

March 8, 1966

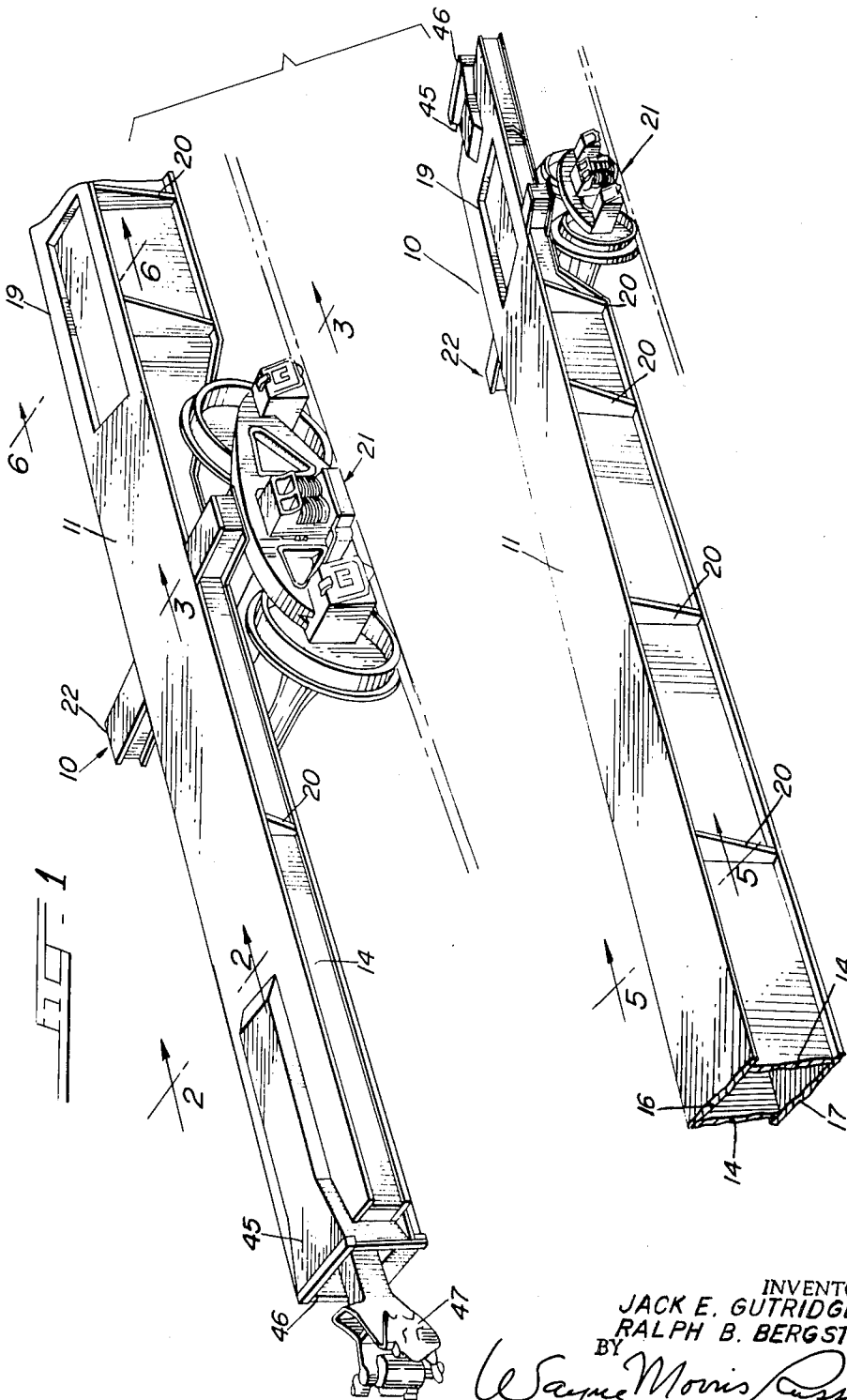
J. E. GUTRIDGE ET AL

3,238,899

RAILWAY CAR UNDERFRAME CONSTRUCTION

Filed March 18, 1964

8 Sheets-Sheet 1



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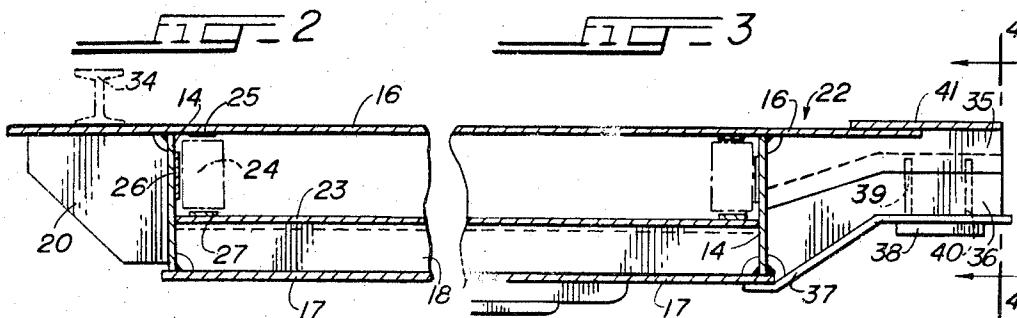
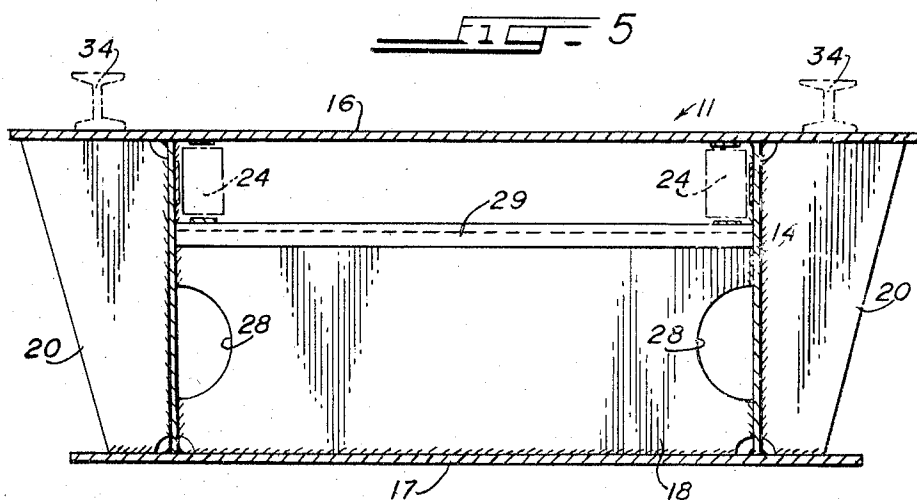
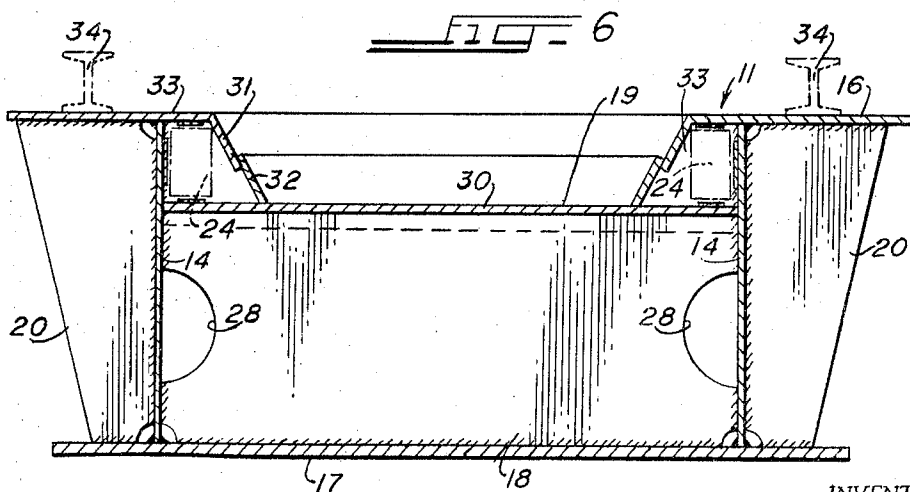
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RAILWAY CAR UNDERFRAME CONSTRUCTION

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8 Sheets-Sheet 2



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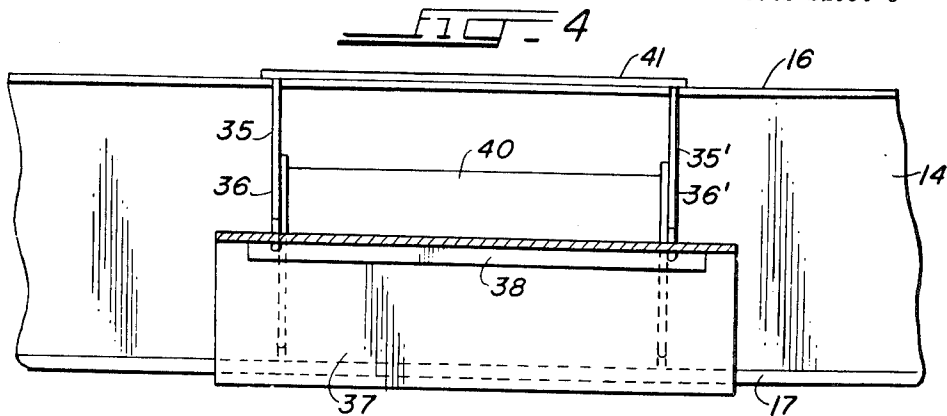
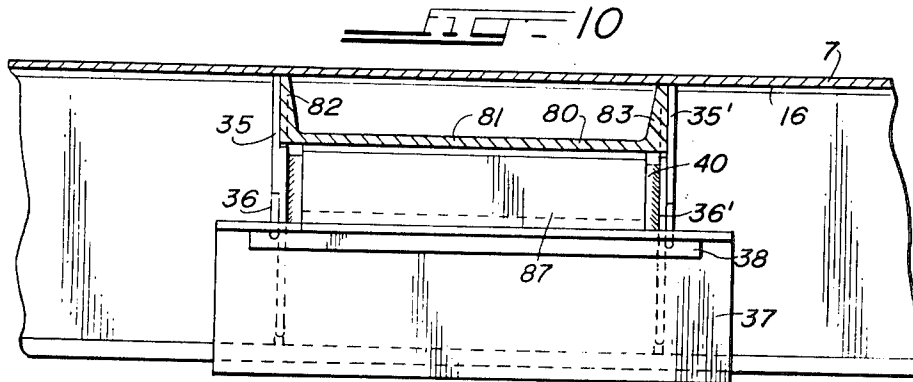
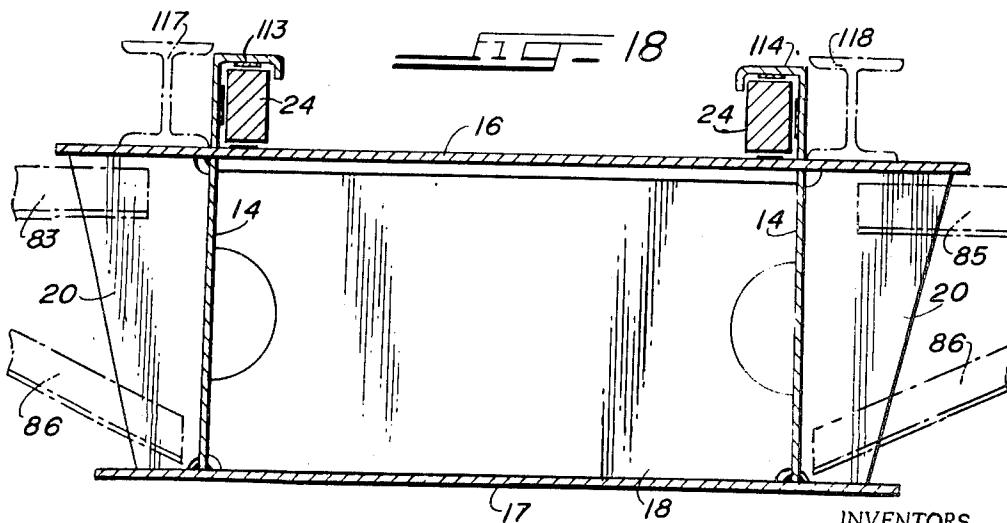
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# RAILWAY CAR UNDERFRAME CONSTRUCTION

Filed March 18, 1964

8 Sheets-Sheet 3



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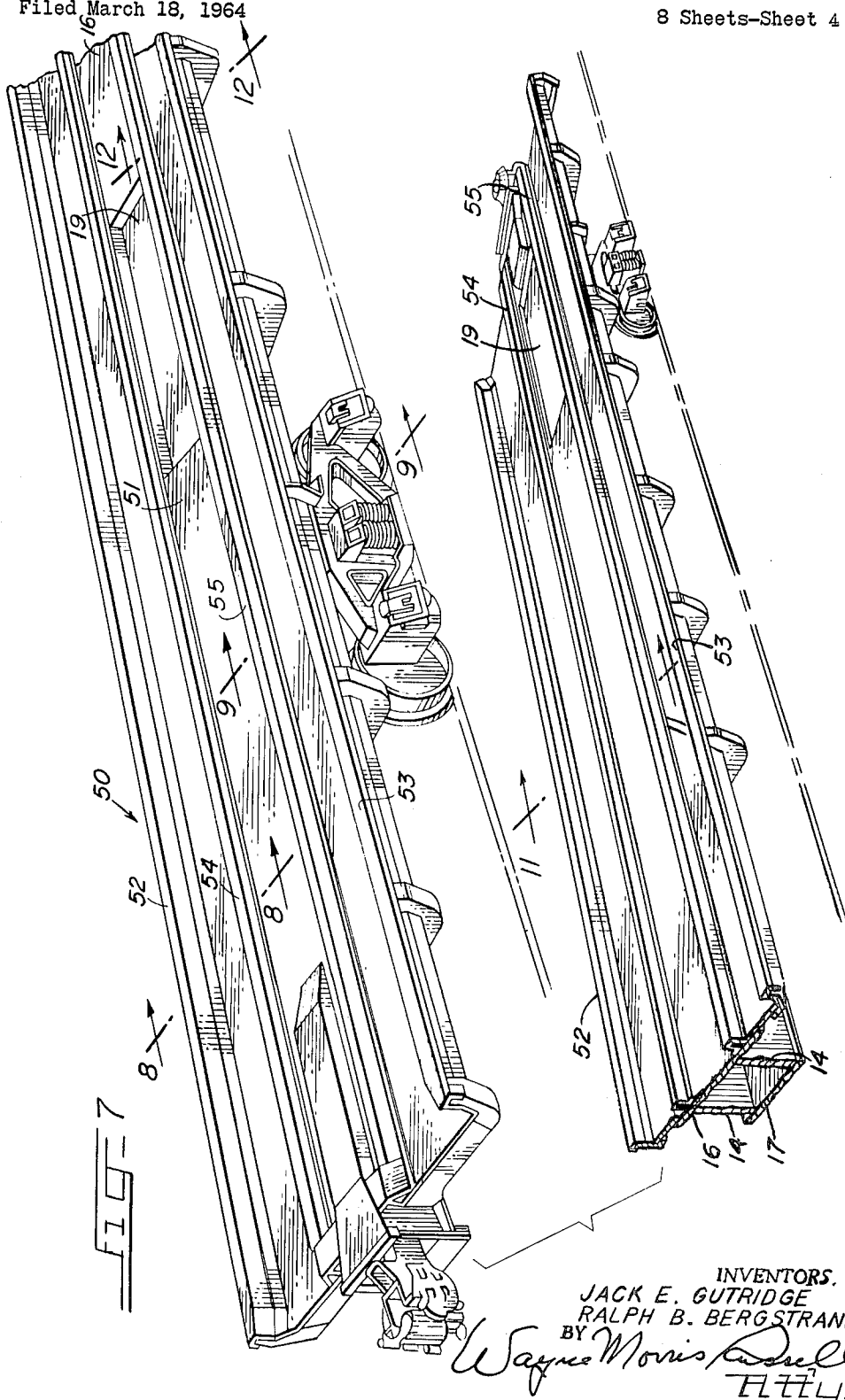
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RAILWAY CAR UNDERFRAME CONSTRUCTION

Filed March 18, 1964

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March 8, 1966

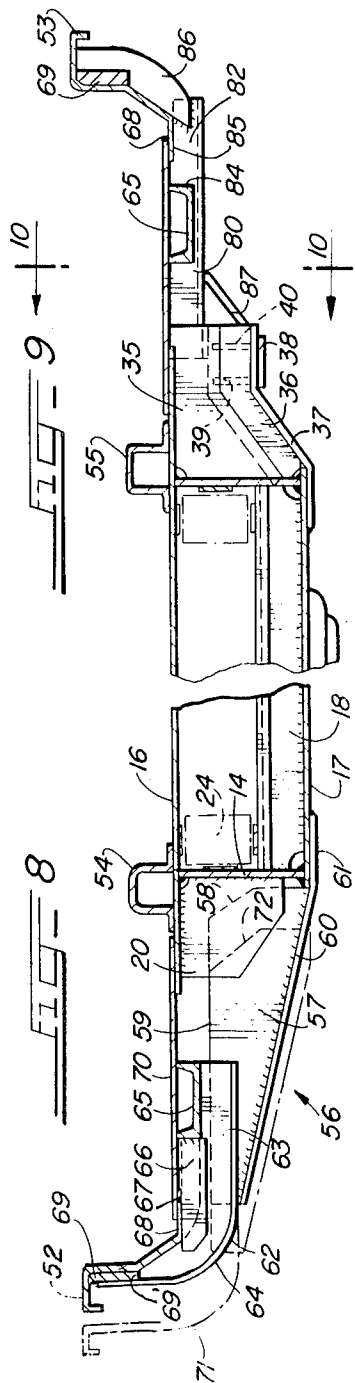
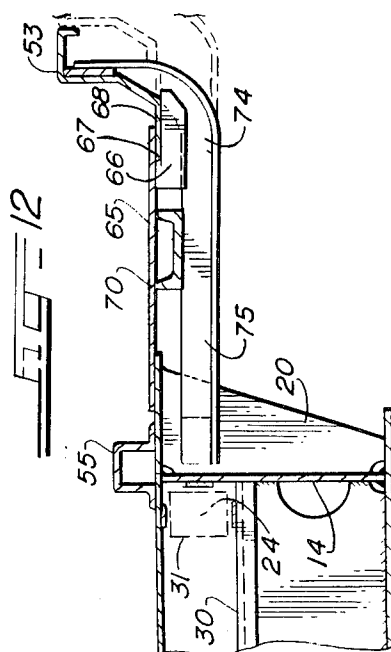
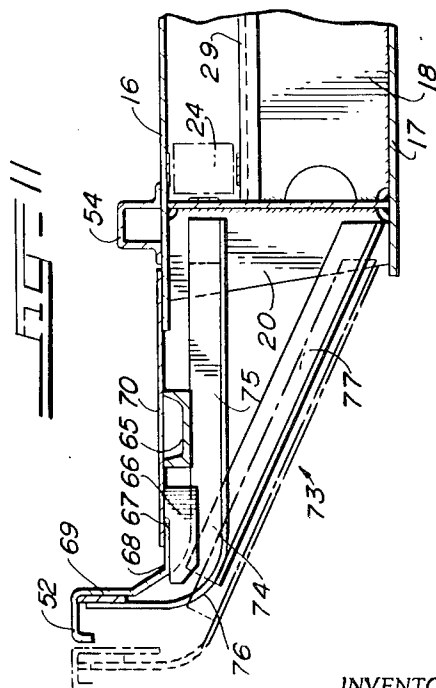
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3,238,899

RAILWAY CAR UNDERFRAME CONSTRUCTION

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8 Sheets-Sheet 5



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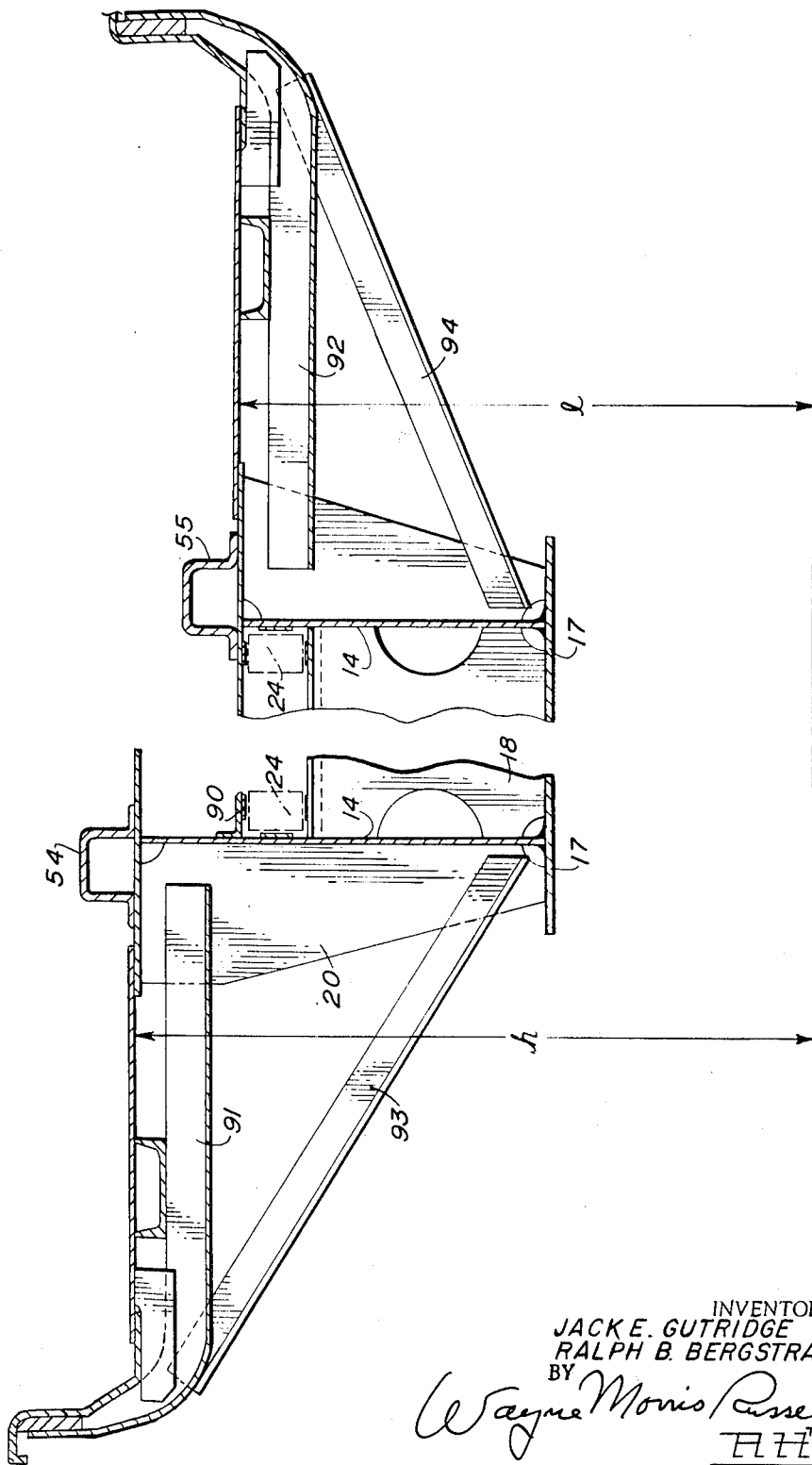
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RAILWAY CAR UNDERFRAME CONSTRUCTION

Filed March 18, 1964

8 Sheets-Sheet 6

FIG. 13



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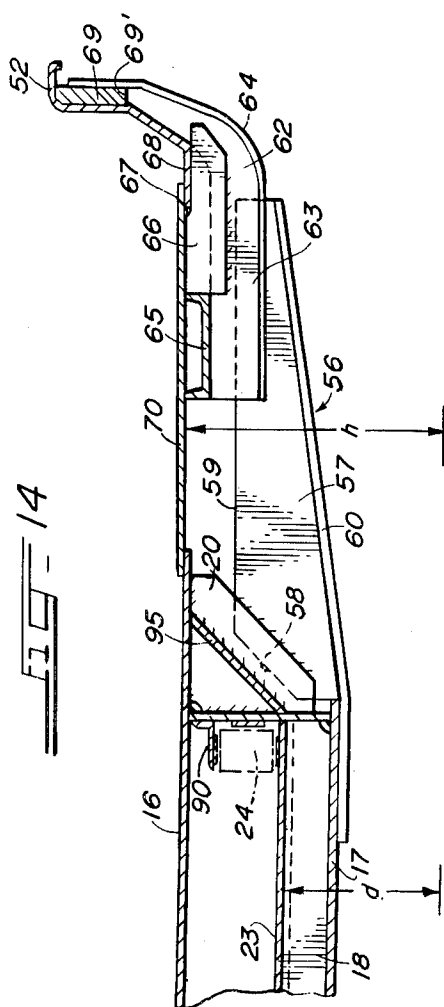
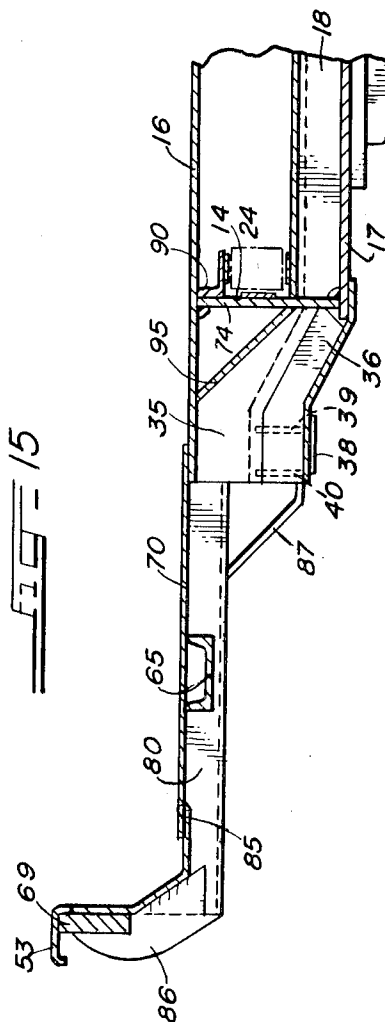
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# RAILWAY CAR UNDERFRAME CONSTRUCTION

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8 Sheets-Sheet 7



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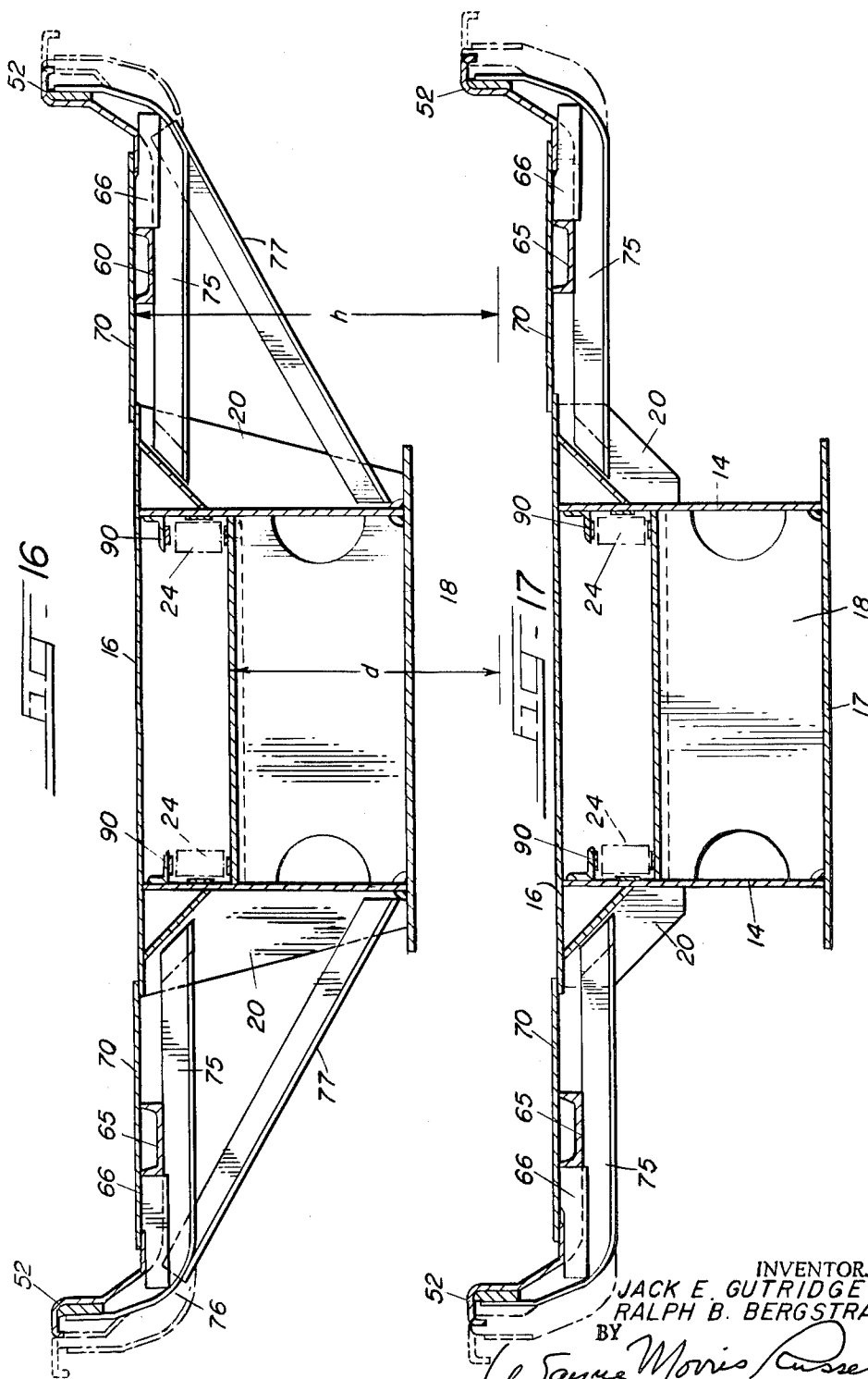
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RAILWAY CAR UNDERFRAME CONSTRUCTION

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8 Sheets-Sheet 8



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**RAILWAY CAR UNDERFRAME CONSTRUCTION**  
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**Chicago, Ill., a corporation of Delaware**  
 Filed Mar. 18, 1964, Ser. No. 352,843  
 10 Claims. (Cl. 105-414)

This application is a continuation-in-part of U.S. application Serial No. 281,980, filed May 21, 1963, now abandoned.

The over-all picture of the railroad industry has been drastically changed in the past few years, largely due to the development of specialty cars which are designed to meet the specific needs and wants of the shipper. The advantages of this type of operation are far reaching, in fact, of such magnitude that the railroad industry is re-acquiring shipping business which was previously lost due to its inability to satisfy shippers, consignees and others involved.

One particular disadvantage which has arisen from this outgrowth of specialty cars is the unusual manufacturing cost requirements when such cars are produced in small quantities. One approach taken in an effort to overcome this disadvantage was to convert, repair and modify existing cars to a satisfactory design. Another approach was to whittle away at the high cost of specialty cars by maintaining tight cost control on each individual project or job order. While each approach has achieved results which are worthy of recognition, neither has followed a course which would meet the problem squarely relying on the premise that a more feasible solution could be effected.

After careful and detailed consideration of the problem, it has been concluded that a workable solution could be effected only if a basic skelton framework, or expressed another way, a skeletonized underframe could be designed which would meet all the requirements as to strength and flexibility, while minimizing the amount of materials which would directly reduce the over-all cost, with the ultimate design serving as the basic underframe for a wide variety of specialized car constructions.

The oversimplification of the problem as expressed above immediately leads one to conclude that a workable solution can be effected without too much difficulty. The fallacy of this reasoning becomes apparent when consideration is given to the myriad of variables which are encountered in developing such a design, largely due to the different loading effects experienced with diverse types of lading, the need for cushioned travel in some cases, and clearance limitations to broadly mention a few.

More specifically, as is well known, wheel spacing is standardized which imposes a definite limitation on the maximum width of the center sill, while transverse stability will, in most cases, govern the minimum desirable width. Vertical depth limitations at one extreme are generally governed by wheel sizes and road bed clearance, while the other extreme is limited by maximum over-all car height. Where the car is to be used in piggyback lading operations, the anticipated height of the piggyback lading, which is far from standardized, will greatly influence the initial design and in some instances constitute one of the controlling factors, not to mention the need for providing a mounting for a collapsible fifth wheel stand. When the car is to be used in the transportation of the more fragile forms of lading, suitable cushion means of a proven design must be accommodated, thereby injecting an additional variable or parameter which, in most cases, will govern or at minimum exert considerable influence on the over-all design.

2

These are but a few of the variables encountered when the problem is approached directly, and exemplify the almost insurmountable obstacles facing the research and development organizations who chose to slant their programs and financial resources towards effecting a solution which would neatly fit within such a labyrinthian framework of variables.

The present invention is directed to a unique solution of the above described problem in the form of a skeletonized car construction which will serve as a basic standard underframe design for a wide variety of specialty cars of diverse capacities. A box-like center sill construction is provided having suitable means providing transverse rigidification, with additional means transversely in line therewith to accommodate vertical loading forces outwardly of the center sill and lend torsional stability to the completed sill structure. With this simplified but unusual construction the load supporting characteristics are such, that loading of various magnitudes in areas transversely and longitudinally spaced along the car will be readily accommodated and be directly transmitted to associated support structure.

In addition to providing an underframe design having unusual load bearing, flexure and torsional qualities, the skeletonized car of the present invention is exceedingly flexible, readily accommodating cushioned draft gear and special container supports to mention a few. With the present construction, conversion from a skelton car to various forms of flat cars can be easily accomplished either at manufacture or after the car has outlived its usefulness as a skelton car. Cushion draft gear may be added at any time during the life of the car primarily because the basic sill construction does not require the sliding sill to be a load bearing member. The significance of the present basic underframe design and the substantial benefits and advantages derived therefrom can best be comprehended upon a careful consideration of the objects and the novel structure as set forth below.

It is therefore an object of this invention to provide a new and improved skeletonized car design which will serve as a basic underframe structure for a wide variety of specialty types of railway cars.

It is a further object of this invention to provide a skeletonized car design having a basic center sill construction of a standardized design forming the basic underframe structure for a wide variety of specialty cars which promote economy in the manufacture, and conversion or change from one type of specialty car to another.

It is a further object of this invention to provide a center sill construction of box-like design having means externally thereof for attachment of load supporting members to maintain the load supporting function over as wide a base as possible in order to provide excellent transverse support for reducing lateral sway of lading.

It is a further object of this invention to provide a skeleton car framework having a unique center sill construction particularly adapted to accommodate a sliding sill in the region of the top portion of said center sill for cushioned protection of the lading carried thereby.

It is a further object of this invention to provide a basic underframe design for railway cars which will utilize standardized components for forming flat cars of varying capacities.

It is a still further object of this invention to provide a basic underframe construction for railway cars which will permit the use of cushion means and a sliding sill without requiring modification of the center sill, and which due to its standardized construction permits the neutral axis of the sliding sill to be placed directly in the line of draft regardless of the selected capacity of the car or deck height.

Further and fuller objects will become readily apparent when reference is made to the accompanying drawings and associated description set forth hereinafter wherein:

FIG. 1 is a broken perspective view of one form of railway car employing the skeletonized construction of the present invention;

FIG. 2 is an enlarged fragmentary half sectional view taken through the shallow end of the car generally along the lines 2—2 of FIG. 1;

FIG. 3 is an enlarged fragmentary half section taken through the shallow end of the car generally along the lines 3—3 of FIG. 1 with the right hand portion of FIG. 3 illustrating the details of the bolster construction;

FIG. 4 is an enlarged fragmentary end view of the bolster as viewed along the lines 4—4 of FIG. 3;

FIG. 5 is an enlarged cross sectional view through the central portion of the skeleton car taken generally along the lines 5—5 of FIG. 1;

FIG. 6 is an enlarged cross sectional view taken along the central portion of the car taken along the lines 6—6 of FIG. 1 to illustrate the recessed section for accommodation of a collapsible fifth wheel stand;

FIG. 7 is a broken perspective view of a flat car construction employing the skeletonized construction of FIG. 1;

FIG. 8 is an enlarged half section taken along the lines 8—8 of FIG. 7;

FIG. 9 is an enlarged half sectional view similar to FIG. 8 taken along the lines 9—9 of FIG. 7 to illustrate the bolster construction;

FIG. 10 is an enlarged transverse section of the bolster taken generally along the lines 10—10 of FIG. 9;

FIG. 11 is an enlarged half sectional view through the central portion of the car taken generally along the lines 11—11 of FIG. 7;

FIG. 12 is an enlarged half sectional view similar to FIG. 11 illustrating the cross tie in elevational and being taken generally along the lines 12—12 of FIG. 7;

FIG. 13 is a composite of comparative half sections of a flat car construction of the present invention to graphically illustrate the range of deck heights of cars of different capacities;

FIG. 14 is a half sectional view through the shallow end of a flat car of increased capacity being taken in the region of a shallow section cross bearer similar to the view shown in FIG. 8;

FIG. 15 is a half section of a flat car of increased capacity taken adjacent the bolster to illustrate the adjustability of the bolster construction illustrated in FIGS. 3 and 9;

FIG. 16 is an enlarged cross sectional view through the central section of the car of FIGS. 14 and 15 illustrating the cross bearer construction in a car of increased capacity;

FIG. 17 is a view similar to FIG. 16 illustrating the cross tie structure; and

FIG. 18 is a transverse section through the deep or central portion of a low level car illustrating a cushion sliding sill in section with the cross tie and cross bearer construction fragmentarily shown in phantom.

As shown in the divided perspective view of FIG. 1, the basic or standardized skeletonized railway car 10 includes wheel truck assemblies indicated generally at 21 which support an elongated box-like center sill 11. The wheel truck assemblies 21 are connected to the center sill in the usual fashion to permit turning movements beneath the bolster assemblies 22 projecting outwardly from the center sill 11. The bolster assemblies 22 are of a versatile design being fastened to the center sill in a unique manner which will be completely described in connection with FIGS. 3 and 4. Suitable coupler housings 45 are provided at opposite ends of the car, having a rectangular flared mouth portion 46 receiving the shank of a coupler 47.

The perspective view of FIG. 1 illustrates the side elevational characteristics of the railway car 10 sufficiently to indicate that the over-all contour of the car structure is of the type commonly referred to in the art as a "fishbelly" design, including a central section of greater vertical depth than the end sections which co-operate with and project beyond the wheel truck assemblies 21. As is well known, this general type of car contour is highly desirable in order to maintain the over-all height of the lading carrying area at a minimum. This is achieved by minimizing the depth requirements of the center sill in the region of the wheel truck assemblies 21 where the expected shear forces are at the lowest value.

As previously noted, the elongated center sill is of a generally box-like design including a pair of transversely spaced vertically disposed side web portions 14 of congruent configuration arranged in substantial parallelism. The transverse spacing is maintained uniform throughout the length of the railway car 10 by means of transverse separator plate members 18 (not shown in FIG. 1) as well as top and bottom cover plates 16 and 17 joined to the upper and lower edges of the side web portions 14. A plurality of gusset plates 20 are fastened to the outwardly facing portion of the side web portions 14 being substantially transversely in line with the separator plate members 18 and providing additional transverse rigidification as well as good load distribution in a manner to be described more completely in conjunction with the cross sectional views of FIGS. 2-6.

A basic factor which influences design criteria is the ultimate load capacity of the car. In the construction of prior art types, the center sill oftentimes consisted of a specialized design for each of the various capacities in order to be appropriate for the anticipated loads. Accordingly, a center sill for a car with a capacity of about 50 tons would oftentimes be of a substantially different longitudinal and cross sectional configuration than a comparable one for a car having a capacity of about 100 tons. Center sill design was also influenced to a large degree by the particular intended use and/or lading supporting structure to be attached thereto. In certain hauling operations cushion draft gear is required and accordingly each sill must be modified so as to provide for such structure contributing a further change in each application. Obviously, other design considerations of lesser order of importance contributed to the diversity in center sill constructions which obviously is undesirable for several reason.

A cursory examination of the impact of these differences would lead one to conclude that they were of a minor nature and relatively unimportant. Careful examination of fabrication costs and related costs in the manufacture of cars under this type of operation graphically indicates the undesirability of this approach. For example, in some cases different dies were required for center sills of different capacities constituting a considerable expense initially as well as being an expensive "shelf" investment since ordinarily they would be only in use part of the time. In addition, each type generally required a different set of jigs or fixtures which also added to the cost of severely jeopardizing the manufacturers competitive position.

The present skeleton car construction due to the unique design utilizes elongated, rectangular plates as the basic raw material for preparing the side web portions 14 of the box-like center sill 11. The lower edge of the side webs is of uniform shape for center sills of all capacities thereby requiring trimming only at the ends to form the "fishbelly" configuration. The vertical depth of the plate-like raw material is governed by the desired ultimate load capacity of the car and thus only one set of dies is required to fabricate the side web portions for sills of any desired capacity, with the trimming operation being maintained at a minimum with the attendant avoidance of nonusable and costly scrap.

5

The top cover plate 16 is formed from elongated rectangular plate-like material to provide a substantially flat load supporting surface with a pair of punched out spaced rectangular recesses or bays 19 serving a function to become apparent. In most instances, the top plate 16 is formed from plate-like raw material of equal thickness to the side web portions 14, gussets 20, and separator plates 18, thereby permitting raw material inventories to be maintained at minimum levels due to the interchangeability thereof with resultant desirable affect on the cost of goods manufactured. Generally speaking, the bottom cover plate 17 is of uniform thickness for cars of various capacities up to and including cars of 100 tons. Obviously, if it is desirable to lower the center of gravity the bottom cover plate may be increased in thickness to conveniently add weight at the lowest point on the car without an appreciable effect on road clearance or greatly increasing the ultimate cost of the completed car. This modification will normally be the exception rather than the rule in car manufacturing and is generally governed by an abnormal or unusual use of the completed car. It will become apparent hereinafter that the present underframe construction is exceptionally flexible in that it can readily accommodate modifications of this type with a minimum increase in cost and virtually no increase in manufacturing effort.

A greater appreciation of the simplified construction of the skeleton car 10 of FIG. 1 will be had by an examination of the corresponding cross sectional views of FIGS. 2-6. In the fragmentary sectional view of FIG. 2, the cross sectional configuration of the shallow end of the railway car 10 may be clearly seen having the side web portion 14 connected by means of a continuous weld to the top cover plate 16. The lower extremity of the side web 14 is attached by means of a similar weld to the bottom cover plate 17, which as previously pointed out, is generally of increased thickness with respect to the remaining structural members.

A gusset plate 20 extends from adjacent the outer marginal edges of the cover plate 16 downwardly and inwardly into close proximity with the bottom cover plate 17. The gusset plate 17 and separator plate 18 may be notched at the corners in a conventional manner for ease in fitting and to provide adequate weld clearance. An L-shaped or channel shaped spacer member 23 may be suitably attached to the upper marginal edge of the separator plate 18 to form a support for the ribbon type sliding sill shown in phantom at 24. Suitable bearing or antifriction wear pads 25, 26 and 27 are provided to enhance the smooth longitudinal travel of the ribbon sill shown in phantom at 24.

The ribbon sill construction is specifically described in our copending application Serial No. 329,343, entitled "Cushioned Low Level Railway Vehicle" filed December 4, 1963.

As previously noted, the spacer member 23 can be L- or U-shaped in section and may be attached directly to the upper marginal edge of the separator plate 18 as well as the side web portions 14. As pointed out previously, the separator plate 18 is transversely in line with the gusset plate 20 to form a unitized center sill having good longitudinal flexibility while being of sufficient rigidity to handle the rather substantial static and dynamic loads supplied thereto. In car designs wherein it is desired to omit the cushion draft gear, the ribbon sill indicated in phantom at 24 is omitted with the balance of the car remaining as illustrated. The standardized construction of the transverse sections of the car is such that the ribbon sill 24 may be inserted at any time, should it later become desirable to convert to the car to the type having cushion draft gear.

FIGS. 5 and 6 are enlarged transverse sections through the central or deep portion of the car 10 further illustrating the box-like construction of the center sill 11. The bottom cover plate 17 is generally of greater transverse

6

width in the deep section of the car than in the shallow section, and accordingly projects outwardly beyond the lower edges of the gusset plates 20 a slight amount. In the shallow section of the car it is necessary to reduce the transverse dimension of the bottom cover plate to accommodate the turning movement of the trucks and provide adequate wheel clearance.

An alternate method of accommodating the turning movement of the wheel trucks is to form the bottom cover plate of a transverse width equal to the width in the deep section of the car and provide relief or cutaway portions in the vicinity of the truck assemblies 21 and bolsters 22. The former method is preferred since a substantially rectangular plate may be used, dispensing with the expense of forming the cutaway portions.

The gussets 20 are attached to the side web portions 14 and top and bottom cover plate 16 and 17 with suitable relief at the inside corners to provide for weld clearance. The separator plates 18 of FIGS. 5 and 6 are of uniform dimension for all sizes of cars always providing clearance between the top edge thereof and the underside of the cover plate 16. The separator plates 18 serve to provide transverse rigidity to the webs 14 and accordingly may be also relieved as at 28 to reduce the total weight and amount of welding in the connecting operation. Obviously, a similar relief section could be removed at the bottom and top marginal edges of the separator plate to form a generally X shaped configuration if desired. It is intended that the term separator plate be construed to include any form of transverse bridging serving to strengthen the cross section of the sill 11.

A spacer block 29 of L- or channel-shaped section may be provided at the upper marginal edge of the separator plate 18 to support the ribbon sill indicated in phantom at 24 in the deep section of the car in a manner consistent with that described in connection with FIG. 2.

As seen in the cross sectional view of FIG. 6 the recessed or well portion 19 is formed by providing a transversely and longitudinally continuous plate member 30 between the side webs 14 and separator plates 18. The top cover plate 16 is modified having a punched out portion with the inner marginal edges 31 bent downwardly at an angle to join with an angularly disposed overlapping connecting plate member 32 attached to the continuous plate 30 forming the bottom of the well 19. Ample clearance is provided between the connecting plate member 32 and side web portions 14 to form a pocket 33 to loosely receive the ribbon sill member shown in phantom at 24.

As pointed out previously, the side web portions 14 are spaced a maximum permissible distance which ordinarily is in the range of 30 to 34 inches with 32 and 1/2 inches being preferable. The generous transverse width of the well 19 permits the use of a fifth wheel stand having an upper trailer engaging pad portion of substantial dimension so as to distribute the load evenly around the draw pin on the trailer underframe. This obviates a problem which has been experienced in the industry wherein inadequate transverse clearance is provided in the well portion of the car, and therefore of necessity fifth wheel stands having a trailer engaging pad portion of reduced transverse dimension have been used. The substantial loads carried on the pad are not distributed over a sufficient area on the trailer underframe and accordingly damage to the trailer in the area of the draw pin occurs during transit or loading or unloading.

In the present case, the depth of the well 19 is sufficient to accommodate any of the popular types of collapsing fifth wheel stands in a manner to provide ample vertical clearance for the axles of vehicles driven or pulled on the car. This is achieved without modifying the separator plates 18 beneath the well 19 or interfering with the normal disposition of the ribbon sill 24. Only two sizes of separator plates are required for cars of all capacities, those for the shallow ends of the car and those

for the deep section with both being of uniform width and thickness. Obviously, fifth wheel stands will not ordinarily be used on the skeleton car unless modified to accommodate the rear wheel portions of trailers, however, on all cars the well 19 is formed at manufacture for reasons to be described in detail below.

As is well known in the industry, container locking mechanisms are not uniformly spaced and any car design, in order to be sufficiently flexible, should have the necessary supporting structure available to space container supports from a minimum of about 30 inches to a maximum of about 45 inches in order to accommodate all popular types. Container supports may be provided on the present skeleton car with the spacing from any minimum up to a maximum of about 50 inches, and in all cases providing the requisite lateral stability while readily accommodating the different dimensions of container locking mechanisms. This is represented schematically by the spaced I beams shown in phantom at 34 in FIGS. 2, 5 and 6.

As previously pointed out the unique skeleton car design utilizes a relatively standardized constructional feature requiring only an increase in the vertical depth of the side web portions 14 to effect an over-all increase in the ultimate capacity in the car. The advantages of this construction have been pointed out hereinbefore in the form of reduction of raw material inventories as well as minimizing the number of jigs and fixtures utilized in the fabrication of the sill. In keeping with this general scheme it is highly desirable to provide a standardized bolster construction which is suitable for the changes in vertical depth of the side webs 14 in the manufacture of cars having a capacity of about 50 tons up to those having a capacity of about 100 tons.

FIGS. 3 and 4 illustrate a unique bolster arrangement which is suitable for web depths of various vertical dimensions. The cross sectional view of FIG. 3 illustrates a half section of the bolster 22 construction at one end of the car, it being understood that the bolster at the other side and opposite end is of uniform construction. A pair of overlapping side plate members 35 and 36 are formed to the shape shown in solid lines and dotted lines respectively, and placed in vertical overlapping relationship at the central portion of the bolster and then welded to form a unitized vertically disposed side plate member.

The upper side plate member 35 is attached at its inner edge to the adjacent vertically extending web portion 14 and along its upper edge to the underside of the outwardly projecting portion of the top cover plate 16. The lower side plate member 36 is also attached at its inner end to the vertically extending web portion 14 and is suitably joined along its lower edge to a bottom closure plate 37 of complementary configuration. The inside lower corner of the lower side plate member 36 may be cutaway as illustrated to eliminate fitting difficulty.

The bottom closure plate 37 extends inwardly beyond the inner end of the lower side plate 36, overlapping the bottom cover plate 17 a slight amount to form a lap joint which may be easily welded in a conventional manner. As is evident in FIG. 4, an identical pair of upper and lower side plate members 35' and 36' are attached in vertical overlapping relationship to the vertical web 14 of the center sill 11 and top and bottom cover plates 16 and 17 respectively. The use of an overlap type construction allows the vertical depth of the bolster to be adjusted in conformity with changes in the vertical depth of the side webs 14, thereby being particularly suited for cars of various widths and capacities. A unique feature made possible by the present construction permits the contour of the lower edge of the upper side plate 35 and the contour of the upper edge of the lower edge of the lower side plate 36 to be uniform for cars of varying capacity, and therefore, normal adjustments in the vertical depth will determine the amount of overlap of the plates. In the particular construction shown, the car design is

of an intermediate capacity on the order of about 70 tons. With an increase in capacity the amount of overlap of the plate members 35 and 36 would diminish while it would increase for cars having lesser capacities.

As is clearly seen in the enlarged side elevational view of FIG. 4 the bottom cover plate 37 extends longitudinally beyond the lower edge of the spaced lower side plate members 36 and 36' and carries a side bearing block 38 disposed directly above the side frame of the truck assembly 21. A pair of reinforcing plate members 39 and 40 extend between the lower side plate members 36 being attached thereto by welding and also attached to the bottom closure plate 37 along the lower edges thereof. The reinforcing plates 39 and 40 serve to increase the overall strength of the bolster and especially assist in resisting any upwardly directed loading forces applied to the bearing block 38, as well as longitudinal and vertical loading forces applied at the outer marginal edge of the bolster 22. A top closure plate 41 overlaps the outer marginal edge of the top cover plate 16 of the center sill 11, and extends outwardly terminating at the outer marginal edges of the upper and lower side plate members 35 and 36. An end cover plate may be placed over the open ends of the bolster to prevent the ingress of foreign material when the skeleton car is used for container hauling.

The simplified bolster construction illustrated in FIGS. 3 and 4 pictorially demonstrates the versatility of the unique design of the present invention. In addition to the advantages previously noted, the bolster construction is particularly suited to facilitate attachment of side floor sheets and a modified form of bolster cross tie thereto when the skeleton underframe is converted to a flat car design in a manner to be described. The side plate members 35 and 36 and their primed counterparts as well as the reinforcing members 39 and 40 and bottom closure plate 37 are of uniform construction for cars of all capacities. If for some reason it is desirable to make the bolster narrower to reduce the over-all width of the car, this may be achieved by trimming the outer end portion of each of the side plates 35 and 36 and the bottom and top closure plates 37 and 41. However, in practically all cases the bolster construction will be of substantially uniform transverse dimension for all types of specialty cars heretofore noted.

The skeleton car construction described in connection with FIGS. 1 through 6 comprises a new and improved combination of elements which are joined together in a unique and coacting manner to provide a skeleton car construction which is, constructionally and comparatively speaking greatly simplified. The railway car 10 has excellent stability characteristics while being extremely flexible and versatile. By the latter it is meant that the skeleton car not only can be used as a freight carrying vehicle, but also may form the basic framework for flat cars or other forms of integrated transportation specialty types of cars.

Cushion draft gear may economically be provided at manufacture or a later date in the service of the car. For example, assuming the skeleton car is built without cushion draft gear and later it becomes desirable to convert the car to a cushioned type, it is merely necessary to insert the ribbon sills shown in phantom in the cross sectional views of FIGS. 2, 5 and 6 and the associated shock dissipating means, all of which may be accomplished at low cost and with a minimum amount of effort. The provision for accommodating a sliding sill at a later date complements the non-cushioned car design by contributing to the over-all strength thereof while not increasing the total dead weight of substantial amount.

The unified skeleton construction has an excellent strength to weight ratio, eliminating the dead weight which would normally detract from the loading carrying capacity of the car. A portion of this is attributable to the fact that stress bearing members are strategically

placed as far from the neutral axis as is possible with the total amount of structural materials at the neutral axis being maintained at a minimum. In this respect the novel sill construction is somewhat analogous to an I-beam construction which has the minimum thickness of material at the neutral axis. It must be appreciated that it is exceedingly complex to achieve such construction in an integrated unified center sill design as has been described, particularly when it is absolutely necessary to provide the flexibility and versatility heretofore noted. A greater appreciation of these unique features will be had when description of the remaining figures is given.

Referring now to FIG. 7, the broken perspective view illustrates a flat car 50 which employs the basic skeleton sill construction described above, and accordingly like reference characters will indicate like parts. The car 50 is commonly referred to in the transportation industry as a flat car and is adapted for a wide variety of uses. The particular design of the present invention makes it especially appropriate to fulfill the needs of the piggy-back type hauling operations readily accommodating containerized type lading as well as highway trailers. The structural additions to the skeleton car 10 of FIG. 1 in order to form the flat car 50 are also standardized to accommodate consumer demands for variances in total vertical height and over-all transverse width of the car. The unique construction permitting such variances will become evident when a full description of FIGS. 8-12 is given below.

The flat car 50 is formed having the usual flat deck positions indicated generally at 51 terminating in low side edge portions 52 and 53 which serve as wheel guides when the flat car 50 is used in piggyback service for hauling vehicles. In the embodiment shown, continuous container supports 54 and 55 are positioned in spaced relationship over the top cover plate 16, however, it is to be understood that the container supports may be omitted or alternatively other forms of lading support means may be utilized in a manner consistent with the discussion above.

The flat car shown is of low level design in the intermediate capacity range, however, the over-all configuration and construction is the same for all capacity ranges with a minor variance in deck height which will be described in detail hereinafter when the cross sectional views of FIGS. 13-18 are discussed. An enlarged half section is shown in FIG. 8 illustrating the typical construction of the flat car 50 through the shallow section adjacent a cross bearer assembly being taken generally along the section lines 8-8 in FIG. 7. As expected, the center sill construction is identical to that described in connection with FIGS. 1-6, since the skeleton car of FIG. 1 forms the basic underframe for the flat car of FIG. 7. A shallow section cross bearer assembly is indicated generally by the reference numeral 56, and includes a vertical reinforcing plate 57 of generally trapezoidal configuration when viewed in elevation. The inner end of the plate 57 has a chamfered corner portion 58 which is in overlapping relation to the gusset plate 20, and attached thereto by the usual lap type weld at the overlapping surfaces. The upper edge 59 of the vertically disposed plate 57 is substantially horizontal and terminates in close proximity to the edge forming side portion 52.

A lower edge portion 60 of the vertical reinforcing plate 57 extends angularly from a point coextensive with the lower surface of the bottom cover plate 17 outwardly to reduce the total vertical depth of the car at the outer marginal edges. A longitudinal plate member 61 is joined to the bottom edge 60 of the vertical reinforcing plate 57 forming therewith a generally inverted T-shaped lower section of the cross bearer member for transmitting vertical load forces back to the center sill 11. The longitudinal plate member at its inner end is in overlapping

relation with the bottom cover plate 17 being welded thereto in a conventional manner.

The shallow section cross bearer assembly 56 further includes a cross tie member 62 formed from angle stock and having a horizontal portion 63 of abbreviated length which merges smoothly with an arcuate section 64 forming a frame work for supporting the lower side portion 52. The arcuate section 64 is formed on the same radius for all cross ties as will become evident hereinafter, thus permitting a single die to be used in the forming operation for all. A vertical leg of the angle on the inner end portion 63 of the cross tie 62 is in overlapping relation with the vertical reinforcing plate 57 to permit joining thereto as by welding. The inner end 63 of the vertical leg on the cross tie 62 supports a channel shaped side sill member 65 (shown in section) which extends longitudinally of the car. A reinforcing channel 66 abuts the outside flange of the side sill 65 having one flange welded to the vertical leg of the cross tie 62. The reinforcing channel 66 is provided with a cutaway portion 67 to receive a lower continuous flange 68 on the side edge portion 52. The upper extremity of the side edge portion 52 is provided with a longitudinally extending spacer 69 for lending rigidity to the side edge portion 52 and providing continuous attachment therealong between cross bearers and cross ties. The vertical leg of the angle forming the cross tie 62 is cutaway to form a shoulder 69' to support the spacer 69 permitting overlapping and welding to the longitudinally disposed leg of the angle.

A side floor sheet 70 overlies the top cover plate 16 of the center sill at the outer marginal edge and extends across the upward projecting flanges of the side sill 65 into overlapping engagement with the longitudinally continuous lower flange 68 on the side edge portion 52. The side floor sheet 70 may be welded continuously along its inner and outer edges to the associated supporting members as well as to the side sill 65.

The over-all width of the car may be readily varied by positioning the cross bearer and associated structure at the outer limit indicated in phantom lines 71 with the inner edge of the vertical reinforcing plate assuming the position shown in phantom lines at 72. It is to be appreciated that no change in the structural dimension of the elements forming the shallow section cross bearer assembly 56 is required in order to permit the increase in over-all width, and therefore the desired final width of the car need only be chosen at the time of assembly.

The overlap of the side floor sheet 70 with the flange 68 on the side portion and the cover plate 16 on the center sill is of sufficient magnitude in the narrow width design so as to allow extension to the position indicated in phantom without requiring a side floor sheet of increased width. Thus the floor sheets and the shallow section cross bearer assembly can be fabricated at any convenient time prior to assembly for quick attachment to convert an existing skeleton car to a flat car or in the manufacture of a flat car.

An enlarged half sectional view of a cross section through the deep or central portion of the flat car is illustrated in FIG. 11. The center sill construction conforms to that shown in the cross sectional view of FIG. 5 including the side web portion 14 having top and bottom cover plates 16 and 17 at opposite edges thereof and being transversely reinforced by means of the gusset plate 20 on the outer surface, and the transversely extending separator plate 18 on the inner surface. The separator plates 18 in the deep section are of uniform height to provide ample vertical clearance for the sliding sill indicated at phantom at 24. A suitable spacer 29 may be provided to support the sliding sill in the manner described in connection with FIGS. 1-6.

A deep section truss type cross bearer assembly is indicated by the reference character 73 including a long cross tie member 74 formed of angle stock in the manner

of the cross tie 62 of FIG. 8. The inner end 75 of the cross tie 74 is of increased length having the vertical leg portion in overlapping relation with the gusset plate 20 and terminating closely adjacent the side web 14. A smooth arcuate section 76 is formed having the same radius as the one indicated at 64 on the cross tie 62. The side edge portion 52 of the flat car is attached to the deep section cross bearer 73 in the same manner as was previously described in connection with the cross tie 62.

The lower flange 68 of the side edge portion 52 is received in a cutaway portion 67 of the channel shaped spacer 66 attached to the cross tie 74, while the upper edge of the cross tie 74 supports the continuous longitudinal side sill 65 in a manner consistent with that described and illustrated in FIG. 8. A diagonal brace 77 is tangentially attached at its outer end to the arcuate section 76 of the cross tie 74 with the longitudinally extending leg portions of the angle members in overlapping relationship and joined by means of welding or the like. At the inner end of the diagonal brace 77 one leg of the angle is in overlapping relation to the gusset plate 20 to enhance the ease of connection thereto.

The deep section cross bearer 73 is of the open web variety to reduce the total weight while not detracting from the available supporting strength. An advantage of this type of construction resides in permitting the use of angle and channel shaped stock material in the forming of the components reducing the overall cost of fabrication. The number of cross bearers and cross ties in a given car will obviously be governed by the total length of the finished car.

As was pointed out in the description of FIG. 8 with respect to the cross bearer assembly 56 in the shallow section of the car, the cross bearer assembly 73 of FIG. 11 may be adjusted outwardly when a wider deck on the flat car is desired without the necessity of refabrication of components. The position of the cross bearer assembly 73 and associated components would assume are indicated in phantom lines in FIG. 11, it being evident on inspection that the cross bearer assembly 73 is merely moved outwardly with the inner end portions of the cross tie 74 and diagonal brace 77 still in overlapping relationship to the gusset plate 20 for ease in connection thereto. The dimensional relationship of the cross tie 74 and the angle brace 77 forming the cross bearer assembly 73 remain substantially unchanged for all sizes of cars. Thus, the cross bearer assembly 73 may be fabricated in large quantities for later assembly to a car of desired capacity. In this manner, cost and constructional advantages are obtained which stem directly from the design, manufacturing and assembly flexibility afforded by the present invention.

The enlarged view of FIG. 12 illustrates the constructional aspects of the flat car in the region of a deep section cross tie assembly being taken generally along the lines 12-12 of FIG. 7. The cross tie assembly shown in FIG. 12 is identical to the cross tie 74 described in connection with the deep section cross bearer assembly 73 in FIG. 11 and bears the same reference numerals. The relationship of the side floor sheet 70, side sill member 65, and side edge portion 52 are the same as was described in connection with FIG. 11. In the cross tie assembly, however, the diagonal brace 77 is omitted since it is not necessary to meet strength requirements.

The cross tie 74 is of the usual angle construction having the inner end portion 75 in overlapping relationship to the gusset plate 20 which is transversely in line with the separator plate 18 shown fragmentarily. As was the case in the cross bearer assembly 73 in FIG. 11, the cross tie assembly in FIG. 12 is also adjustable outwardly to accommodate increase in the flat car width. The adjustability of the cross bearer and cross tie assemblies has taken on considerable importance with the revision in existing state laws as to the width of highway trailers, and accordingly any increase in over-all trailer width must be

accommodated in flat car designs for transporting such trailers. In addition, certain railroad lines are provided with tunnels, underpasses and the like that will readily accommodate the increased width and therefore it is desirable to provide the same for those applications in which it is desired to accommodate other forms of lading of increased width.

The enlarged sectional view of FIG. 9 illustrates the bolster construction shown in the cross sectional view of FIG. 3 as it appears when the skeleton car 10 is converted to or forms the basic underframe of the flat car 50. Like reference characters have been used to indicate like parts. Snugly received within the side plates 35 of the bolster assembly 22 is a channel member 80 having a web 81 bounded at the marginal edges by upstanding side flanges 82 and 83. As seen in FIG. 10, the web 81 of the channel 80 is disposed so that the side flange portions 82 and 83 project upwardly into engagement with the underside of the side floor sheet 70. The flanges 82 and 83 may be notched as at 84 to receive the continuous side sill 65, with the two being joined by means of welding.

A relief groove 85 is provided at the outer end of the channel 80 and receives the lower flange 68 of the side edge portion 53. A pair of identical plate members (only one shown at 86 in FIG. 9) overlie the outer portion of the flanges 82 and 83, with each being contoured in a manner to be received in abutting relation with the side edge portion and the spacer 69. A plate-like brace 87 is received in overlying relation to the top of the bottom cover plate 37 of the bolster 22 and extends angularly upward into engagement with the web 81 of the channel member 80 to provide maximum vertical support.

It is to be appreciated that the bolster 22 illustrated in FIG. 3 remains unchanged when the skeleton car 10 is converted to form the flat car 50 of FIG. 7. The channel member is received in overlapping relationship to the side plates 35 and is adjustable to vary the width as was described in connection with the cross bearer and cross tie assemblies in reference to FIGS. 8-11. The unified construction of the bolster 22 provides excellent support without interfering with the wheel clearance or the side clearances required by A. A. R. Standards.

Referring now to FIG. 13, the uniformity in construction of the high and low level designs may be conveniently compared in the enlarged half section views illustrated. Each of the sectional views illustrates the normal structural arrangements in the deep section of a high and low level car respectively being taken adjacent a cross bearer. For descriptive convenience, a low level car (*l*) is one whose deck height is from about 31 inches to about 37 or 38 inches. A high level car (*h*) is one having a deck height of in excess of about 37 or 38 inches.

In both designs, the bottom cover plate 17 is maintained at uniform elevation, approximately 11 and 1/2 inches from the top of the rail is represented schematically by the line beneath the views. The 11 and 1/2 inch dimension will provide sufficient roadbed clearance on a car of long length, for example, in the neighborhood of 90 feet on the maximum vertical curve permissible under A.A.R. Standards.

The separator plates 18 in each design extend from the one side web 14 to the other and as is evident in the drawing are of identical dimension for both the high and low level designs. Accordingly, a single press and die may be used in the fabrication of separator plates which will serve to fulfill the requirements on all sizes of cars in the low to high level range.

The ribbon sill 24 (illustrated in phantom) in each of the half sections in FIG. 13 has the neutral axis thereof directly in the line of draft, which as well known in the art is 34 and 1/2 inches above the top of the rail. In the high level design, an angle member 90 extends along the side web 14 above the ribbon sill 24 and supports the usual wear pad to maintain the sill properly positioned

and prevent buckling under impact. The angle 90 extends longitudinally along the associated side web 14 to which it is attached. In each of the half sections, if a sliding sill is used, the present center sill design irrespective of deck height, permits the sliding ribbon sill 24 to be directly in the line of draft. Absent the sliding sill, the cross sections remain unchanged with each cross section having the requisite strength to handle the anticipated loads with a satisfactory margin of safety.

The side webs 14 in both the high and low level designs may be formed from plate-like raw material of uniform width. In forming the high level design, the material is removed at each end of the plate-like raw material to form the fishbelly design in the side webs. In the low level design of minimum height, approximately 6 inches is removed from the lower edge after forming the fishbelly configuration and 4 inches is removed from the upper edge. In forming side webs for low level cars having an intermediate capacity, the trimming operation removing 6 inches from lower edge is omitted.

Accordingly, plate-like raw material of uniform or standard width may be purchased, and the side webs formed to the appropriate dimension for a car of given capacity currently being manufactured. When forming the side webs for the low level design, the material trimmed in the forming operation is of sufficient width that it may be used in other parts of the car maintaining non-usable scrap at a minimum. A single forming die may be used to cut the fishbelly contour for all sizes of cars since the angularity at the ends of the side webs is the same.

Substantial benefits are derived from having an underframe design that will permit the use of a standard dimension plate for side web forming in that the cutting operation may be reserved until immediately prior to welding, thereby providing clean raw edges to enhance the strength of the welded joint. In the past, it has been found undesirable to cut plate material too far in advance of welding since the cut or raw edges have a tendency to oxidize causing pockets to be formed in the weld which ultimately reduces the over-all strength of the welded joint.

As is evident from a cursory comparison of the half sections in FIG. 13, the cross bearer construction in each of the designs is for all practical purposes identical. The cross tie 91 in the left hand portion of FIG. 13 is identical in shape, configuration and size to the cross tie 92 in the right hand portion. The same holds true for the cross ties of FIGS. 11 and 12. Diagonal brace 93 in the left hand portion is substantially identical to the diagonal brace 94 in the right hand portion of FIG. 13 with the exception that it may be slightly longer to provide sufficient overlap on the gusset plate 20 to permit an adequate length of weld. This minor difference can readily be accommodated without an appreciable increase in manufacturing expense by providing angle stock of maximum anticipated length for the high level designs and trim the same to the appropriate length for low level cars. Alternatively, the angle stock may be stock piled in long lengths reserving the trimming to length operation until assembly at which time the diagonal braces may be cut to the exact dimension.

The high level design shown in half section in FIG. 13 is representative of a deep section in a car of 100 ton capacity. The right hand portion or half section designated at a low level design is of intermediate capacity being of the order of about 70 tons as was pointed out in the description of FIGS. 7-12.

A still smaller capacity car is available which utilizes the standardized sill construction being of the order of about 55 tons with a typical cross sectional view through the deep section of the car being illustrated in FIG. 18. As shown in FIG. 18, the center sill construction is of the usual box-like design having vertically disposed side web portions 14 joined at the top marginal edges to a

top cover plate 16 and at the lower edges a bottom cover plate 17 of reduced transverse dimension with respect to the top cover plate.

At each of the cross ties and cross bearers, gusset plates 20 are provided outwardly of the side web portions 14 being in alignment with a transverse separator plate 18 of the type previously described extending between the side web portions 14. The separator plate 18 is of the same dimension as those used in the high and low level designs discussed in connection with FIG. 13. In the low level design of FIG. 18, however, the top cover plate is only about 31 inches from the top of the rail. Obviously, if a cushioning arrangement is to be used and the ribbon sill 24 is to be positioned with the neutral axis directly in the line of draft, the ribbon sill 24 will of necessity be disposed above the top cover plate 16. The separator plate 18 substantially fills the interior section of the center sill stopping short of top cover plate.

A pair of angle members 113 and 114 provided with the usual wear pads are mounted on the deck portion (top cover plate) of the car and serve as guides for the ribbon sill shown in phantom at 24. If desired, the ribbon sill may be used in conjunction with the skeleton car design illustrated in solid lines in FIG. 18 to cushion the car in draft and buff to protect the lading. It is contemplated that in either the skeleton or flat car designs, the container will rest directly on the top of angle members 113 and 114 thus serving a dual function.

If the skeleton construction shown in solid lines is to be converted to a flat car, cross ties 85 and diagonal braces 86 illustrated in phantom may be added with the outward construction of the car being identical to that of FIGS. 7-12 and utilizing identical components. In the absence of the ribbon sill 24 or to accommodate containers having container supports of greater transverse width than 32 inches, suitable I-beam members or longitudinal runners 117 and 118 may be provided in the manner illustrated in phantom lines in FIG. 18.

The shallow sections of the smaller capacity car are substantially the same as was described previously in connection with the flat car illustrated in FIG. 7. As discussed above, dimensional exceptions exist in that the side webs 14 are of reduced vertical height and the separator plates 18 while of identical dimension substantially fill the central portion of the center sill. The ribbon sill guides or supports 113 and 114 extend longitudinally over the length of the top cover plate and are joined to conventional couplers in a manner described more completely in the copending application hereinbefore mentioned.

A more complete appreciation of the construction of the high level design shown in the enlarged half section of FIG. 13 will be had by referring to FIGS. 14-17. FIG. 14 is a section, taken through a high level car in the shallow section of the car adjacent a cross bearer in the same relative vicinity of the high level car as FIG. 8 was taken from the low level flat car of FIG. 7. In the high level design illustrated in FIGS. 14-16 all components are identical to those of FIG. 8 with the exception previously noted that the side web members 14 are of increased depth.

As expected, the center sill construction is identical to that previously described in connection with FIGS. 1-12 being of box-like design and having side web portion 14 joined to a top and bottom cover plate 16 and 17 respectively. Transverse separator plates 18 identical in dimension to the separator plates described in FIG. 2 with respect to the skeleton car design, and FIG. 8 with respect to the flat car design extend between the side web portions 14.

A channel shaped member 23 is mounted on the top marginal edge of the separator plate 13 to form a support to accommodate the sliding sill illustrated in phantom at 24 if the car is to be equipped with cushion draft gear. Angle member 80 described in connection with FIG. 13

is welded directly to the side web portion 14 and forms a guide for the solid section sliding ribbon sill 24.

The cross bearer assembly in the sectional view of FIG. 14 is indicated generally by the reference character 56 and bears like reference characters to the cross sectional view of FIG. 8 since all the components are identical. As previously noted in the discussion of FIG. 8, cross bearer assembly 56 includes vertical reinforcing plates 57 of generally trapezoidal configuration when viewed in elevation. A chamfered corner portion 58 is provided at the inner end of the plate 57 with the inner end 58 being in overlapping relation to the gusset plate 20.

Comparison of FIGS. 14 and 8 will bear out the fact that the overlap of the components in the high level car is somewhat less in the vertical direction due to the requirement of accommodating the increased vertical height of the side webs 14. In this connection, the shortened cross tie 62 is moved upwardly toward the top edge 59 of the vertical reinforcing plate 57 to compensate for the increase in vertical height without requiring a specially constructed cross tie. It is to be appreciated that requisite strength requirements will remain notwithstanding the noted adjustments and thus enable the parts to be fabricated for the high and low level designs and stock piled until such time it becomes desirable to assemble the desired size of skeleton or flat car to meet customer demands. If additional rigidity is desired in the area of the gusset plate 20, a diagonal brace 95 may be provided extending from the side web 14 diagonally towards the outer edge of the top cover plate 16 to prevent buckling in the central region of the gusset plate 20. If desired, the diagonal brace 95 may easily be formed from the material removed in forming the fishbelly contour on the side webs 14.

The transverse adjustments of the entire cross bearer assembly to form a flat car of increased width may be effected in the manner described in connection with FIG. 8. Accordingly, the high degree of flexibility available in the low level designs also exists in the high level car while permitting standardized components to be used in both.

It is contemplated that the recessed portions to accommodate fifth wheel stands will also be provided in the high level design at manufacturing. In this connection, a tractor pull up stand or other forms of fifth wheel stands may be disposed between the ribbon sill 24 as long as the total width does not exceed about 32 inches. The present sill construction permits the fifth wheel stand to be recessed between the vertical side webs 14 without interference with the cushioning arrangement should the car be so equipped. Ample axle clearance is available permitting vehicles to travel over the car without riser boards or the like.

Referring now to FIG. 15, a half section taken adjacent the bolster of a high level car is shown. The bolster assembly in the high level car is formed of the components illustrated in FIG. 9 for the low level design. The adjustability of the bolster construction described in connection with FIG. 9 permits compensation for the increased depth of the side webs 14 in the high level car. In the high level design of FIG. 15, the amount of overlap of the side plates 35 and 36 is somewhat less than illustrated in the bolster construction of skeleton car design illustrated in FIG. 3, and the flat car design of FIG. 9. The amount of overlap of the side plates 35 and 36 is sufficient however, to form a bolster construction of sufficient strength to meet the requirements of the car.

The remaining portion of the bolster assembly is formed of identical components to those described in connection with FIG. 9, and accordingly bears like reference characters to FIG. 9. If desired, the side plate 35 may be provided with a diagonal brace 95 of the form shown at 95 in FIG. 14 to resist any tendency for the plate to buckle under load.

FIGS. 16 and 17 illustrate representative cross sections through the deep section of the car taken adjacent a cross

bearer and cross tie respectively. The construction illustrated in FIGS. 16 and 17 is identical to that illustrated in FIGS. 11 and 12 and accordingly the respective components bear like reference characters. The single differentiating feature between FIG. 16 and 17 and FIGS. 11 and 12 is the increased dimension in vertical depth of the side web portions 14 found in the high level design. The separator plate 18 and sliding sill 24 (shown in phantom) are of the same configuration and dimension as described in connection with FIGS. 1-15 and 18. If the car is to be equipped with cushioned draft gear, the sliding sill 24 is positioned within the box-like center sill with the neutral axis in the line of draft to provide the maximum columnar strength for a given solid cross section. The usual longitudinal angles 90 are provided on the top of the sliding sill 24 to maintain it in the line of draft. The distance of the top of the separator plate from the rail represented by the letter *d* is approximately 31 inches while the deck height from the rail represented by the letter *h* is about 41 inches thus classifying the car as a high level car.

In the construction illustrated in FIGS. 14 through 17 suitable longitudinal container support means, fifth wheel stands or both may be positioned in the usual manner described in connection with the flat car illustrated in FIG. 7. Additionally, in the modifications of FIGS. 7-18, adjustable rub rails may be provided at the raised side portions for vehicles about 8 feet wide. It is contemplated that the rub rails would be of the removable variety to readily accommodate vehicles of greater width.

Obviously, other modifications may be made without departing from the inventive concepts embodied in the foregoing description. Accordingly, it is intended that any limitations imposed be within the spirit and scope of the appended claims.

We claim:

1. A railway car comprising, a pair of spaced wheel truck assemblies, a center sill having a central portion extending between said wheel truck assemblies, end portions on said center sill extending over and projecting beyond each of said wheel truck assemblies and being supported thereby, said center sill including a pair of spaced vertically extending side web portions, each of said side web portions having greater vertical depth intermediate said wheel truck assemblies than at the end portions thereof for accommodating increased shear forces in the central portion of said center sill, a series of longitudinally spaced transversely extending separator plate means joining said spaced side web portions for providing transversely rigidity thereto, a bottom cover plate of greater transverse width than the spacing between said side web portions extending outwardly beyond the lower edges of each of said side web portions, means joining said bottom cover plate to said side web portions in the region of said wheel truck assemblies, said separator plates being joined to said bottom cover plate and extending upwardly therefrom terminating short of a top edge of said side webs, a top cover plate of greater transverse dimensions than said spacing between said side web portions, said top cover plate extending across the top edges of said side web portions and being joined thereto to define a pair of outwardly projecting top flanges, a plurality of gusset plate means joined to said side web portions to lend transverse rigidity thereto, said gusset plate means being transversely in line with said separator plate means, and a pair of bolster assemblies above each of said wheel truck assemblies said bolster assemblies each including two pair of longitudinally spaced side plate means, said side plate means each including a plurality of plate means connected in selective vertical spaced relationship, said plurality of plate means each being fixed to a respective one of said side webs and of which at least one of said plate means is fixed to said outwardly projecting flanges of said top cover plate, and

a bottom closure plate fixed across the bottom edges of another of said plurality of plate means and to said bottom cover plate.

2. The railway car of claim 1 wherein said gusset plate means at said side web portions intermediate said wheels are substantially equal to the vertical depth of said side webs and are joined to said top and bottom cover plates for vertical load supporting relationship therewith, said gusset plate means being of sufficient vertical depth to provide surfaces to which a planar surface of a cross-tie member may be secured at selective heights between the upper and lower edges thereof.

3. A railway car including a box-like center sill having a pair of spaced congruent side web portions of greater vertical depth in the central portion than at the ends, a plurality of separator plates extending transversely of said side webs and being joined thereto, a bottom cover plate of greater transverse dimension than the spacing between said side web portions being joined to said side web portions at the lower edges thereof, a top cover plate of greater transverse width than said bottom cover plate joining the upper edges of said side web portions, a plurality of gusset plates joined outwardly of each of said side web portions, said gusset plates being substantially in transverse alignment with said separator plates and extending between said top cover plate and said bottom cover plate, a plurality of cross ties having a substantially horizontal log with an inner portion thereof overlapping and fixed to said gusset plates adjacent to said top cover plate in the central portion of said side webs, means extending longitudinally between said cross ties for supporting a side floor sheet having the inner marginal edge thereof in overlapping relationship with said top cover plate, brace means fixed at one end to an associated one of said cross ties and extending from the outer end thereof diagonally toward a lower end portion of an associated gusset plate and fixed thereto to form a truss type cross bearer, and a pair of vertically adjustable bolster assemblies on each of said side web portions, each of said adjustable bolster assemblies including first upper and lower side plate means in vertical overlapping relation, second upper and lower side plate means longitudinally spaced from the first said side plate means and being in vertical overlapping relation, each of said upper side plate means being joined to said side web portion and said top cover plate, said lower side plate means being joined to the associated upper side plate means and said side web portion and a longitudinal extending bottom closure plate joined to said bottom cover plate and the lower edges of each of said lower side plate means.

4. The railway car of claim 3 wherein said top cover plate is provided with a pair of longitudinally spaced recesses to accommodate a collapsible fifth wheel support stand, each of said recesses being of lesser transverse dimension than the spacing between said side web portions.

5. A railway car comprising in combination a center sill having shallow end portions joined by a central section of increased vertical depth, said center sill including a pair of congruent side web portions having longitudinally continuous upper edges, a plurality of transversely extending separator plates joined at opposite ends to said side web portions thereby to maintain said side webs in spaced relation to each other, a bottom cover plate joined to said side web portions and said separator plates, a top cover plate of greater transverse dimension said said bottom cover plate joining said longitudinally continuous edges of said side web portions, a plurality of gusset plates joined to said side web portions outwardly of said separator plates, an upper edge of each of said gusset plates being joined to said top cover plate, a plurality of cross tie members projecting substantially horizontally outwardly of said gusset plates, each of said cross ties having the outer end thereof turned upwardly, a longitudinally extending side sill mounted on said upwardly

turned portion of said cross ties, a longitudinal side floor sheet extending between and fixed to said top cover plate and said side sill, brace means fixed at one end to an outer portion of said cross ties and fixed at its other end to a lower portion of an associated one of said gusset plates and an outwardly extending vertically adjustable bolster assembly provided on each of said shallow end portions on each of said side web portions, each of said adjustable bolster assemblies including first upper and lower side plate members in vertical overlapping relationship, second upper and lower side plate members longitudinally spaced from first side plate members and being joined in vertical overlapping relation, each of said upper side plates being joined to said side web portions at the inner ends thereof, and further being joined to said top cover plate along a portion of the top marginal edge, said lower side plates being joined to the associated upper side plate members and said side web portion and a longitudinally extending bottom closure plate joined to said bottom cover plate and the lower edges of each of said lower side plate members.

6. The railway car of claim 5 wherein said brace means in the shallow section of said center sill includes a vertical reinforcing plate joined at its lower edge to a longitudinal plate to form an inverted T shaped brace, the vertical reinforcing plate being joined in overlapping relation at its outer end to said cross tie and its inner end to said gusset plate, and said longitudinal plate being joined in overlapping load supporting relationship to said bottom cover plate.

7. The railway car of claim 5 wherein said brace means in the central section of the center sill includes a diagonal brace joined at its outer end to the upstanding turned portion of said cross tie and joined at its inner end in overlapping relation to the gusset plate associated with said cross tie for supporting loads outwardly of said center sill.

8. The railway car of claim 5 wherein said top cover plate is provided with a pair of spaced recesses to accommodate a collapsible fifth wheel support stand, each of said recesses being of lesser transverse dimension than the spacing between said side web portions, and a plate forming the bottom of said recess, said plate being supported by said separator plates.

9. In a railway car having a pair of spaced wheel trucks, the provision of a center sill construction mounted on said wheel truck, said center sill having a pair of longitudinally extending substantially congruent transversely spaced upstanding side web portions, a bottom cover plate joined to each of said side web portions along the lower marginal edges thereof, said bottom cover plate being of greater transverse dimensions than the spacing of said side web portions so as to project outwardly therefrom, a top cover plate joining the upper marginal edges of said side web portions, said top cover plate being of greater transverse width than the spacing between said side web portions so as to project outwardly therefrom to provide a pair of longitudinally extending laterally projecting top flanges, a plurality of longitudinal spaced transversely extending separator plate means mounted between said side web portions for rigidifying said web portions internally of said center sill, a plurality of longitudinally spaced, outwardly projecting gusset plate means joined to each of said side web portions outwardly thereof, said separator plate means and said gusset plate means rigidifying said center sill at longitudinally spaced intervals and said gusset plate means extending between said top and bottom flanges so as to be adapted to mount load supporting members at various levels outwardly of said gusset means for transferring loads outwardly of said side web portions to said center sill, and a pair of bolster assemblies above each of said wheel truck assemblies said bolster assemblies each including two pair of longitudinally spaced side plate means, said side plate means each

including a plurality of plate means connected in selective vertical spaced relationship, said plurality of plate means each being fixed to a respective one of said side webs and of which at least one of said plate means is fixed to said outwardly projecting flanges of said top cover plate, and a bottom closure plate fixed across the bottom edges of another of said plurality of plate means and to said bottom cover plate.

10. A railway car comprising a pair of spaced wheel truck assemblies, a box-like center sill supported on said wheel truck assemblies, said center sill including a pair of spaced vertically extending substantially congruent side web portions, a bottom cover plate of greater transverse width than said spacing between said side web portions and being joined thereto and projecting therebeyond between said spaced wheel truck assemblies to define a lower flange, said side web portions and said bottom cover plate defining an upwardly opening elongated channel, a plurality of longitudinally spaced, transversely extending separator plates received in said channel and being joined at the associated marginal edges thereof with said side web portions and said bottom cover plate, a top cover plate of greater transverse width than the spacing of said side web portions closing off the top of said channel, said top cover plate being joined to said side web portions and projecting outwardly therefrom to define an upper flange, gusset plate means attached to said flanges and said side web portions and projecting outwardly therefrom, said gusset plate means being substantially transversely in line with said separator plates and being adapted to accommodate the load of lading carried by said car and a pair of bolster assemblies above each

of said wheel truck assemblies, each bolster assembly including first upper and lower side plates in vertical overlapping relation, second upper and lower side plates longitudinally spaced from the first side plates and being in vertical overlapping relation, each of said upper side plates being joined to said side web portion and said top cover plate, said lower side plates being joined to the associated upper side plate and said side web portions, and a longitudinally extending bottom closure plate joined to said bottom cover plate at its inner end and projecting outwardly into joining engagement with the lower marginal edges of each of said lower side plates.

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