

Nov. 23, 1943.

G. A. SUCKFIELD

2,335,216

CAR CONSTRUCTION

Filed June 13, 1940

3 Sheets-Sheet 1

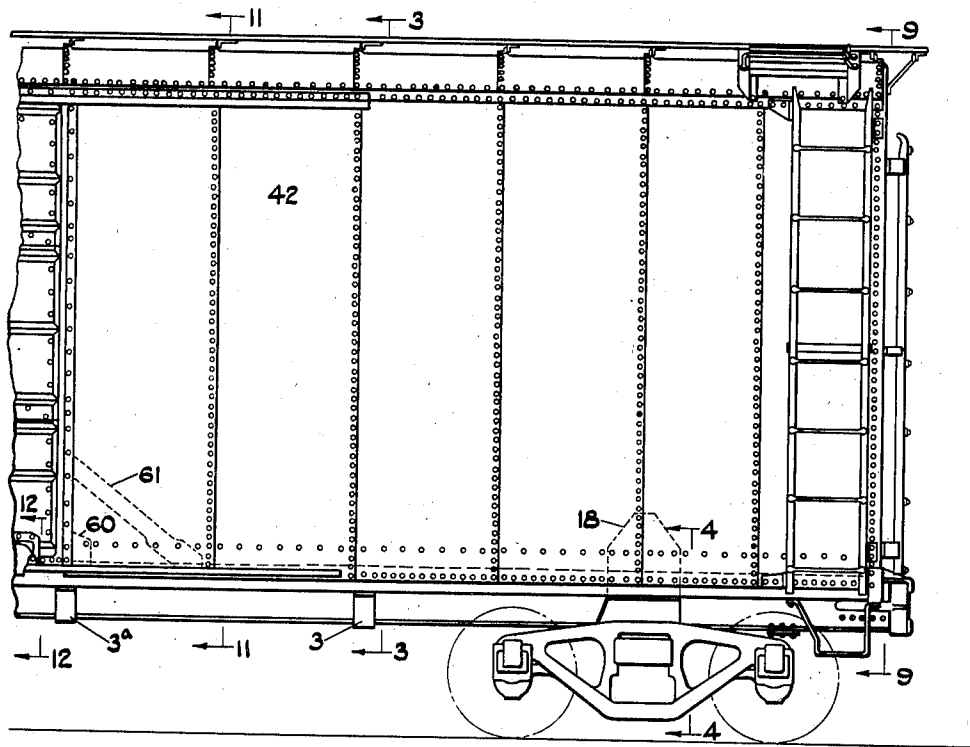


Fig. 1

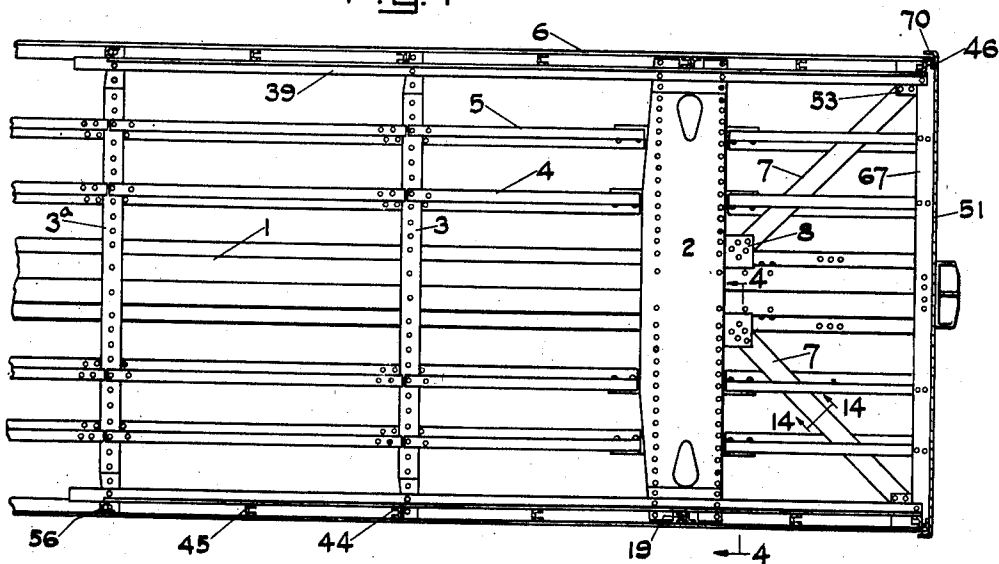


Fig. 2

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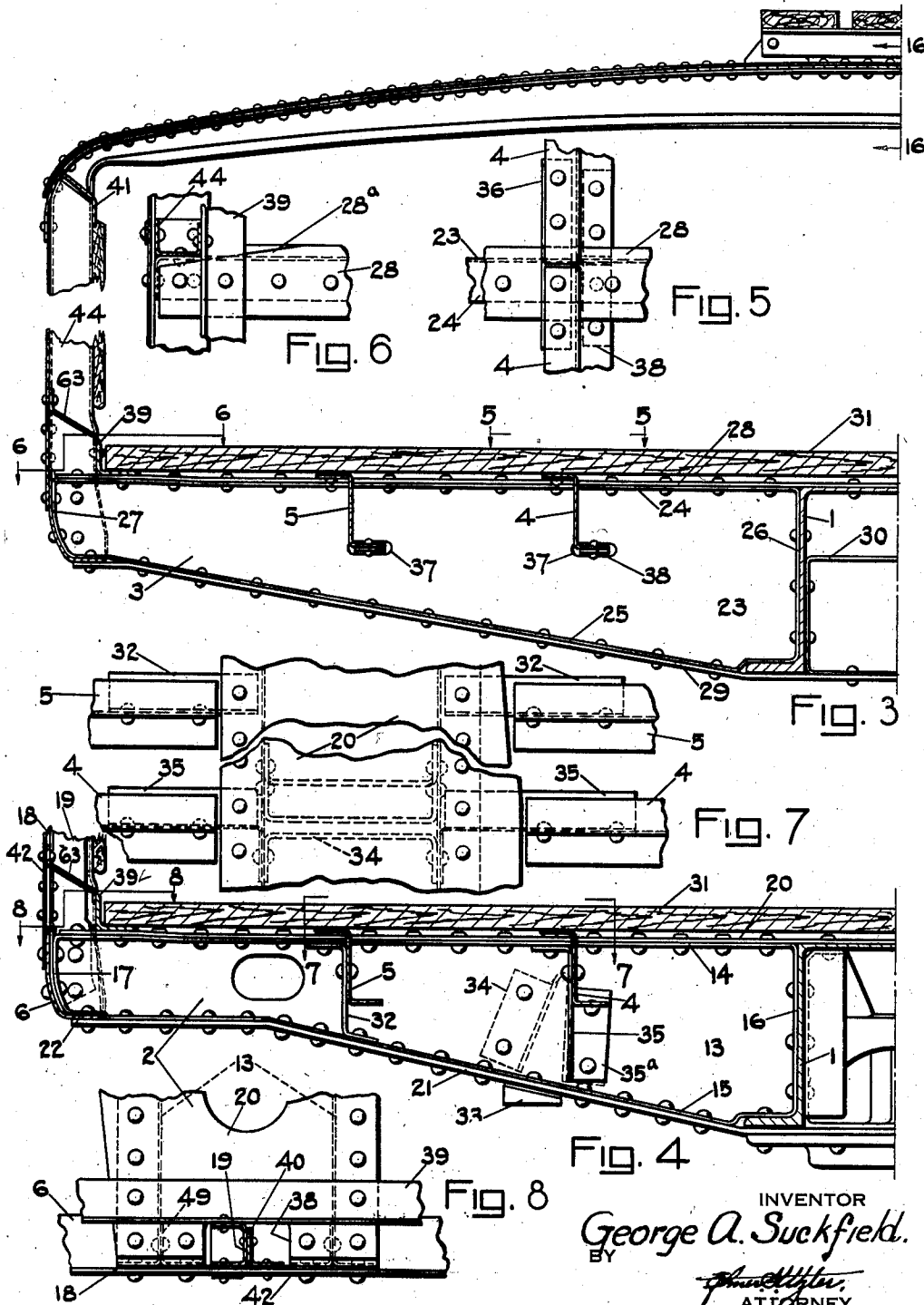
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3 Sheets-Sheet 2



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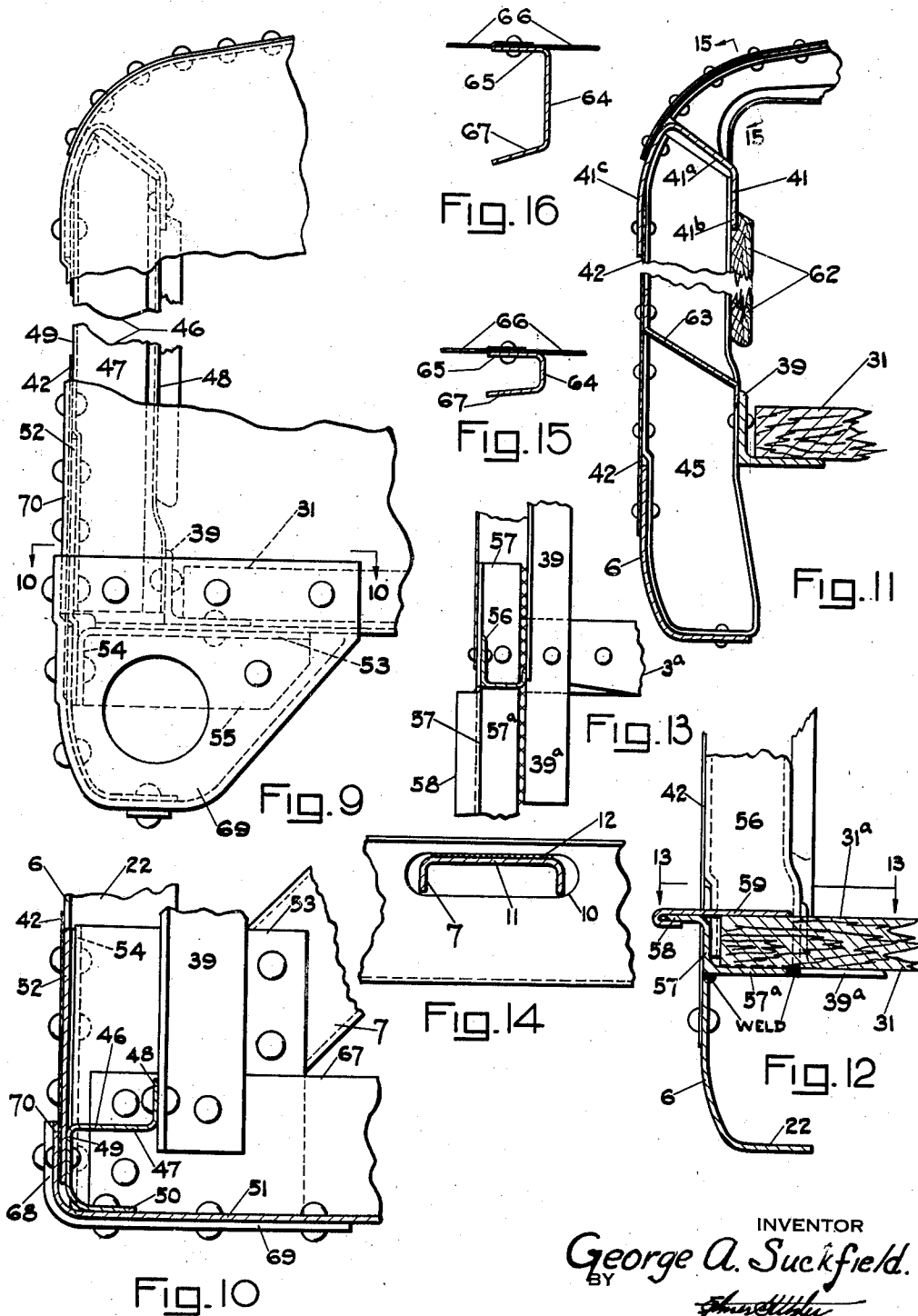
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CAR CONSTRUCTION

Filed June 13, 1940

3 Sheets-Sheet 3



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CAR CONSTRUCTION

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Application June 13, 1940, Serial No. 340,257

18 Claims. (Cl. 105—404)

My invention pertains in general to metal sheathed house or box cars as distinguished from open top cars and in particular to a novel manner of forming and assembling the component members of the car framing structure in order to utilize the maximum strength of the members individually and in combination, whilst conforming to the current trend for "streamlining" the structure as a whole.

In recent years many efforts have been made to reduce the weight of railroad cars. This reduction in weight has heretofore been mainly secured through the use of special alloy steels so that the inherent increase strength of the material itself has been utilized to secure the desired result rather than through change in design. Whilst my invention as hereinafter set forth can advantageously utilize special alloy steels to further lighten the car structure, my invention contemplates increasing the strength of the car structure chiefly through the use of members of a novel design and through the use of novel combinations of such members in forming the car structure.

One object of my invention is to provide in a new and novel manner a box car structure wherein each of the transverse members of the underframe, the adjacent posts of the side walls, and the associated carlines of the roof combine to form unitary members which are assembled in sections and function as continuous members.

Another object of my invention is to provide a car floor structure strong enough to support concentrated loads and which provides a novel manner of utilizing the various adjacent underframe members in providing this support.

Another object of my invention is to provide a car side wall construction of new and novel form having strong connections with the underframe and roof of the car.

A further object of my invention is to provide new and novel combinations of members forming the various component parts of the car structure to obtain reduction in weight over the conventional car structure without sacrifice in strength or increase in cost of manufacture thereof.

These and other objects of the invention will be made apparent as the description proceeds.

In the drawings forming part of this specification and wherein like reference characters refer to like parts: Fig. 1 shows in side elevation a portion of a car embodying the invention; Fig. 2 shows in plan a portion of the underframe of such car; Fig. 3 shows a section taken on lines

3—3 of Fig. 1 at one of the car crossbearers and is one-half of a transverse section through the car illustrating the crossbearer, side post, side walls and car roof assembly; Fig. 4 shows a section taken on lines 4—4 of Fig. 1 and is a transverse section through one-half of the car at the bolster illustrating the bolster and post connections as well as attachment of other members to the bolster; Fig. 5 shows a plan view taken at lines 5—5 of Fig. 3 with the car floor removed to better illustrate a mode of attachment of the floor stringers to the crossbearer; Fig. 6 shows a section through a side post taken on lines 6—6 of Fig. 3 with the car floor removed to better illustrate the crossbearer and mode of connecting the post to the crossbearer; Fig. 7 shows a plan view taken at lines 7—7 of Fig. 4 with the car floor removed to better illustrate the mode of attachment of the floor stringer sections at the bolster; Fig. 8 shows a section through the side post at lines 8—8 of Fig. 4 with the car floor removed to better illustrate the attachment of the post to the side sill and bolster; Fig. 9 shows an enlarged fragmentary view of a portion of the end of the car showing the connections between the car end wall, the side sill, end post and push pole pocket; Fig. 10 shows a section taken on lines 10—10 of Fig. 9 illustrating details of the assembly of the corner post to the end and side walls of the car; Fig. 11 shows an enlarged section through the car side wall at lines 11—11 of Fig. 1 illustrating the side wall post connections to the side sill and side plate; Fig. 12 shows an enlarged section taken on lines 12—12 of Fig. 1 illustrating the underframe conditions between the door posts at the door opening in the side wall; Fig. 13 shows an enlarged plan taken on lines 13—13 of Fig. 12 with the car floor and threshold plate removed to better illustrate the manner of forming the floor and threshold support at the door opening in the car side wall; Fig. 14 shows a section taken on lines 14—14 of Fig. 2 illustrating the floor stringer and diagonal brace conditions; Fig. 15 shows a section taken on lines 15—15 of Fig. 11 showing the formation of the car roof carline at this point; Fig. 16 shows a section taken on lines 16—16 of Fig. 3 illustrating the roof carline condition at this point.

A box car structure is usually considered as comprised of an underframe, opposite side walls, end walls and a connecting roof. In the car illustrated herein the car end walls are unitary structures assembled on the car as a unit and are connected to the underframe, the side walls

and the roof. The end wall, as illustrated, is provided with a bottom flange serving as an end sill of the underframe but the invention is not limited to such an end wall and it is to be understood that other and well-known end wall and end sill constructions may be substituted.

The underframe now to be described is illustrated in the drawings as being symmetrical about its longitudinal center line and about its transverse center line except for such modification as may be made necessary therein by the location of the door opening in the car side wall.

Extending longitudinally of the underframe, from end to end thereof, is a center sill 1 illustrated as the "A. A. R." standard Z bar sill comprised of continuous Z bars having their top flanges substantially abutting and these flanges being either continuously or stagger welded throughout the length of the center sill thereof. Adjacent each end of the center sill 1 and inwardly therefrom are bolster members 2 extending on opposite sides of the sill 1. Intermediate the bolsters 2 are a suitable number of transverse members 3 designated as crossbearers and extending on opposite sides of the center sill 1. Extending longitudinally of the car on opposite sides of the center sill 1, in spaced relation thereto and to each other, are floor stringers 4 and 5. These floor stringers, extending from end to end of the car, perform the dual purpose of supporting the car floor and tying together the bolsters and crossbearers of the car underframe. At each side of the car underframe and extending continuously from end to end of the car are side sills 6 which form a part of the car side wall structure and serve to connect the bolsters and crossbearers. In the car structure as illustrated no separate end sills are provided as I prefer to use an integral steel end and to utilize a bottom flange on said end as an end sill. At each end of the car underframe, between the bolsters and the said bottom flange of the end wall of the car, I provide diagonal bracing members 7, having their inner ends connected by plates 8 to the bolster and center sill, and their outer ends connected by plates 9 to the end and side walls of the car. Each floor stringer 4 and 5, as illustrated in Fig. 14, has an aperture 10 therein through which the diagonal brace 7 extends, with the top face or web 11 of the diagonal brace 7 being welded at 12 to the web of the Z shaped floor stringer at the top of the aperture 10. At opposite ends of the underframe and secured to the center sill 1 are the usual striking plates, bolster center braces, and draft lugs which form no part of the present invention and will not be hereinafter referred to.

The car herein illustrated and described has the side walls designed as girder members supported by the bolsters which carry the weight of the lading and car structure to the supporting car trucks. The center sills serve as columns into which are transmitted all draft and buffing shock. The center sills also serve to carry the vertical load between the underframe cross members and to transmit such load to said members. The car side posts which serve to stiffen the side wall structure, are also rigidly connected to the roof carlines and to the underframe cross members thereby forming a series of substantially continuous transverse members spaced longitudinally of the car structure.

Each bolster, as illustrated in Figs. 4 and 8, comprises pairs of spaced pan-shaped diaphragms placed back to back and extending outwardly

from each side of the center sill 1. Each diaphragm comprises a web 13, top flange 14, bottom flange 15, inner side flange 16, and outer side flange 17. The inner side flange 16, web 13, and bottom flange 15 are shaped to fit around the adjacent bottom flange of the center sill. The bottom flange and said side flange being secured to the center sill web and bottom flange respectively. The outer side flange 17, web 13 and bottom flange 15 are shaped to fit within the side sill 6. Disposed between the web of sill 6 and flanges 17 is a plate 18, as illustrated in Figs. 4 and 8, connecting the bolster diaphragms and side sill with the adjacent side post 19. In order that the side sheathing 42 may be in a single plane the bottoms of the side posts extending across the side sill are offset as illustrated in Figs. 3, 4 and 11. The top flanges 14 of the bolster diaphragms are substantially in the horizontal plane of the top of the center sill 1 and are connected by a continuous bolster top cover plate 20 extending substantially from end to end of the bolster and secured to the said flanges 14 and to the top of the center sill 1. The ends of the cover plate 20 are cut out, as shown in Fig. 8, to fit around the side posts 19. The bolster diaphragm bottom flanges 15 are connected by a bottom bolster cover plate 21 extending continuously from substantially end to end of the bolster and secured to the diaphragm flanges 15 and the bottom flanges of the center sill 1. At opposite ends of the bolster the diaphragm webs 13 are shaped to fit around the bottom flange 22 of the side sill 6 so as to bring the bottom flange 22 of the side sill into the plane of the adjacent portion of the bottom flange 15 of the bolster diaphragm. The bottom bolster cover plate 21 laps over and is secured beneath the bottom flange 22 of the side sill and to the bottom flange 15 of the bolster diaphragm.

The crossbearers 3, as illustrated in Figs. 2, 3 and 6, are at least four in number, two marked 3^a being spaced on opposite sides of the transverse center line of the car and preferably at the side door opening, and at least one marked 3 between each of said first named crossbearers and the adjacent bolster 2. Each crossbearer comprises a pan-shaped diaphragm extending outwardly from each side of the center sill and having a web 23, top flange 24, bottom flange 25, inner side flange 26 and outer side flange 27. The inner side flange 26 is shaped to fit over the bottom flange of the center sill and is secured to the center sill side wall. The top flange 24 of the crossbearer diaphragm is in substantially the horizontal plane of the top of the center sill and these flanges 24 on opposite sides of the center sill 1 are connected by a top cover plate 28 extending substantially from side sill to side sill. This top cover plate 28 is secured to top flanges 24 of diaphragm webs 23 and to the top of the center sill. The end portions of the cover plate 28 are cut so as to be disposed inwardly of the vertical plane of the outer face of the web 23 of the crossbearer diaphragm, as illustrated in Fig. 6, for a purpose hereinafter set forth. The bottom flanges 25 of the crossbearer diaphragms on opposite sides of the center sill are connected by a continuous bottom cover plate 29 extending substantially from end to end of the crossbearer and beneath the bottom flanges 22 of the side sill 6. Intermediate the crossbearer diaphragms 23 and between the center sill side walls are diaphragm center braces 30, which are pan-shaped, having the side

flanges connecting the inner side flanges 26 of the crossbearer diaphragms and a bottom flange secured to the bottom cover plate 29. At opposite ends of the crossbearers the outer side flanges 27 lie against and are secured to the side sill 6. As in the case of the bolsters, the outer side flange 27 and web 23 are shaped to fit over the bottom flange 22 of the side sill so that the bottom cover plate 29 laps under the bottom flange of the side sill and is secured thereto and to the bottom flanges 25 of the crossbearers.

The floor stringers 4 and 5, extending from end to end of the car, are preferably Z shaped in cross section and have the top flanges thereof, which support the car floor 31, disposed above the horizontal plane of the top of the bolsters 2 and crossbearers 3. The members 4 and 5 are preferably substantially identical and their number depend primarily upon the amount and nature of load imposed upon the car floor. Where concentrated loading is apt to be imposed, two or more are used; where the load is less, but one may be used. Whilst functionally the floor stringers are primarily beams extending between adjacent transverse members of the underframe structure to support the car floor, such a beam when made continuous across a plurality of transverse members is stronger for a given depth of floor stringer than when made in short pieces extending between said transverse members. To maintain this continuous beam feature and to avoid weakening the crossbearers and bolsters were they to be offset in order to permit disposing the floor stringer entirely above them and to avoid increasing the height of the car as would be the case when disposing the floor stringers wholly above the bolster and crossbearer without said offsets, the floor stringers are made in sections which are disposed with the major portion of the vertical web thereof below the horizontal plane of the tops of the bolsters and crossbearers and these floor stringer sections are connected to the said cross members in a manner so as to form continuous members. Likewise, in order to avoid increasing the weight of the car the stringers must be kept to a minimum in size and the connections thereof to the bolsters and crossbearers must be of a design light in weight and yet developing the full strength of the floor stringer section.

At the bolsters, in order to accomplish the foregoing purposes, I have provided a substantially Z shaped connecting member 32 which is disposed between the top and bottom flanges of each bolster diaphragm at the ends of floor stringer 5. The top and bottom flanges of the member 32 are then connected to the bolster diaphragm flanges 14 and 15 and to the top and bottom cover plates 20 and 21. The floor stringers 5 may then terminate adjacent the bolster top cover plate 20 and the web of the floor stringer 5 is disposed against and secured to the web of the member 32 as illustrated in Figs. 4 and 7. In this manner the top and bottom cover plates act as a tie between adjacent ends of the floor stringer sections 5 producing the effect of a continuous beam. In the case of the floor stringer 4, a similar connection between the ends of the stringer and the bolster may be used as in the case of the floor stringer 5, if desired. However, as this floor stringer 4 is adjacent the body side bearing 33 which necessitates the use of a brace 34 to connect the opposite webs 13 of the bolster diaphragms to assist the bolster bottom cover

plate in backing up the body side bearing, I prefer to utilize this member 34 to connect adjacent ends of the floor stringer sections 4. For this purpose I provide a substantially angle shaped member 35 having a horizontal leg lying beneath and secured to the bolster top flange 14 and top cover plate 20, and a vertical leg disposed in a plane normal to bolster web 13 and provided with a laterally extending flange 35^a lying against the web 13 of the bolster diaphragm and secured thereto and to the flange of brace 34. The web of the Z shaped floor stringer 4 may then be secured to the vertically disposed leg of the member 35. Thus the connections between the adjacent ends of the floor stringer sections 4 and 5 on opposite sides of the bolster develop equivalent or greater strength than a cross section of the floor stringer sections, giving the effect of continuous floor stringer beams extending from end to end of the car.

At the juncture between the floor stringer 4 and 5 and the crossbearers 3, as illustrated in Figs. 3 and 5, the top flanges of the Z shaped floor stringers are, as previously described, disposed above the plane of the crossbearer top cover plate 28 and I prefer to use a connecting member 36 disposed across the crossbearer cover plate 28 and beneath the top flanges of the adjacent ends of the floor stringer sections. For this purpose the web of the floor stringer at the flange side of the member 3 is cut away so that the top flanges of floor stringers 4 and 5 project over the top cover plate 28 and top flange 24 of the crossbearer, and the bottom flange of the floor stringers project beneath the flange 24 of the crossbearer to adjacent web 23 thereof. On the opposite side of crossbearer 3 the webs of floor stringers 4 and 5 are cut a lesser amount so that the flanges thereof project over and under the top cover plate 28 as shown in Fig. 5 of the drawings. The top flanges of the floor stringers 4 and 5 are then riveted to the member 36 and preferably to cover plate 28 as shown in Fig. 5. In order to provide a symmetrical connection between the adjacent ends of the floor stringer sections I prefer to provide apertures 37 in the webs 23 of the crossbearer and extend a member 38 through these apertures and beneath adjacent ends of the bottom flanges of the floor stringers. The floor stringer bottom flanges and member 38 are then connected as in Fig. 5. As will be apparent from examination of Figs. 3 and 5 this arrangement provides a simple, economic connection between the adjacent ends of the floor stringers at the crossbearers which is equivalent to or greater in strength than a cross section of the floor stringers.

Referring now to the side construction which is in effect a plate girder having the side plate as the top chord, the side sill as the bottom chord and the side posts and sheathing connecting said top and bottom chords. These side posts are substantially U shaped having the web thereof disposed in a plane substantially normal to the side plate and side sill, and the flanges of the post disposed in a direction longitudinally of the car. These side posts are arranged at the ends of the bolsters and the crossbearers as well as intermediate the said crossbearers and bolsters and intermediate the bolsters and the ends of the car.

The side post 19 at each end of the bolster, as illustrated in Figs. 4 and 8, is disposed between the webs 13 of the bolster diaphragms, passing through the aperture in the top bolster cover plate 20 and extending down to the side sill bot-

tom flange 22. The side post 19 is substantially U shape in cross section and provided with a bottom flange engaging the side sill bottom flange 22, with the web of the post 19 disposed in a plane normal to the upright leg of the side sill 6. Disposed between the outer flange of the post 19 and the upright leg of the side sill 6 is a plate 18 which connects the bolster diaphragm flanges 17 and is secured to the side sill 6. The outside flange of the post 19 is also secured to the plate 18 and the side sill 6. Disposed against and secured to the inner flange of the post 19 is an angle 39 having an upright leg secured to the inner flange of the post and having a horizontal leg secured to the bolster top cover plate 20 and bolster diaphragm top flanges 14. This angle 39 preferably extends across a plurality of the side posts, as illustrated in Fig. 2 of the drawings, and also serves as a support for the floor 31.

In order to further strengthen the bolster post 19 I prefer to provide an angle post 40 having one leg disposed against the plate 18 and the other leg disposed against the web of post 19. Suitable connections between the post 40, the post 19 and plate 18 are provided. Post 19, as do all other side posts, extends upwardly to and is secured within the side plate 41 which is best illustrated in Fig. 11 of the drawings.

In order that the side sheathing 42 may lie in the same plane as the outer faces of the side posts and the side sill 6 I prefer to offset the outer flange and web of each side post at the side sill, as best shown in Fig. 11 of the drawings.

As will be apparent from an examination of Figs. 1, 4, 8 and 11 of the drawings, the side post 19 at the bolster is secured directly to the bottom flange 22 of the side sill 6 and is secured through plate 18 to the upright leg of the side sill 6 and the flanges 17 of the bolster diaphragms. In order to provide a better connection between the plate 18 and the bolster diaphragms I prefer to use the connecting members 43 secured to the webs 13 of the bolster diaphragms and to the plate 18 and side sill 6.

Referring now to Figs. 3 and 6 of the drawings, the side post 44 at the crossbearers is likewise of U shape in cross section having the web of the post 44 disposed against and secured to the web 23 of the crossbearer diaphragm. As in the case of the bolster post 19, the crossbearer post 44 has a bottom flange secured to the flange 22 of the side sill, the outer flange of the post secured directly to the vertical leg of the side sill and the inner flange secured to the angle 39. As illustrated in Fig. 6 of the drawings, the crossbearer top cover plate 28 which normally extends outwardly from both sides of the top flange 24 of the crossbearer diaphragm has its end portions 28^a offset to avoid interference with the side post 44. The intermediate side post 45, as best illustrated in Fig. 11 of the drawings, is likewise U shape in cross section, has the bottom portion thereof offset to fit around the upright leg of the side sill 6, and is secured to the side sill 6, as are the side posts 44 and 19.

The side posts 55 at each side of the door opening are also preferably located at a crossbearer. In this case however, as illustrated in Figs. 12 and 13, the side or door posts 55 instead of extending downward along the side sill are preferably terminated above the side sill and crossbearer. At the door opening a threshold angle 57 is disposed above and connects the crossbearers 3^a. The door posts 55 at each side of the door opening are secured to the vertical

flange of the threshold angle and bear on the bottom flange 57^a thereof. This connection between door post and threshold angle may, if desired, be reinforced by addition of gusset plate 60 and if further reinforcements are required diagonal brace 61 extended from door post 55 to adjacent side post 45, all as illustrated in Fig. 1 of the drawings. Between the door posts 55 the vertical leg of threshold angle 57 has a portion 58 thereof flanged outwardly, as shown in Fig. 12, to serve as a threshold support, and a threshold plate 59 is secured thereto and to floor 31^a. At the door opening and between door posts 55 the angle 39 extends a suitable distance past each door post 55. The upright leg of angle 39 at such extension is cut away to permit passage of floor boards 31^a and the bottom leg 39^a is welded to the bottom leg 57^a of the threshold angle as shown in Figs. 12 and 13. In this manner the threshold angle 57 combines with the angles 39 to provide a continuous member tying together the side wall posts from corner post to corner post. These corner posts, as best illustrated in Figs. 9 and 10, are of modified Z shape in cross section having a web 47 disposed transversely of the car, an inwardly disposed flange 48 and an outwardly disposed flange 49. The flange 48 has a portion 50 thereof turned in a direction transversely of the car serving as a support for and place of attachment of the car end wall 51. The corner post, like the side wall posts, extends from the side plate 41 to the side sill 6 and fits within the side plate in the same manner as do the posts 19, 44, 45 and 56. At the side sill I prefer to terminate the corner post above the side sill and to place a gusset plate 52 between the side sill and flange 49 of the corner post as shown in Figs. 9 and 10 of the drawings. The gusset plate 52 extends inwardly of the car and is connected to the corner post flange 49 and side sill 6. The gusset plate 52 is offset at the side sill, as shown in Fig. 9 of the drawings, in order that the outer sheathing 42 may lie in the plane of the outer flange of the corner post and the vertical leg of side sill angle 6. Beneath the corner post is placed a reinforcing corner member, as shown in Figs. 9 and 10, having a web 53, side flange 54 and end flange 55. A push pole pocket 69 completes the corner of the car and is fastened to the side sill 6, corner post flanges 49 and 50, end wall 51, and corner member flanges 53 and 54.

The top chord of the girder side construction is the side plate 41. This side plate extends from end to end of the car and has its opposite ends secured to the corner posts 45. I prefer to make the side plate 41 of inverted U shape and for this purpose may use a rolled angle or a pressed plate. This latter construction is illustrated in the drawings. When a rolled angle is used the leg thereof forming the front leg of the side plate 41 is bent to fit over the outer face of the curved end of the side posts and the remaining leg of the angle has the outer portion offset downwardly to form the inner leg of the side plate. As shown by Fig. 11 of the drawings the inner and outer legs of the pressed side plate 41 overlap the side post flanges and are secured thereto. The web portion 41^a of the side plate is disposed inwardly and downward across the ends of the side posts and provides a bearing for the roof carlines. The inner or shorter side plate 41^b extends downwardly from web 41^a and overlaps the inner flanges of the side posts. The outer or longer side plate flanges 41^c extend

downwardly over the outer flanges of the side posts and the side sheathing 42. The side sheathing 42 which is applied to the side posts is preferably disposed beneath the front leg of the side plate and overlaps the side sill to provide leakproof joints.

Steel box cars of the type illustrated are usually provided with wood flooring and metal side sheathing. The flooring comprises transversely disposed wood planks 31 supported upon the center sill and floor stringers. As previously set forth where concentrated loading may occur I prefer to use two or more floor stringers 4 and 5 at each side of the center sill. Where loading is not concentrated but one floor stringer will suffice. At the sides of the car floor the members 39 support the ends of the floor boards and provides a finishing member at the side of the floor. The wood inside sheathing is comprised of boards 62 extending longitudinally of the car and disposed against the inner flanges of the side posts. Intermediate the side posts are vertically disposed nailing strips supported by usual members secured to the side sheathing 42. The inside sheathing is nailed to the nailing strips.

Referring now to Fig. 11 showing a cross section through the car at the floor and side of the car, the relation between the wood side sheathing 62 and flooring boards 31 is such that the ends of the floor boards 31 are in a vertical plane disposed inwardly of the vertical plane of the side sheathing 62. When so disposed the floor boards may be readily replaced without removing the side sheathing. To create this condition the angles 39 are disposed a sufficient distance inwardly of the side sills 6 and the lower portion of the side posts are offset outwardly to engage the angle 39 as set forth supra.

The cars herein described are frequently used for carrying grain and when used for the purpose the car must be sealed at the floor to prevent leakage of the grain. Such grain as passes through the wood side sheathing 62 will fall downwardly behind the sheathing 62 and is deflected onto the car floor by the sealing strip 63 extending between the car side posts. This member 63 is substantially of Z shape having a web sloping inwardly and downwardly from the steel sheathing 42 to the adjacent angle 39. The bottom flange of the member 63 is disposed against and welded to the vertical leg of the angle 39, and the top flange of the member 63 is disposed against and welded to the steel side sheathing 42. The floor boards 31 preferably terminate short of the vertical flange of the angle 39 and the resultant space is preferably filled with car cement or other suitable medium. In this manner the car floor at the sides of the car are completely sealed against loss of grain. In a similar manner sheathing may be attached to the end wall of the car and car cement used to seal the joint between the car floor and end wall sheathing.

Referring now to the roof construction, as illustrated in Figs. 3, 11, 15 and 16, carlines extend between opposite side posts of the car and roof sheets secured to the carlines. Each carline is of substantially channel shape, having a vertically disposed web 64 of greatest height adjacent the center of the car and the major portion of the web formed on an arc of a circle. The top flange 65 is made flat to provide a support for and connection with the roof sheets 66 and is disposed substantially normally to the web of the carline. The bottom flange 67 is inclined down-

wardly from the web, the angle of inclination preferably being greatest at the center portion of the car. At each end of the carline the web is curved downwardly and cut off square to provide a full bearing for the carline web and flanges upon the web of the side plate 41. I prefer to continue the top and bottom flanges of the carline throughout the full length of the carline, reducing the bottom flange at the extreme ends of carline and welding the web and at least one flange of the carline to the web of the side plate 41. It will be observed, however, that by forming the top plate 41 from a rolled angle, the extreme upper edge of the web of the side plate forms an adequate bearing for the top flange of the carline and the latter may be welded to the web of the side plate if desired, and thereby increase the strength of the connection between the carline and side plate. The roof sheets 66 are secured to the top flange of the carline and lap over the side plate front flange for a suitable distance and are connected thereto.

The end wall 51 of the car may be of most any desired design, provided with side and bottom flanges. The bottom flange 68 of the end wall serves as an end sill of the car, to which may be secured the side floor angles 39 and such other members as are desirable. The end wall side flanges 70 are joined with the body of the end wall on arcs of relatively large radii and are connected to the corner posts 46. The flange 68 of the end wall being secured to the flange 49 of the corner post and the body of end wall 51 being secured to flange 50 of the corner post. To provide leakproof joints between the end wall and side sheathing the end wall flanges 68 overlap the ends of side sheathing 42.

Throughout this specification and the drawings I have illustrated and described what I now consider to be a preferred form of construction. It is recognized, however, that many modifications in the details of construction are obvious or will suggest themselves to those skilled in the art and I do not wish to limit myself to the exact forms of construction herein shown and described except as are made necessary by the scope of the appended claims.

Having thus described the invention what I claim as new and desire to secure by Letters Patent is:

1. In a car underframe including bolsters having top and bottom cover plates and crossbearers spaced between said bolsters; floor stringers extending from end to end of the underframe as continuous beams on opposite sides of the longitudinal center of the underframe and comprising angularly shaped beam sections disposed between each bolster and the end of the underframe and between the bolsters and crossbearers, each beam section having the major portion thereof disposed below the horizontal plane of the top of said bolsters and crossbearers, and the horizontal plane of the top of the beam sections disposed above the similar plane of said bolster and crossbearer, the adjacent ends of said beam sections at said bolsters being connected with said bolster cover plates by means of connection members secured to said bolster cover plates and to said beam sections at each side of said bolsters, and the adjacent ends of said beam sections at said crossbearer being connected top and bottom by members extending respectively above and through the crossbearers.

2. In a car underframe, a bolster comprising spaced diaphragm members connected top and

bottom by cover plates; floor stringer sections extending outwardly from each bolster diaphragm and having the tops of said sections above the top of the bolster; a member interposed between the bolster diaphragms at the oppositely extending floor stringer sections; and means connecting the adjacent ends of said floor stringer sections to said bolster diaphragms and the interposed member.

3. In a car underframe, a bolster comprising spaced diaphragm members connected by top and bottom cover plates; floor stringer sections extending outwardly from each said diaphragm member, each said floor stringer section having a portion thereof disposed above the plane of the top of said bolster; a member interposed between said diaphragms; and means connecting an end of each said floor stringer section to the bolster top cover plate and to the said interposed member at said adjacent bolster diaphragm.

4. In a railway car, in combination, a center sill having spaced webs terminating in oppositely disposed bottom flanges; side sills spaced on opposite sides of said center sill and provided with upright webs terminating in bottom flanges disposed toward the adjacent center sill bottom flanges; bolster and crossbearer members supported on the bottom flanges of said sills and connected to the webs thereof; side wall posts supported on said side sill bottom flanges at opposite ends of each bolster and crossbearer and connected thereto and to the side sill web; a bottom tie between opposite side sills at each bolster and crossbearer forming a continuous member connecting the bottom flanges of said sills with the adjacent bolster and crossbearer and associated side wall posts; and roof carlines connecting the tops of opposite side wall posts to form with the posts, crossbearers and bolsters, continuous girth members spaced longitudinally of the car.

5. In a car side wall comprising a side plate and a side sill, with side posts connecting the side sill and side plate; the combination of a pair of side posts secured to the said side plate and terminated short of the side sill and spaced apart to define a car door opening; an angle disposed beneath said posts with one flange providing a bearing for said posts and the other flange overlapping and secured to the post, said latter flange of the angle having a portion thereof between the posts deflected outwardly providing an abutment for the car floor and a support for the car floor threshold plate.

6. In a car side wall construction including side sill and side posts; the combination of spaced posts secured to the side plate and terminating short of the side sill to define a door opening; an angle member having a horizontal leg thereof secured to the car structure and extending beneath both posts, the vertical leg of said angle being disposed in the vertical plane of the side sill with the base of said leg secured to said sill and thence extending upwardly of the posts and secured thereto, said vertical leg intermediate said posts having the upper portion thereof deflected outwardly to form a support for the floor threshold plate and the lower portion thereof serving as an abutment for the floor boards at the door opening.

7. In a railway car, in combination, a side sill having an upwardly extending body portion and a flange at the bottom of said portion, a side post having a vertical web provided with a side flange secured to said side sill body portion and with

a bottom flange secured to said side sill flange; a transverse underframe member having a vertically disposed web provided with a side flange secured to the side sill body portion and with a bottom flange secured to the side sill flange; the side post and the underframe member webs being juxtaposed and secured together.

8. In a railway car, in combination, spaced side sills having upwardly extending body portions and opposing bottom flanges; aligned transversely disposed interconnected underframe members connecting said side sills at said body portions and at said body bottom flanges; side posts extending upwardly from the side sills and connected to the side sill body portions and side sill bottom flanges and to the adjacent transversely disposed underframe members; and transverse roof members connecting the tops of said side posts at each end of the transverse underframe members.

9. In a railway car, in combination, a center sill; side sills having an upstanding web and a bottom flange directed toward the center sill; a plurality of transversely disposed members spaced longitudinally of and connecting opposite sides of the center sill to the respective adjacent side sills, each said member having an upstanding web terminating in an end flange connected to the side sill web and a bottom flange secured to the corresponding side sill flange; a side wall post at each connection between transverse members and side sill, each post having an upstanding web connected to the member web, a flange at one side of said upstanding web connected to the side sill web and a bottom flange on said upstanding web connected to said side sill bottom flange.

10. In a railway car, in combination, spaced side sills, each including an upwardly extending and an inwardly extending flange; a plurality of pairs of aligned transversely extending underframe members spaced longitudinally of the sills and overlapping the inwardly extending side sill flanges; side wall posts having upright webs overlapping the transverse underframe members at the side sills, means connecting both side sill flanges to the adjacent ends of the transversely extending underframe members and to the adjacent side wall posts and a tie member secured to each pair of aligned transverse underframe members and connecting opposite inwardly extending side sill flanges.

11. In a railway car, in combination, a side sill having an upturned and an intumed flange; a plurality of transversely disposed underframe members spaced longitudinally of the side sill and secured thereto; a member secured to the underframe members and extending across a plurality thereof in spaced relation to the side sill; the side sill flanges, transversely disposed underframe members and connecting member forming sides of a plurality of pockets into which the side posts are inserted and secured to each of said pocket side forming members.

12. In a railway vehicle, in combination, a center sill; side sills at opposite sides of the center sill, each of the sills including an upwardly extending web having a bottom flange disposed toward the corresponding bottom flange of the adjacent sill web; aligned underframe cross-members supported on the sill bottom flanges and connected with the adjacent sill flanges and webs; side posts supported on the side sill bottom flanges at each cross member and connected to the webs of the adjacent side sill and cross member; tie bars beneath each aligned cross members

and connected thereto and to the bottom flanges of the said center and side sills; a side plate connecting the tops of the side posts above each side sill, and roof members connecting said side plates at opposite side posts.

13. In an underframe for a railway car having side walls with door openings therein; continuous side sills at opposite sides of the underframe; transverse members connecting the side sills; floor stringers combining with the transverse members to form continuous floor supports extending above the transverse members intermediate the side sills; an angle-shaped floor stringer connecting the tops of the transverse members adjacent each side sill and extending from end to end of the underframe, each angle-shaped floor stringer having a portion offset outwardly above the side sill at the side wall opening to form a horizontal support and vertical protection strip for the ends of the floor boards throughout the length of the underframe side wall including the side wall opening.

14. In a car underframe, in combination, a bolster including spaced vertically disposed webs connected by top and bottom cover plates extending on opposite sides of the webs; a floor beam comprised of portions extending from opposite sides of the bolster, each said portion including a top flange extending above the horizontal plane of the bolster top cover plate and a depending flange; a member connecting each side of the bolster to the adjacent end of the floor beam and comprising a substantially vertically disposed web connected to the depending flange of the floor beam and flanges at opposite ends of the web connected to the top and bottom bolster cover plates.

15. In a car underframe, in combination, a member extending transversely of the underframe and including top and bottom laterally extending portions; a member extending longitudinally of the underframe from opposite sides of the transverse member, and means connecting said members comprising a vertically extending portion having its opposite ends connected to the laterally extending portions of the transverse member and a connection intermediate the ends of said means to the longitudinally extending member.

16. In a wood-lined box car in combination, an underframe, a car side wall including a plurality of side posts spaced on opposite sides of

a door opening in said side wall, an angle extending from each side of the door opening to the adjacent end of the underframe and side wall having one leg of the angle secured to the inner face of the side wall posts and the other leg secured to the underframe, wood inside sheathing secured to the inner face of said posts and terminating above the said angle, outside sheathing secured to the outer faces of said posts and a member extending from said angle to the outside sheathing between the side wall posts on opposite sides of the door opening and comprised of a vertical flange secured to said angle, a body portion extending upwardly and outwardly from the top of the vertical leg of said angle to the outside sheathing and means attaching said body portion to the outside sheathing.

17. In a railway car corner construction, in combination, a car side wall construction including side sheathing, a car end wall provided with vertical side flanges joined to the body of the end wall by relatively large radii, a corner post forming an integral part of the side wall construction and including a vertical web disposed in a direction transversely of the car, a flange on said vertical web extending behind said side wall sheathing and the adjacent end wall flange and terminating in a re-entrant portion disposed behind the car end wall, said reentrant portion being joined to the corner post flange on an arc of relatively large radius, said corner post having the flange thereof connected to the side wall sheathing and end wall flange with the re-entrant portion of the flange secured to the car end wall.

18. In a railway car corner construction, in combination, a car side wall including side sheathing, a car end wall provided with vertical side flanges, a corner post forming part of the car side wall structure and including a vertical web disposed in a direction transversely of the car, oppositely disposed flanges on said vertical web connected to the side wall structure, the outer of said flanges being extended behind the side wall sheathing and car end wall vertical flange toward the car end wall and terminating in a re-entrant portion disposed behind the car end wall, said corner post outer flange being connected to the side sheathing and end wall side flange, and the re-entrant portion being connected to the body of the end wall.

GEORGE A. SUCKFIELD.