May 17, 1932. W. H. MUSSEY ET AL 1,859,261

WELDED HOPPER CAR

Filed May 15, 1931 5 Sheets-Sheet 1

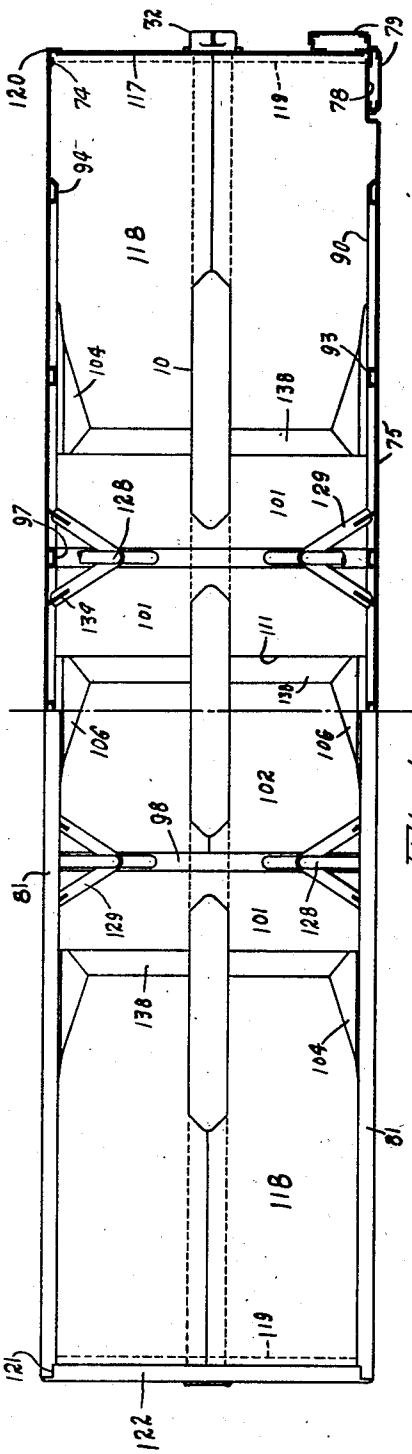


FIG. 1.

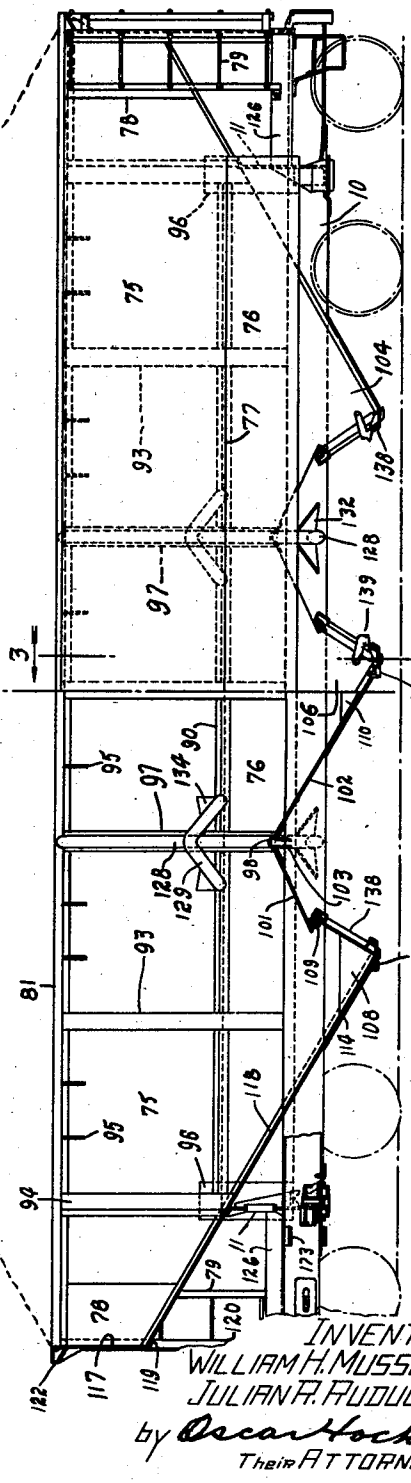


FIG. 2.

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WELDED HOPPER CAR

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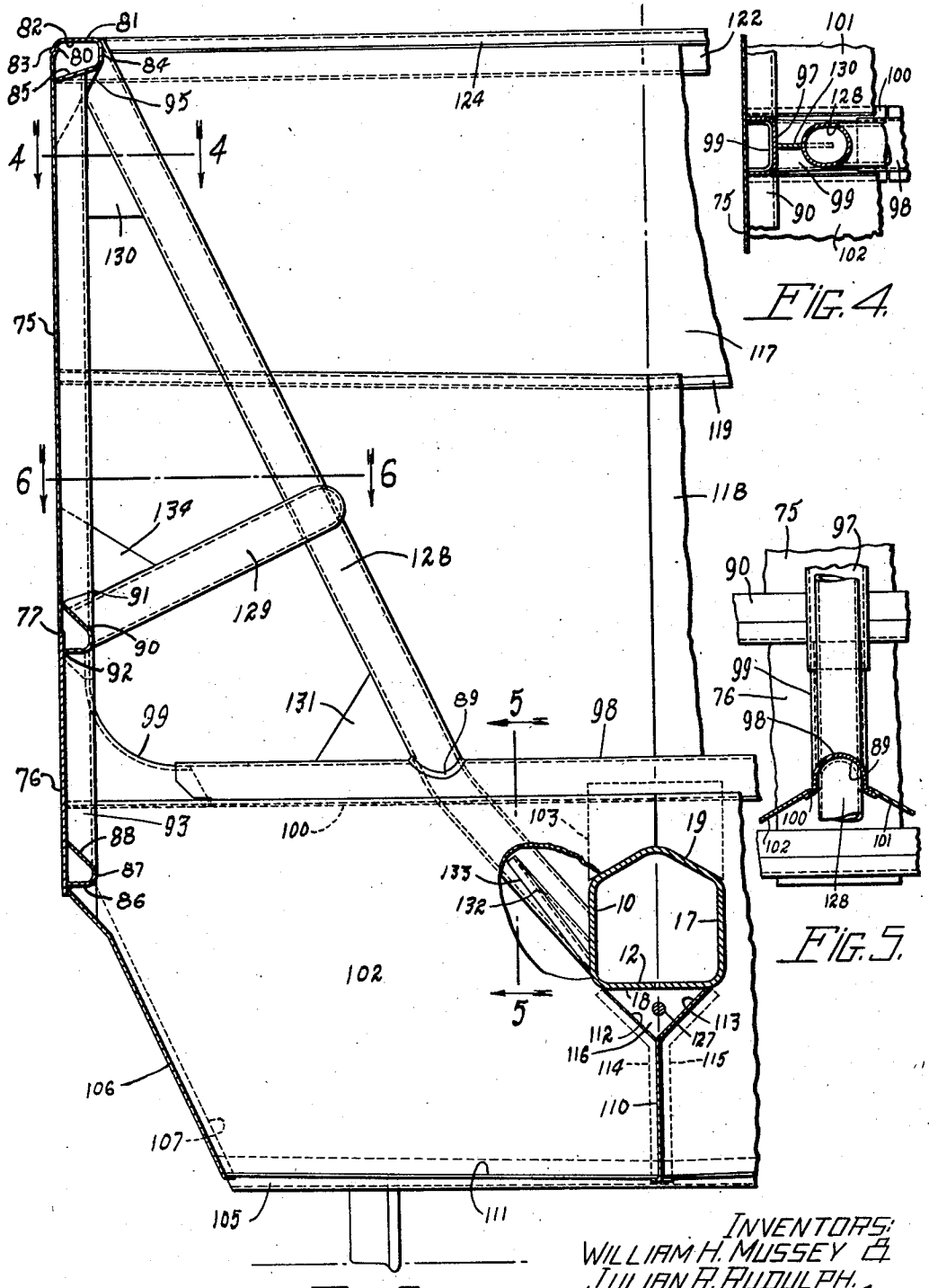


FIG. 3.

FIG. 4.

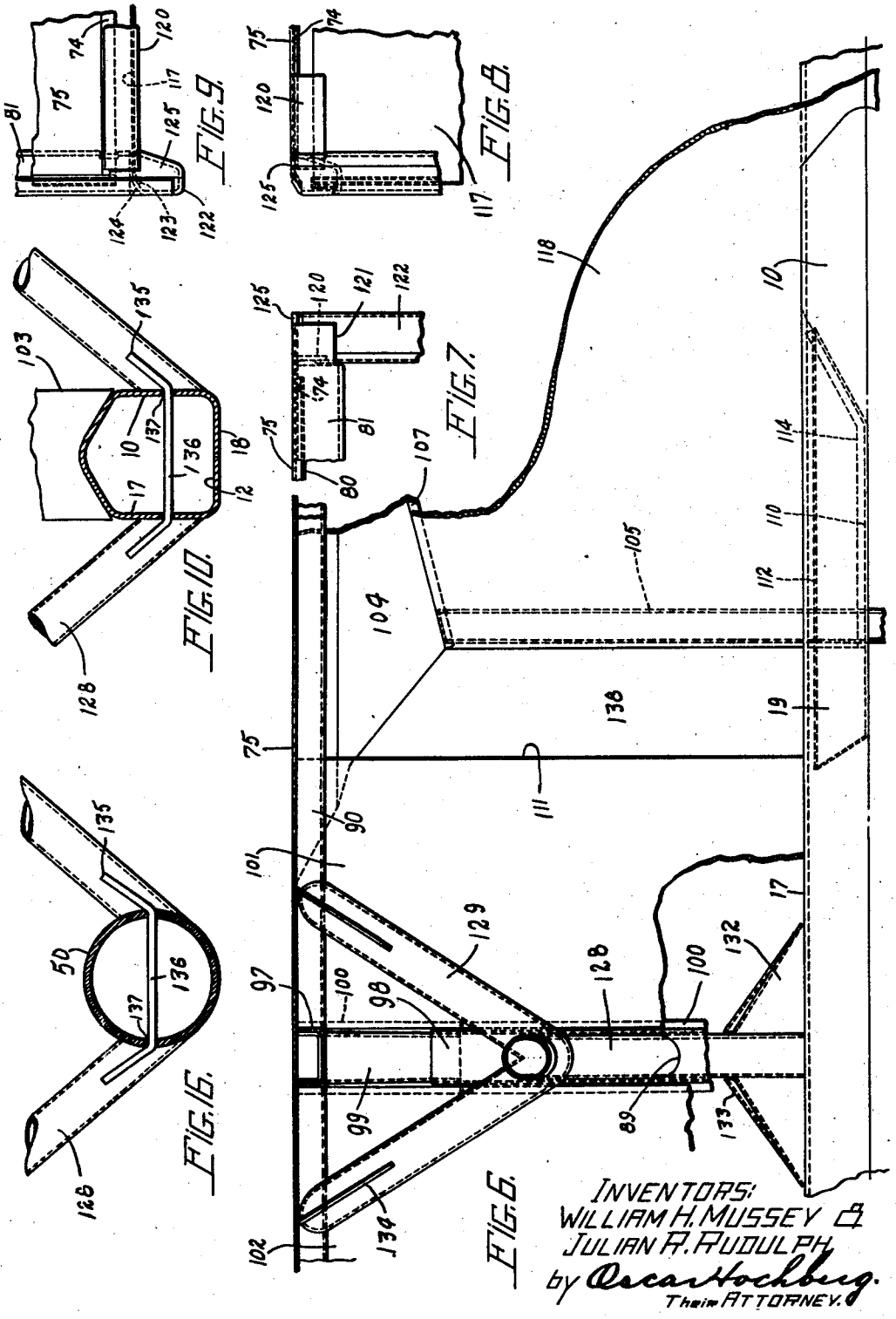
FIG. 5.

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WELDED HOPPER CAR

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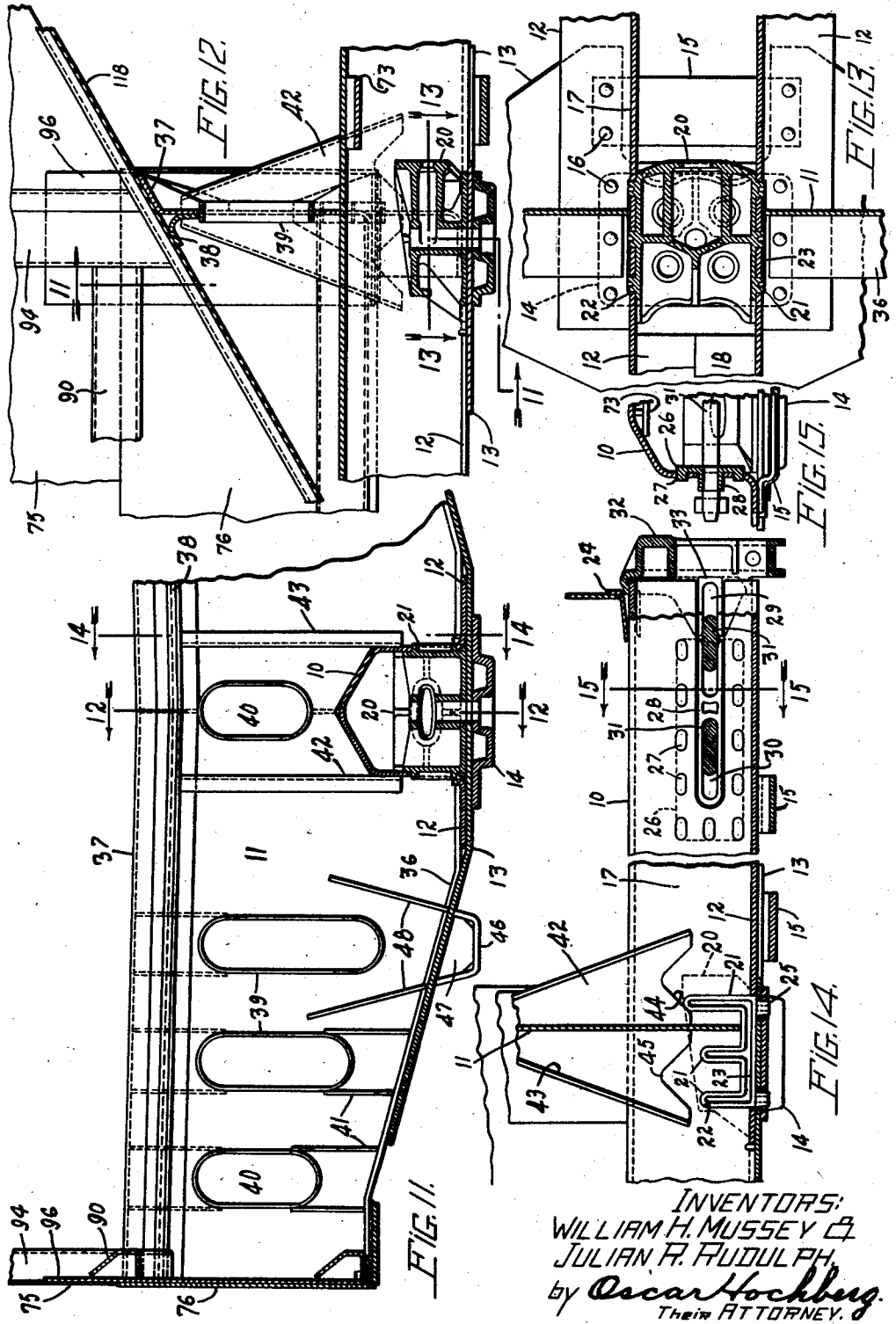


FIG. 11.

FIG. 12.

FIG. 13.

FIG. 14.

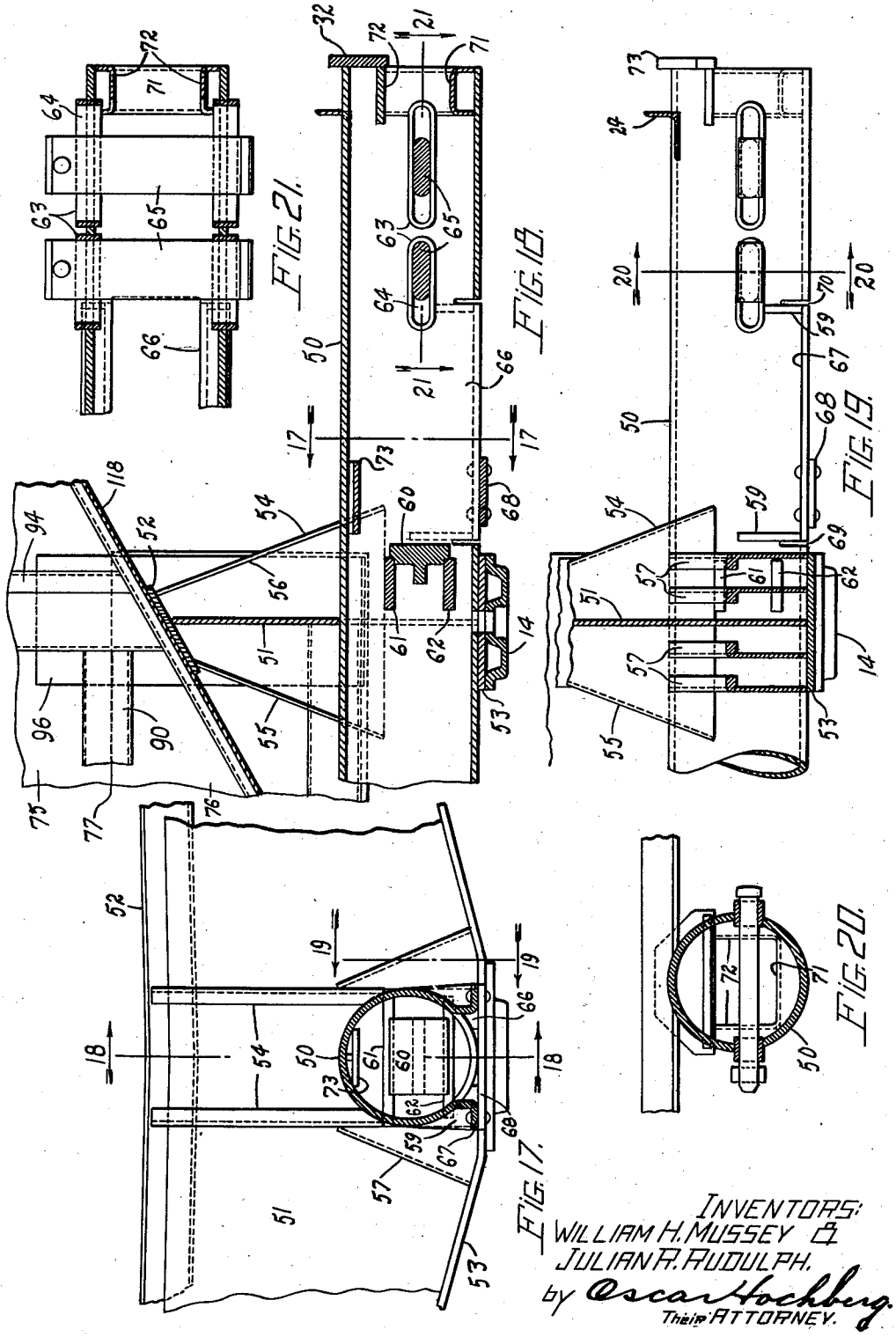
FIG. 15.

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WELDED HOPPER CAR

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UNITED STATES PATENT OFFICE

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WELDED HOPPER CAR

Application filed May 15, 1931. Serial No. 537,636.

The invention relates generally to railway hopper cars and comprehends the distribution and proportion of the parts entering into the construction thereof to facilitate union of the various members by welding, and with the exception of certain portions of the car framing hereinafter specifically mentioned, the invention proposes the elimination of overlapping securing areas by the use of fillet or butt welding for uniting the several parts wherever practicable.

The principal object of the invention is to provide a car construction in which the predominant characteristic is embodied in the use of pressed metal stress members of such form and amplitude, when disposed and united by welding as hereinafter described, that the parts entering into the structure of the several units and the units with respect to the whole assembly, will be fully co-ordinated.

The invention further contemplates a balanced distribution of the material entering into the construction of the car to the end that all members of the underframe and superstructure will function as a unit to resist draft, buffing, and load stresses, whereby a maximum payload capacity may be obtained with a minimum number of parts and corresponding saving in weight.

A further object is to so distribute the elements entering into the construction of the side and end wall sections, bolsters and center sill, that said parts may be fabricated on the bench and brought to the erection track for assembly with other sections in predetermined sequence.

The foregoing and other objects are attained by the mechanism illustrated in the accompanying drawings, in which—

Fig. 1 is a plan view of the car with a portion of the top chords of the car at the right broken away to show the form and disposition of the several side wall stiffening members on the inside of the car walls and showing one of the wall plates offset at the car ends to provide room for the ladder irons within the plane of the car side;

Fig. 2 is a dual view in elevation with a portion of the car in vertical section to illustrate the application of the intermediate longitudinal side wall stiffening member with respect to the vertical stiffening members for connecting the upper and lower side wall plates;

Fig. 3 is a transverse vertical sectional view through the center sill and car side taken on line 3—3 of Fig. 2, showing on larger scale, detailed assembly of side wall, cross-ridge side wall bracing members, and center sill;

Fig. 4 is a horizontal sectional view taken on line 4—4, of Fig. 3, showing the side wall stiffening channels assembled with adjacent hollow transverse bracing member and connecting gusset;

Fig. 5 is a vertical sectional view taken on line 5—5, of Fig. 3, showing the connection between the transverse ridge cap member and the floor plates;

Fig. 6 is a horizontal sectional view taken on line 6—6, of Fig. 3, showing the method of securing the diverging guard braces to side wall and hollow transverse brace member;

Fig. 7 is a view in plan showing the corner construction at the top chords, with the side chords directed inwardly and the end chords presented outwardly;

Figs. 8 and 9 are end and side elevations of the corner construction, respectively;

Fig. 10 is a vertical section transversely through the center sill similar to that indicated in Fig. 3, but showing the sides thereof slotted to receive a tie plate for connecting the side wall brace members;

Fig. 11 is a rear elevational view of one embodiment of the bolster with the sloping floor sheet removed to better show the bolster upper chord and web stiffening arrangement, and adjacent portion of the center sill in transverse section taken on line 11—11, of Fig. 12, to show the welding of the draft gear back stop and bolster filler casting to the center sill;

Fig. 12 is a vertical longitudinal median section through bolster, sloping end floor plate, and center sill of the car taken on line 12—12, of Fig. 11;

Fig. 13 is a horizontal section through center sill, back stop casting, and adjacent bolster web, taken on line 13—13, of Fig. 12, showing the method of securing the casting

by interlocking with and welding to the center sill;

Fig. 14 is a vertical section through the bolster at one side of the center sill, taken on line 14—14, of Fig. 11, showing the method of interlocking the back stop casting with center sill web, bottom cover plate, and center plate, and method of increasing the line of weld between the center sill and adjacent bolster web stiffeners, and further showing one application of the draft gear cheek plates at the end of the center sill;

Fig. 15 is a vertical section through center sill and applied cheek plates taken on line 15—15, of Fig. 14;

Fig. 16 is a section similar to Fig. 10, but showing a center sill of pipe section connected with the hollow side wall braces, as an alternative form of center sill;

Figs. 17 to 20 inc., are views similar to Figs. 11, 12, 14, and 15, respectively, but showing a preferred form of bolster applied to a center sill of pipe section; and taken, respectively, on lines 17—17, Fig. 18; 18—18, of Fig. 17; 19—19, of Fig. 17; and 20—20, of Fig. 19;

Fig. 21 is a horizontal sectional view through the center sill taken on line 21—21, of Fig. 18, showing the draft key bearings and slot reinforcing plates welded to the sill plate.

In the drawings, the car is represented as a self-clearing hopper car with the greater proportion of its constituent parts of pressed metal shapes, to form tubular or hollow members of light though relatively powerful section designed to transmit load, draft and buffing forces to contiguous members of the car, and all of them joined by welding to form a unitary structure, free from overlapping joints where practicable, to avoid the lodgment of dirt and moisture and possible corrosion at such points.

The center sill 10 is of tubular formation, and in the present embodiment, continuous from end to end of the car, the bottom portion thereof being channel shaped between the bolsters 11 and the car ends, being opened up to receive the draft gear and other parts. As best shown in Figs. 11 to 15 inc., the bottom portion of the center sill upon opposite sides of the median line between the bolsters is formed of flanges 12 welded together at their meeting edges, and from points back of adjacent bolsters, is formed with the flanges 12 directed outwardly to provide securing areas for the bottom cover plate 13, underlying body center plate 14, and draft sill tie and gear supporting plates 15, held by rivets 16. As indicated in these figures, the center sill is made in one piece with plane sides 17 and bottom 18, the top portion being crowned as shown, to at once provide material shedding surfaces 19 and further rigidify the sill against distortion under load.

As best shown in Figs. 11 to 14 inc., the center sill is fitted with a combined draft gear back stop and bolster filler casting 20 having interlocking engagement with center sill through the medium of spaced lugs 21 projecting into correspondingly shaped slots 22 opening downwardly in sides 17 of the sill to permit application of the casting with the lugs from beneath the sill. The lugs 21 are preferably shaped as shown in Fig. 14 with their lower ends connected by intermediate horizontal portions 23 having end abutment with the sill webs 17 and flanges 12, and both sill and casting united by welding along the projecting peripheries of said lugs.

To insure further stability in the assembly constituting back stop casting 20, bottom cover plate 13, and center bearing 14, casting 20 is preferably formed with additional dowels 25 projecting downwardly through registered openings in said cover plate and center bearing, and likewise secured together by welding about the dowel peripheries. Similarly, the draft gear cheek plates 26 are formed with lugs 27 and draft key bearing portions 28 adapted for interlocking engagement with the center sill and welded to the sill about their respective peripheries. The bearing portions 28 define elongated openings 29 and 30 for the reception of draft keys 31 slidable therein under coupler movement. The sill is further equipped at its ends with striking plates 32 having rearwardly extending brackets 33 slotted to complement elongated openings 29 in the cheek plates 26 whereby such openings are extended for forward movement of the respective gear keys under draft. That portion of the brackets 33 defining the slots and providing the additional bearing for adjacent keys, projects beyond the respective sides of the sill and welded about the bearing periphery to rigidly secure the striking plate to the sill. The usual draft sill tie plates 15 are firmly secured to center sill flanges 12 and function also to support the customary cushioning gear.

Bolsters 11 are mounted upon the center sill and preferably cut out for the sill, the plates extending in one piece from side to side of the car. In the embodiment shown in Figs. 11 to 14, the bolster web is shown with flanges 36 extending along its bottom margin from the sides of the center sill to the car sides and secured by welding to bottom cover plate 13, and with suitable flanges 37 and 38 at the top for supporting adjacent sloping floor sheets. As best shown in Fig. 11, the upper flanges are sloped to conform to pitch of the floor toward the median line of the car and welded to the underside thereof. The bolster webs may be stiffened locally in any approved manner, the reinforcement herein shown taking the form of metal strips 39 shaped to conform to openings 40 in the bolster webs and welded midway their width to form with said webs continuous rein-

forcing members of substantial T-section, best shown in Fig. 12. These reinforcements are supplemented by a plurality of gusset plates 41 extending to adjacent marginal flanges of the bolster and welded to the reinforcing strips, bolster webs and flanges.

To further reinforce the bolster structure, upright braces 42, preferably stiffened along their sloping edges 43, are welded to opposite faces of the bolster, and along their respective lower edges 44 to adjacent portions of the center sill. As shown in Fig. 14, the lower edges 44 of braces 42 may be cut along staggered lines as indicated at 45 to provide longer lines of securing welds at these positions. The bolster side bearings are built-up of plates 46 shaped to the contour and proportions of the bearing required and reinforced by a stiffening web 47 and both welded together and to the bolster bottom cover plate 13, as shown. That portion of the bolster 11 immediately above the side bearing is further reinforced by gusset plates 48, forming virtual extensions of plates 46 of the bearing to prevent undue stressing of bolster at the bearing position.

The bolster and center sill construction, within the scope of the invention, may take the form illustrated in Figs. 17 to 21, in which the center sill 50 is of pipe section and the bolster webs 51 fillet welded to sill, and top and bottom plates 52 and 53, respectively. The top plates are introduced between the respective bolster web and floor plates to provide extended bearings for the floor plates. The bolster webs 51 are held at the center sill by front and rear braces 54 and 55 extending vertically from the sill to top plate 52 and welded to these parts and the bolster web 51. As in the case of the first embodiment, these braces are flanged along their inclined edge portions 56 to rigidify the assembly.

To insure further stability in the connection between center sill and bolster, a plurality of lateral braces 57 are disposed upon opposite sides of bolster web and sill and welded to bolster bottom plate 53, the center sill, and preferably also to the sides of braces 54 and 55, as best shown in Figs. 17 and 19. Instead of the bolster web reinforcement employed in the first embodiment illustrated in Figs. 11 and 12, the bolster webs may be stiffened otherwise, as by corrugating the webs vertically and the edges of the corrugations fillet welded to upper and lower bolster plates 52 and 53, as will be understood.

The center sill of round pipe section lends itself admirably to the application of draft gear parts since by virtue of the form of the sill section at the bolster position the sill affords considerable resistance to crushing loads and permits the installation of the relatively simple form of draft gear back stop and draft key bearing pieces illustrated in Figs. 17 to 21 inc. The back stop is made up of a plurality of sections welded together, the back stop face plate 60 being secured top and bottom to respectively adjacent cross-plates 61 and 62 extending transversely through the sill and welded.

The draft key bearing pieces 63 comprise metal strips shaped to define elongated openings 64 for draft keys 65 and are welded to the sill about the openings. The center sill is formed with bottom openings 66 for the draft gear parts, the metal cut for the openings being directed downwardly and outwardly to provide securing flanges 67 for the combined draft sill tie and gear supporting plates 68. As indicated in Figs. 17 and 19, the flanges 67 are held rigid by gusset plates 59 welded to them and adjacent portions of the sill at points adjacent the ends of opening 66.

Unlike the sill of the first embodiment, the draft gear opening 66 extends from a point 69 immediately in front of the bolster to a point 70 intermediate the bolster and adjacent car end whereby a substantial portion of the sill column remains intact between said opening and sill end. Suitable striking plates 32 and coupler carrier and guide members 71 and 72 respectively, are welded to the sill ends. The sills of both embodiments are further equipped with draft gear top guide plates 73 welded to the inside of the upper portions of the respective sills, as best shown in Figs. 12, 15, 17 and 18.

The side girder walls are made made up of upper wall plates 75 and heavier lower wall plates 76 butt-welded along their meeting edges 77. The upper walls extend the full length of the car with an end portion thereof offset inwardly to provide a recessed wall area 78 to accommodate ladders 79 within the plane of the maximum car side. The lower walls are straight and extend only from bolster to bolster to which they are welded, as best shown in Figs. 2, 11, 12, and 18. To avoid the projection of any of the girder parts beyond the plane of the maximum width of the car, the upper edge of the upper wall plates 75 is deflected inwardly and upwardly to provide a securing flange 80 to which the top chord 81, presently to be described, may be welded within the plane of the car side, as best shown in Figs. 3 and 8.

The top chord 81 is shaped from a plate bent to provide a hollow column having an upper horizontal flange 82 having a downwardly and outwardly deflected securing flange portion 83 designed to overlap the wall flange 80 to which it is joined by welding intermittently along its length. The chord 81 is provided also with an inside vertical flange portion 84 depending from adjacent edge of flange 82 and deflected downwardly and outwardly to provide a reinforcing wall 85 fillet welded to wall plate 75, to complete the column. The bottom chord of the grider wall is likewise a hollow column, but extend-

ing from bolster to bolster only, and formed of an angled plate to provide a lower flange portion 86 fillet welded to wall plate 76, and an inner vertical flange portion 87 rising from adjacent edge of flange 86 and deflected upwardly and outwardly for fillet weld connection with the girder wall, to provide a material shedding surface 88 between the sloping floor plates hereinafter described.

The upper and lower girder wall plates 75 and 76, at their meeting edges 77, butt-welded as before noted, are further provided with an intermediate hollow stiffening longitudinal member 90 having edge portions 91 and 92 fillet welded respectively to wall plates 75 and 76 above and below the welded meeting edge 77. This member 90 is similar in contour to that of the bottom chord member and is designed to stiffen the girder at the seam area to provide additional resistance to hammering and bulging at this position, and is preferably in sections spaced apart longitudinally to permit the application of side wall stake members 93 extending vertically between the top and bottom chord members.

The stakes are preferably of channel shape fillet welded to the wall plates 75 and 76, top and bottom chords, and contiguous ends of the intermediate stiffeners 90, providing altogether an integral girder structure adapted for assembly as a unit with the bolsters and other elements of the car. The top chord member 81 may be stiffened locally at intervals along its length by gusset plates 95 fillet welded to underside 85 of the top chord and girder wall plate 75, as best shown in Figs. 2 and 3.

It will be noted that the inside stakes 94 at the bolster position have one flange of the channel deflected at an angle toward the respectively adjacent ends of the car to avoid obstruction to lading movement in the opposite direction. The bolster stakes are fillet welded to both upper and lower girder wall plates 75 and 76 and to the floor plates of the car, as best shown in Figs. 2, 12, and 18. To further connect the girder plates and stakes 94 at the bolsters, a tie plate 96 is interposed between said plates and stakes and the ends of adjacent bolster webs, and the girder bottom chords, as indicated in Figs. 11, 12 and 18, whereby the load stresses on the girder plates are directly transmitted to the bolsters. If desired, the ends of the intermediate longitudinal member 90 adjacent the bolsters may overlap tie plates 96 and fillet welded thereto and stakes 94 to provide additional rigidity to the assembly.

Certain of the side stakes upon opposite sides of the transverse center of the car and indicated at 97, connect at their lower ends with respectively adjacent portions of a cross ridge having a rounded cap piece 98 extending transversely across the center sill between the girder sides. As shown in Figs. 1, 2, 3, 5 and 6, this connection is made preferably by means of hollow gusset pieces 99 telescopically engaging the ridge cap pieces 98 and stakes 97 at their respective ends and welded to provide a unitary hollow connecting girder between the car sides.

The cap pieces and gussets are formed with downwardly and outwardly flared supporting flanges 100 along their respective lower edges to which the intermediate floor plates 101 and 102 are welded to complete the cross ridge structure. The floor plates 101 are preferably in one piece from side to side of car and cut out for and fillet welded to the center sill crown and side portions, but the longer floor plates 102 with portions extending below the center sill are divided at and cut out for the center sill, as best indicated in Figs. 1, 2, and 3. To insure further stability for the center sill at the cross ridge position, the cap pieces 98 are stiffened by tie plates 103 fillet welded to inner sides of cap pieces and to crown portion 19 of the center sill, as best shown in Figs. 2 and 3.

The intermediate floor plates are supported at the car sides by outside hopper sheets 104 and 106, welded to the lower side girder plates 76 beneath the bottom chords, as shown in Figs. 1, 2, 3, and 6. That portion of said sheets extending below the girder bottom being preferably though not necessarily, formed with floor plate supporting flanges 107, primarily for the purpose of positioning said plates during the welding operation, and manifestly these plates may be fillet welded to these hopper sheets at the margins and the flanges dispensed with, if desired. About the girder bottom chords and to the wall plates 76, the intermediate floor plates are fillet welded to render the joints seal tight at these positions. Corresponding inside hopper sheets 108 and 110, are positioned at the median line of the car beneath the center sill, as shown in Fig. 3, to provide the maximum width of door openings 111 between inner and outer hopper sheets to facilitate discharge of the lading.

The inside hopper sheets in the present embodiment, are secured to the sill bottom face 18 by deflected plate portions 112 and 113 inclined upwardly and outwardly toward the sides 17 of the sill and there welded. The deflected plate 112 is preferably an integral part of the body of its respective hopper sheet with an integral floor supporting flange 114, while its companion plate 113 is separate from said hopper sheet but connected to it by an angle piece 115 secured to the lower margins of the hopper sheet and supplementing flange 114 in the support of the floor plates upon opposite sides of said hopper sheets. The diverging plates and respective hopper sheets are welded together and to the center sill and floor plates and further rigidify the center sill at the deepest load sec-

tions of the car structure. The space 116 defined by the sill bottom and diverging plates 112 and 113, is utilized for the passage of the customary brake connection rod 127, indicated in Fig. 3.

The end floor plates 118 may be in two longitudinal pieces welded along the median line of the car and sloped transversely to direct water and lading flow toward the center of the car and to lend further stability to the floor assembly. The floor plates are supported upon and welded to bottom chord flanges 119 of adjacent end walls and the marginal flanges 107 on outside hopper sheets and flanges 114 and 115 on inside hopper sheets 108, as best shown in Fig. 2, and define the lower margins of end door openings 111 upon opposite sides of inside hopper sheets 108. Except for the thickness of the inside hopper sheets 108 the door openings are virtually continuous between the outside hopper sheets 104. As in the case of intermediate floor plates 101 and 102, the floor plates 118 are cut out for and welded to the shedding faces 19 and sides 17 of the center sill and diverging plates 112 and 113 beneath the sill to fully seal the joints against leakage.

The girder sides at their respective ends are connected by a transverse girder plate 117 to form load retaining end walls designed to provide a support for the sloping end plates 118 as by chord flanges 119. The connection between end girder plates 117 and side wall girders, is effected by means of corner post angles 120 extending vertically to the underframe of the car, as best shown in Figs. 2, 7, 8 and 9. These parts are further connected through the medium of the stepped welded joint 121 between the top side chords 81 and similarly formed chords 122 surmounting the end girders except that the end chords are directed outwardly instead of inwardly to provide for increased length of the heap load, as indicated in Fig. 2. In Fig. 9, the upper edge of end girders 117 is deflected upwardly and outwardly to provide a securing flange 123 to which the downwardly and inwardly deflected securing flange 124 of the top end chord may be welded within the plane of the end walls to avoid encroachment upon the load space, and the remainder of the chord members fillet welded to the outer faces of said girder plates to complete the hollow chord after the fashion described with respect to the top side chords 81.

As indicated in Fig. 8, the end top chords extend the full width of the car, overlapping adjacent flange of corner post angles 120, and their opposite ends closed by plates 125 welded to the chord ends and extended for connection with side girder plates 75 and adjacent flange of corner post angle 120 to both of which the closure plates are also welded. As shown in Figs. 7 and 9, the closure plates are arranged to lie flush with side girder plates and corner post flanges, being cut out to clear adjacent post tops. The flush surface arrangement at the side is effected by offsetting girder plate 75 inwardly behind adjacent flange of the corner post and welded thereto, as indicated at 74.

The side structure is completed by the addition of sub side sills 126 connecting the lower ends of respectively adjacent ends of corner post angles 120 and end sills 24 to the ends of the respective girder plates 76 and adjacent bolster webs to preserve the rectangular relation of the structure under corner poling thrust. Braces 128 extending transversely of the car from respectively adjacent top chords 81 downwardly and inwardly to the center sill, as best shown in Fig. 3, and extended in the present embodiment through cap pieces 98 of the cross ridges, as indicated at 89 in Figs. 3 and 5, are welded to top chords 81, cap pieces 98, and respectively adjacent sides 17 of the center sill. It will be noted that said braces are positioned preferably in line with the vertical side wall stakes 97 between the ends of the sections making up the intermediate longitudinal stiffening chords 90, to form with said stakes and the cross ridge cap pieces 98, triangular wall trusses to prevent lateral bulging of the girder sides.

The braces 128 are themselves held against displacement from impacts of loading buckets by local bracing members 129 connecting said main braces 128 and girder walls at the intermediate longitudinal chords 90 forming with said local braces 129, additional triangular trusses longitudinally of the car and at substantially right angles to the main truss members 128, the assembled trusses being welded to provide a unitary skeleton structure of great strength and minimum weight. When braces 128 are extended to the center sill as described, they contribute materially in stabilizing the center sill, girder side, and cross ridge assembly under load. As shown in Figs. 2, 3, and 6, the connection of the braces 128 to said assembly is effected by fillet welding the upper ends to the girder top chord 81, cross ridge cap pieces 98, and center sill sides 17, and further respectively, by gusset plates 130 to adjacent side stakes 97, by gusset plates 131 to respective cap pieces 98, and by gusset plates 132 to the center sill.

To insure sufficient welding at the center sill position, gusset plates 132 are preferably applied to opposite sides of the brace 128 as shown. If necessary, gussets 132 may be formed with stiffening flanges 133 along their free marginal edges, as shown. To stiffen the connection between the girder walls and auxiliary braces 129, gusset plates 134 are preferably fillet welded to girder plates 75 and upper sides of respective braces 129.

With the girder sides, cross ridge, and center sill assembly connected by the braces 128 as stated, a virtually integral structure is provided in which all of the elements thereof are co-ordinated to function as a unit in resisting load and impact stresses.

Preferably, that portion of the brace 128 extending between the cross ridge caps 98 and center sill at each assembly, is bent inwardly towards the center sill as best shown in Fig. 3, so that the angularity between the braces and adjacent girder sides above the respective cross ridges will be less than that between the deflected lower portions of said braces and adjacent center sill sides 17, in order that the distance between the braces immediately above the respective cross ridges shall be great enough to permit clam shell buckets to descend as closely as possible to the ridges without interference from the braces.

It will be observed that with the braces 128 connected to their respective girder top chord members 81 and center sill sides, they function somewhat after the fashion of slings for suspending the center sill. Constructions of this character are further exemplified in the modifications illustrated in Figs. 10 and 16, showing respectively the pressed steel sill 10 of the preferred embodiment and the sill 50 of pipe section, wherein the respective brace ends are slotted substantially longitudinally of the braces 128 to receive adjacent ends 135 of tie plates 136 extending through slots 137 in opposite sides of the sill. The tie plates 136 are preferably welded to the sills at the slot positions and their respective end portions 135 to adjacent ends of braces 128. Thus united, the construction described may be substituted for the gusset plates 132 before noted, or supplement them, as required.

As before stated, the several discharge openings 111 are virtually continuous between the respective outside hopper sheets 104 and 106 except for the thickness of the inside hopper sheets 108 and 110 beneath the center sill, and are controlled by doors 138, presently to be described, hung transversely of the car and held closed by locking hooks 139 or the like, positioned at the outside hopper sheets. The doors for the openings upon opposite sides of the inside hopper sheets are preferably in one piece with a central opening 140 to clear the center sill and brake rod 127 during opening movements.

As before stated, the doors are hung upon hinge sections 109 forming part of the respective intermediate sloping floor plates 101. The sections 109 are indicated as separately formed pressed metal members extending continuously across the car between adjacent outside hopper sheets. They serve at once to provide mountings for the several doors and to reinforce the floor plates 101 defining the upper edge of the respective door openings 111.

With the hinge sections 109 stiffening the intermediate floor plates 101 at the upper sides of respective door openings 111 and the pressed channel shaped stiffeners 105 welded to and connecting outside and inside hopper sheets and floor plates 102 and 118 extending transversely of the car at the lower sides of said openings, the structure about the openings is amply reinforced to prevent distortion during machine dumping operations.

The doors are pivotally hung and held in operative position upon associated hinge members on the car by interposing a bar or tube between the hinge on the door and that on the car and the doors taken down by the mere withdrawal of the interposed bar, as before outlined.

From the foregoing it will be noted that there has been provided a car construction in which overlapping of metal parts is reduced to a minimum and the pressed parts fashioned to provide joints of ample proportions designed to facilitate the welding-in of the members at their intersections whereby box sections of maximum strength and minimum weight may be employed. Welding at the joints renders them watertight and proof against corrosion and, when conformed to the contours of the connected parts, promotes uniformity in the distribution of stresses within the several assemblies of the car, and therefore throughout the whole structure.

The absence of rivets and other projections at the joints in the floor areas insures the uninterrupted flow of the lading to the discharge openings, and since the discharge openings extend beneath the center sill almost continuously between the outside hopper sheets, except for the thickness of the inside hopper sheets as before noted, obstruction to flow of the lading by the bridging thereof at the openings, is avoided. By virtue of the extension of the hoppers beneath the sill, that space is utilized for the accommodation of additional lading at points below the underframe whereby the pay load capacity of the car is increased and the center of gravity lowered to provide an additional factor of safety.

What we claim is:—

1. A welded railway car having side and end load retaining walls, sloping floor plates connecting said walls, a hollow center sill penetrating said floor plates, hollow ridge members extending transversely of the car and supporting certain of said floor plates, and braces connecting the side walls and center sill.

2. A welded railway car having side and end load retaining walls, sloping floor plates connecting said walls, a hollow center sill penetrating said floor plates, hollow ridge members extending transversely of the car

and supporting certain of said floor plates, and braces connecting the side walls and center sill and extending between said ridge supported floor plates.

3. A welded railway car having side and end load retaining walls, sloping floor plates connecting said walls, a hollow center sill connecting said floor plates, hollow ridge members extending transversely of the car and supporting certain of said floor plates, braces connecting the respective side walls and the center sill, and auxiliary trusses connecting said walls and respective braces.

4. A welded railway car having side and end load retaining walls, sloping floor plates connecting said walls, a hollow center sill connecting said floor plates, hollow ridge members extending transversely of the car and supporting certain of said floor plates, and braces connecting the respective side walls and the center sill and extending through openings in said ridge members.

5. A welded railway car having side and end load retaining walls, sloping floor plates connecting said walls, a continuous hollow center sill connecting said floor plates, hollow ridge members extending transversely of the car and supporting certain of said floor plates, hollow top chords surmounting said side walls, and braces extending between said ridge supported floor plates and connecting the respective top chords and the center sill.

6. In a welded railway car including load retaining end walls, bolsters, side wall girders comprising upper and lower plates respectively connecting said end walls and bolsters, a continuous hollow center sill connecting said bolsters, sloping floor plates connecting said bolsters, sill, and wall members, and side wall braces extending inwardly and beneath certain of said floor plates for connection with the center sill.

7. In a welded railway car having side wall girders having their respective upper edges bent inwardly and upwardly, a surmounting top chord having a web formed with marginal flange portions extending downwardly and outwardly in overlapping relation with the bent upper edges of the girder wall within the plane of the maximum width of the respective car sides, and an inner substantially vertical flange portion depending from said web and deflected outwardly for marginal engagement with the respective girder wall plates and forming therewith hollow chord members of substantial rectilinear configuration.

8. In a welded railway car having side wall girders comprising upper and lower wall plates united at their meeting edges longitudinally of the car, a top chord member surmounting said girder walls, a bottom chord member having a horizontal flange portion secured to said walls and an upwardly and outwardly deflected flange portion secured to said wall portions to form therewith a hollow chord member, a plurality of channel shaped stake members extending vertically between and secured to said chord members, and hollow wall stiffening members extending longitudinally between said stakes and top and bottom chords.

9. A welded hopper car comprising side girders, load retaining end walls and a pair of bolsters connecting said girders, sloping floor plates uniting said girders, bolsters, and end walls, a hollow center sill member penetrating said bolsters and floor plates, and outside and inside hopper sheets depending respectively from said girder sides and the center sill for supporting said floor plates, said inside hopper sheets being common to respectively adjacent outside hopper sheets upon opposite sides of the car.

10. A welded hopper car comprising side wall girders, load retaining end walls and a pair of bolsters connecting said girders, sloping floor plates uniting said girders, bolsters, and end walls, a hollow center sill member penetrating said bolsters and floor plates, outside hopper sheets depending from the respective girders for supporting said floor plates, and inside hopper sheets beneath the center sill and common to respectively adjacent outside hopper sheets upon opposite sides of the car, certain of said floor plates being extended beneath the center sill for connection with said inside sheets.

11. A welded hopper car comprising side girder walls, a pair of bolsters and load retaining end walls connecting said girders, sloping floor plates uniting said walls and bolsters, a continuous hollow center sill penetrating said floor plates and bolsters, certain of said floor plates forming ridges transversely of the car for uniting the girder sides intermediate said bolsters, hollow vertical stakes connecting adjacent ridge plates to respective girder sides, wall braces connecting said ridge plates and stakes, and gusset plates uniting said braces, stakes, and ridges.

12. A welded hopper car comprising side girder walls, a pair of bolsters and load retaining end walls connecting said girders, sloping floor plates uniting said walls and bolsters, a continuous hollow center sill penetrating said floor plates and bolsters, certain of said floor plates forming ridges transversely of the car for uniting the girder sides intermediate said bolsters, hollow vertical stakes connecting adjacent ridge plates to respective girder sides, wall braces connecting said ridge plates and stakes, and relatively short brace members connecting said ridge plates to the center sill.

13. A welded hopper car comprising side girder walls, a pair of bolsters and load retaining end walls connecting said girders, sloping floor plates uniting said walls and

bolsters, a continuous hollow center sill penetrating said floor plates and bolsters, certain of said floor plates forming ridges transversely of the car for uniting the girder sides intermediate said bolsters, hollow vertical stakes connecting adjacent ridge plates to respective girder sides, and wall braces connecting the center sill and said stakes and extending through respective openings in said ridge plates.

14. A welded hopper car comprising girder sided walls, a pair of bolsters, and load retaining end walls, sloping floor plates uniting said walls and bolsters, a continuous hollow center sill penetrating said floor plates and bolsters, certain of said floor plates forming ridges transversely of the car for uniting the girder sides intermediate said bolsters, hollow vertical stakes connecting adjacent ridge plates to respective girder sides, wall braces connecting said ridge plates and stakes, and auxiliary truss members connecting said braces to adjacent girder walls upon opposite sides of said stakes.

15. A hopper car comprising girder side walls, a pair of bolsters, and load retaining end walls, sloping floor plates connecting said walls and bolsters, a continuous hollow center sill penetrating said floor plates and bolsters, certain of said floor plates forming ridges transversely of the car above the center sill, and short brace members connecting adjacent ridges to opposite sides of the center sill, all of said members being united by welding.

16. A hopper car comprising girder side walls, a pair of bolsters, and load retaining end walls, sloping floor plates uniting said walls and bolsters, a continuous hollow center sill and penetrating said floor plates and bolsters, certain of said floor plates constituting ridges transversely of the car above the center sill for connecting the girder sides intermediate said bolsters, and tie plates between said ridges and center sill, all of said members being united by welding.

17. A hopper car comprising girder side walls, a pair of bolsters, and load retaining end walls, sloping floor plates connecting said walls and bolsters, a continuous hollow center sill penetrating said floor plates and bolsters, outside and inside hopper sheets depending from said girder sides and center sill respectively, and defining with said floor plates the discharge openings upon opposite sides of and beneath the center sill, all of said members being united by welding, doors controlling said openings, and door locking means.

18. A hopper car comprising girder side walls, a pair of bolsters, and load retaining end walls, sloping floor plates connecting said walls and bolsters, a continuous hollow center sill penetrating said floor plates and bolsters, outside hopper sheets depending from said girder sides for supporting said floor plates, inside hopper sheets beneath the center sill and common to adjacent outside hopper sheets having their upper securing margins deflected laterally of the plane of the body of the sheet, and separate companion plates secured to said hopper sheets and forming with the deflected sheet portion and the center sill a hollow passageway for a brake rod, certain of said floor plates being extended beneath the center sill for connection with said inside hopper sheets, all of said members being united by welding.

19. In a railway car including a pair of bolsters, and a continuous hollow center sill penetrating and extending beyond said bolsters to the car ends, said sill between the bolsters and adjacent car ends having their underside portions cut away to provide openings for the insertion of bolster filler castings and draft gear parts, said bolsters, center sill and filler castings being united by welding.

20. In a railway car including a pair of bolsters, and a continuous hollow center sill penetrating and extending beyond said bolsters to the car ends and having portions of its underside cut away and flanged outwardly between the bolsters and adjacent car ends, portions of said flanges and adjacent sill walls at the bolsters having open slots of predetermined length in the sill walls extending upwardly from adjacent flanges, bolster filler castings having projecting lug portions adapted to be entered in said slots for interlocking engagement with respectively adjacent sill walls, and bottom bolster cover plates connecting the respective bolsters, center sills, and filler castings, all of said parts being united by welding.

In witness whereof we have hereunto set our hands this 13th day of May, 1931.

WILLIAM H. MUSSEY.
JULIAN R. RUDULPH.

DISCLAIMER

1,859,261.—*William H. Mussey*, Chicago, and *Julian R. Rudulph*, Homewood, Ill. WELDED HOPPER CAR. Patent dated May 17, 1932. Disclaimer filed March 26, 1936, by the patentees; the assignee, *Pullman-Standard Car Manufacturing Company*, approving.

Hereby enter this disclaimer to claims 1, 2, 6, and 16, in said patent.

[*Official Gazette April 21, 1936.*]