidly secured to said side posts, said plates extending continuously from end to end of the car and having upstanding and depending flanges, said depending flanges being rigidly secured to the outer side of said side posts, a metal roof section spanning the car from side plate to side plate and rigidly connected to said upstanding flanges, and cap members seated on said end posts and having depending portions rigidly secured thereto and having upstanding portions rigidly secured to said roof section and to the adjacent side plate.

10. A railway car consruction comprising side posts, hollow corner posts fabricated from sheet metal and triangular in cross section, all sides of said corner posts being flat, a hollow side plate of sheet metal triangular in cross section extending continuously from end to end of the car and having a horizontal web seated on said side posts and rigidly secured thereto, said side plate having a depending flange extending downward alongside said side posts and rigidly secured thereto, means extending across the upper ends of said corner posts and rigidly secured thereto and to said side plates, a side sill having a vertical flange, and side sheathing of sheet metal connected to said side and corner posts and to the named flanges of said side plate and side sill.

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