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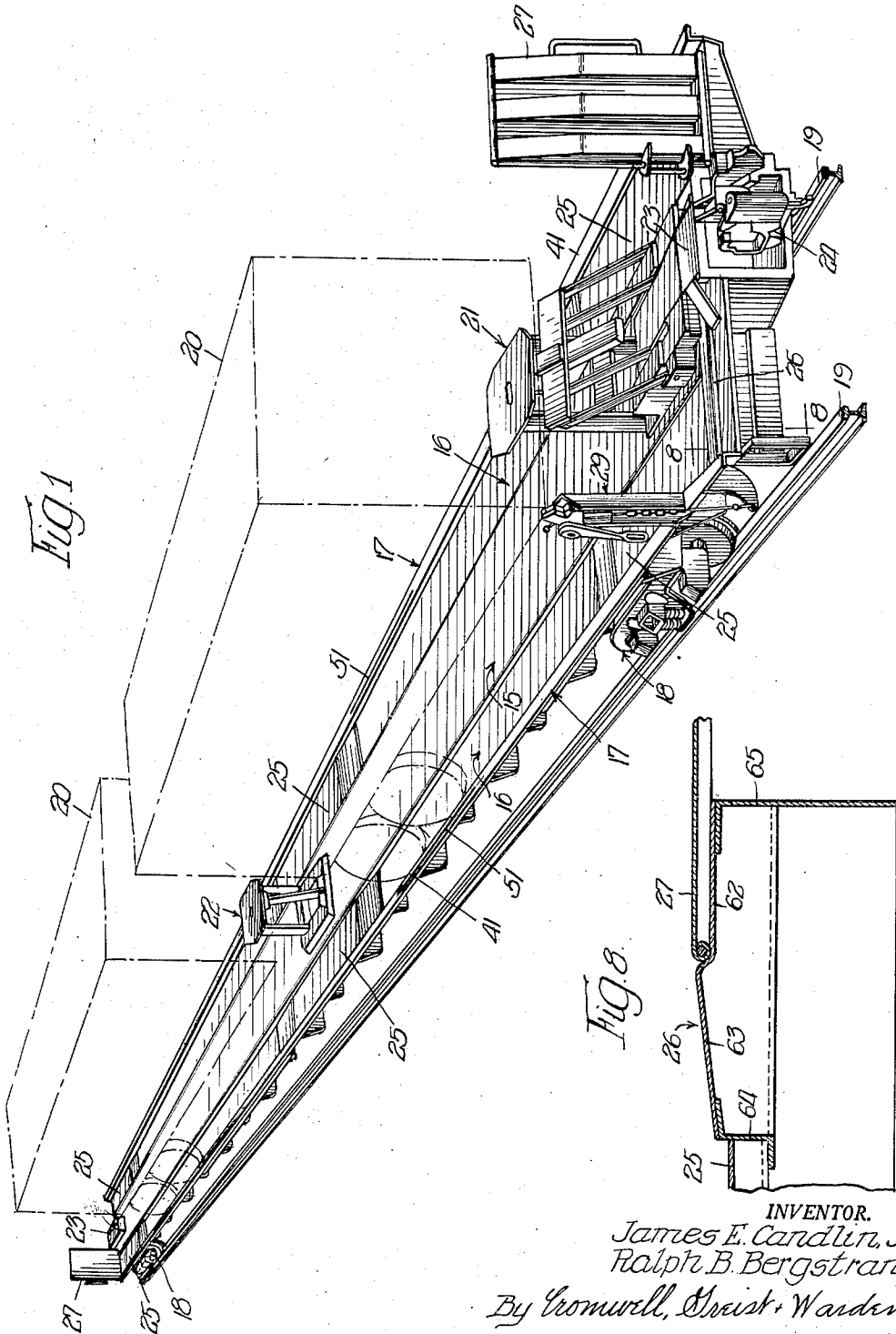
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3,102,497

FLAT CAR FOR RAILWAY FREIGHT UNIT LOADING

Filed Sept. 12, 1960

7 Sheets-Sheet 1



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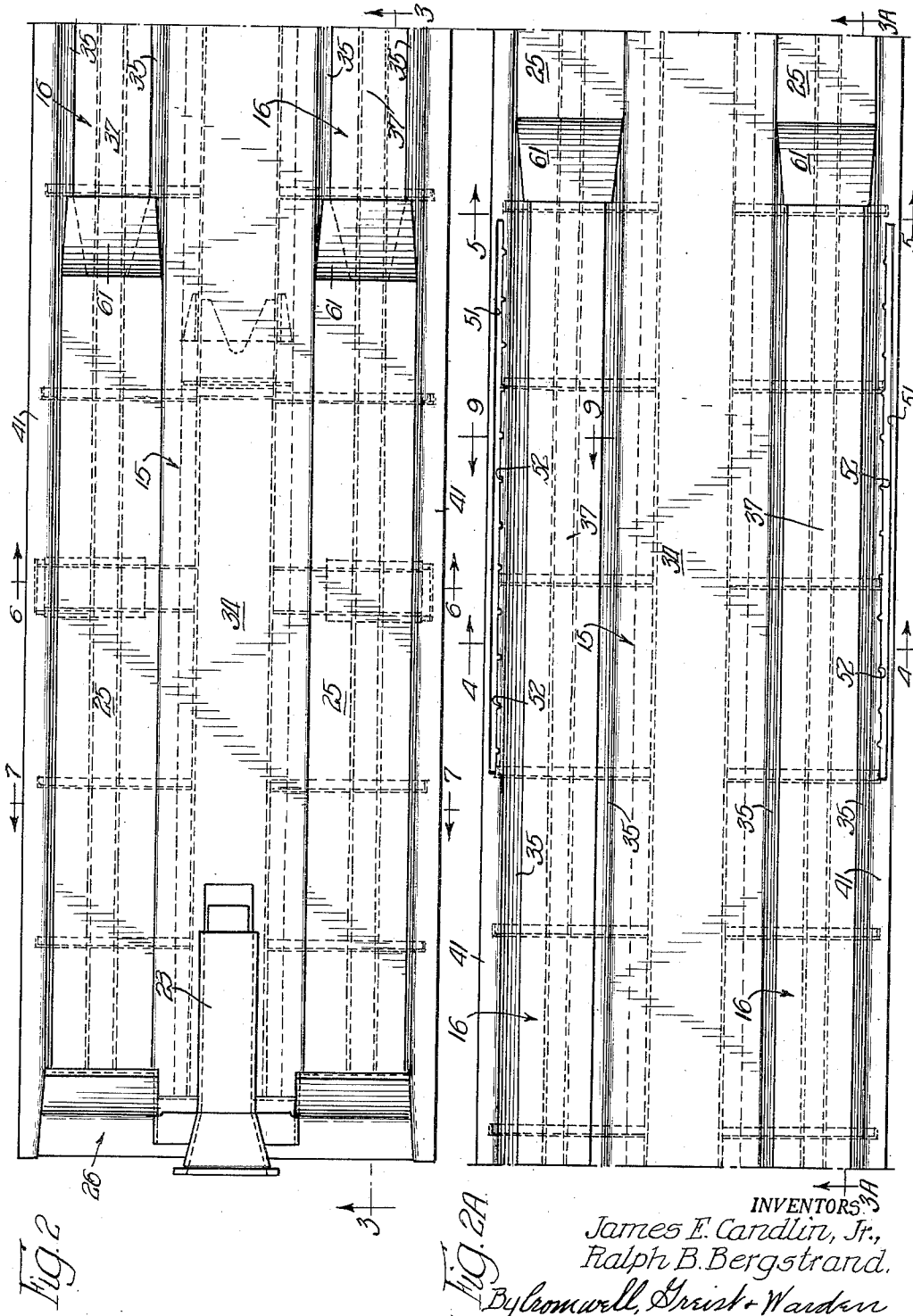
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FLAT CAR FOR RAILWAY FREIGHT UNIT LOADING

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7 Sheets-Sheet 2



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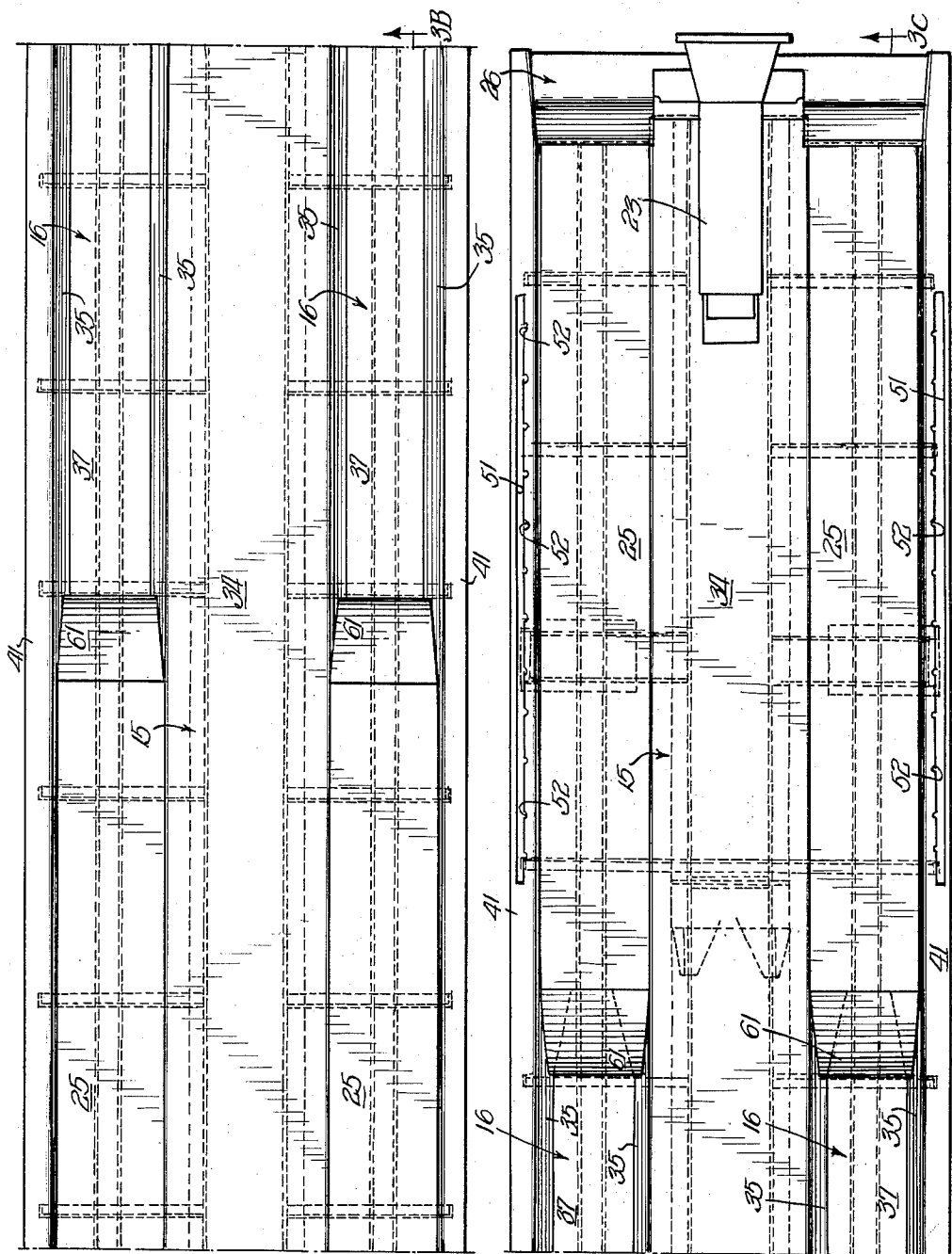


Fig. 2B

Fig. 2c.

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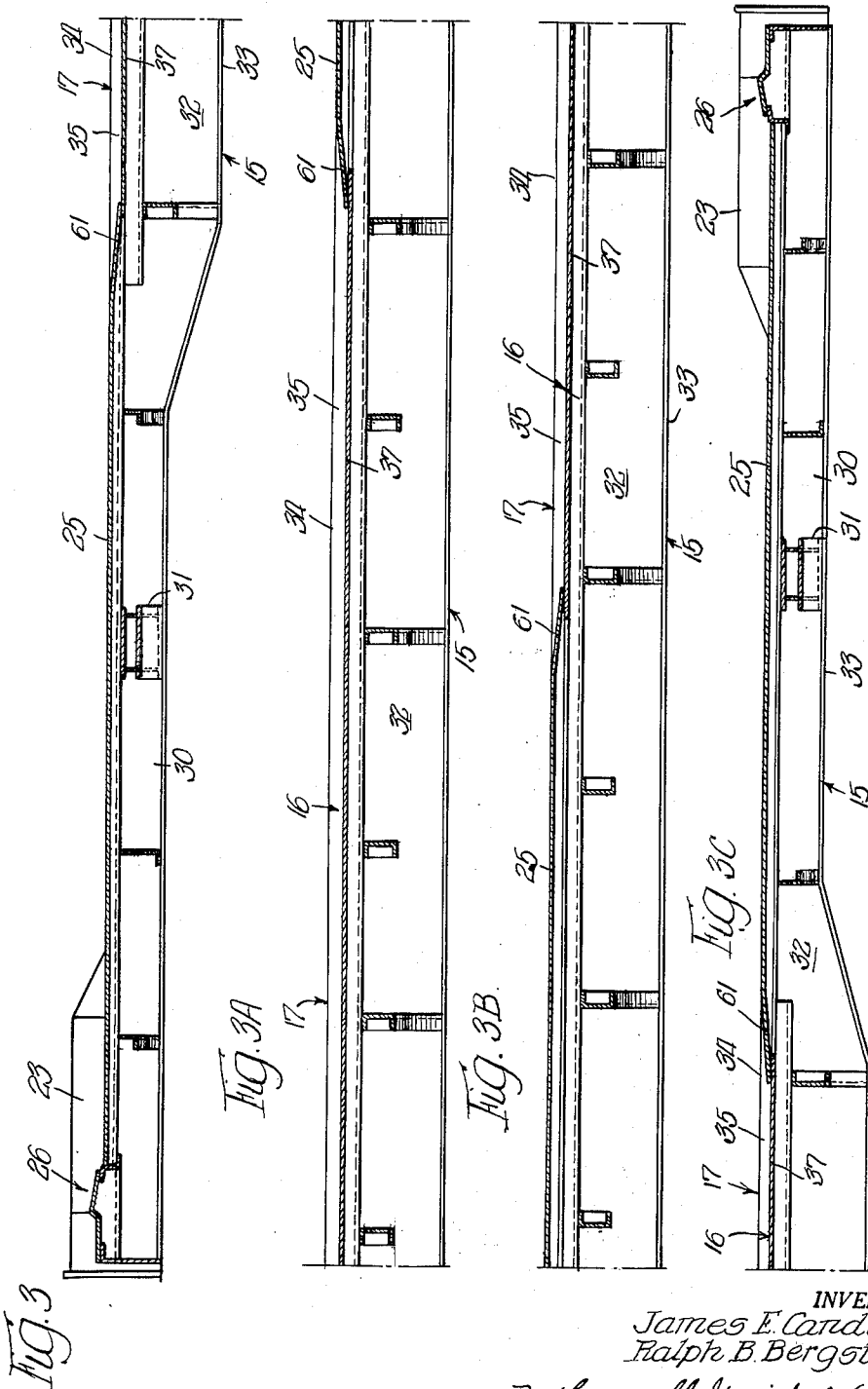
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7 Sheets-Sheet 4



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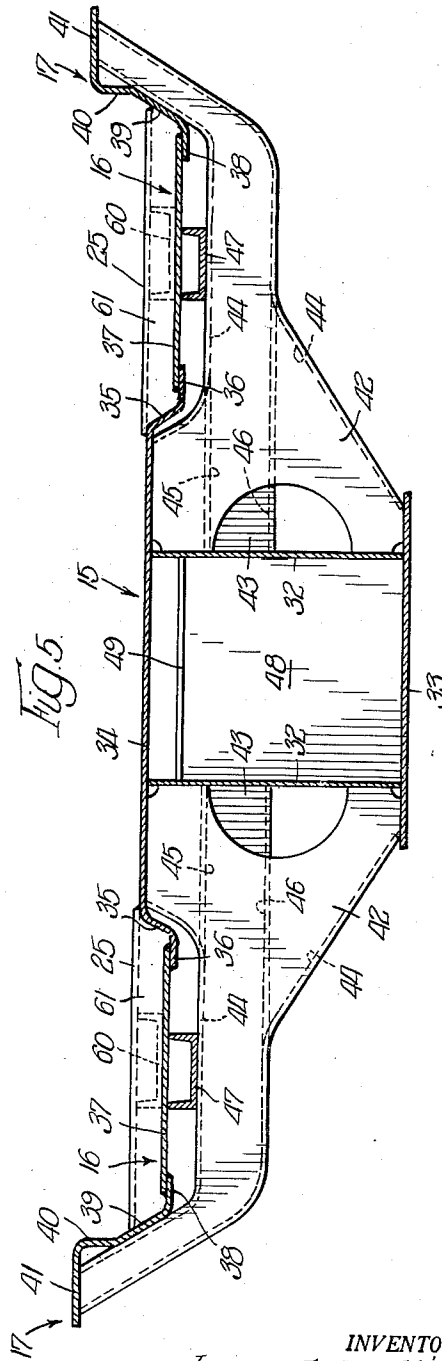
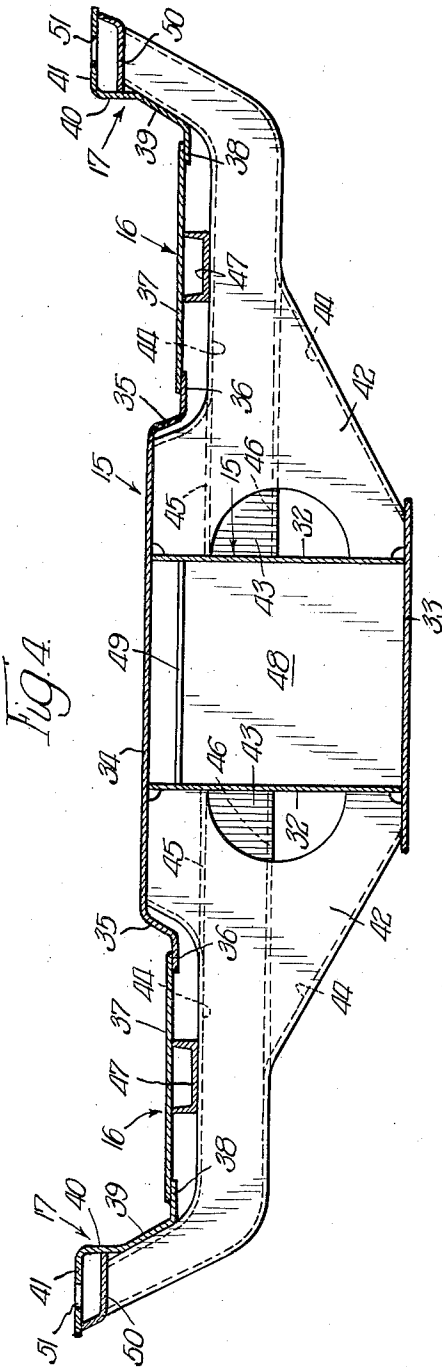
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7 Sheets-Sheet 5



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FLAT CAR FOR RAILWAY FREIGHT UNIT LOADING

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7 Sheets-Sheet 6

Fig. 6

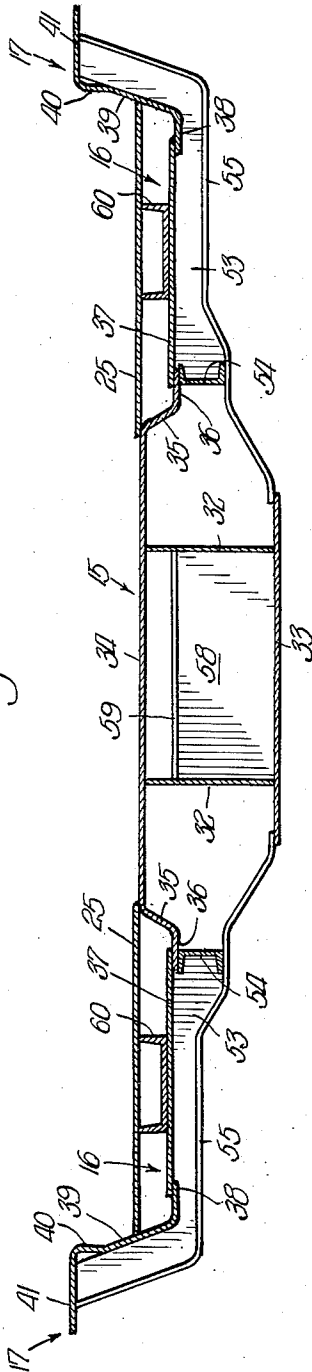
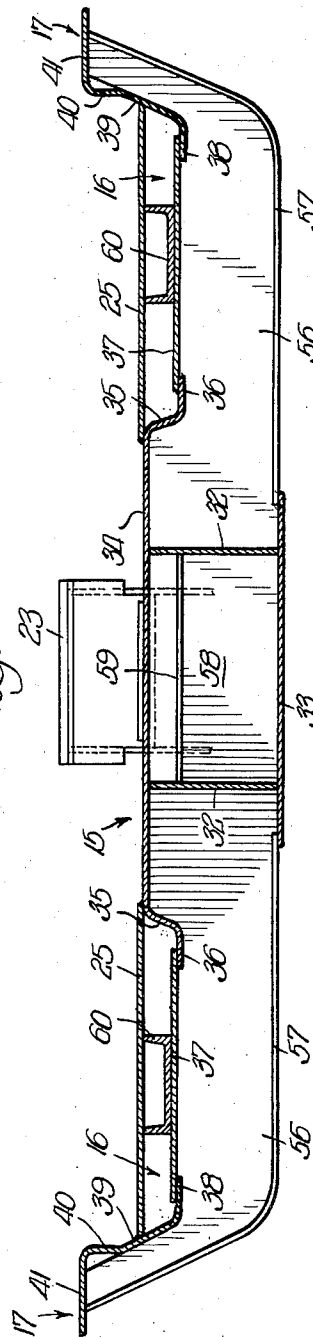


Fig. 7



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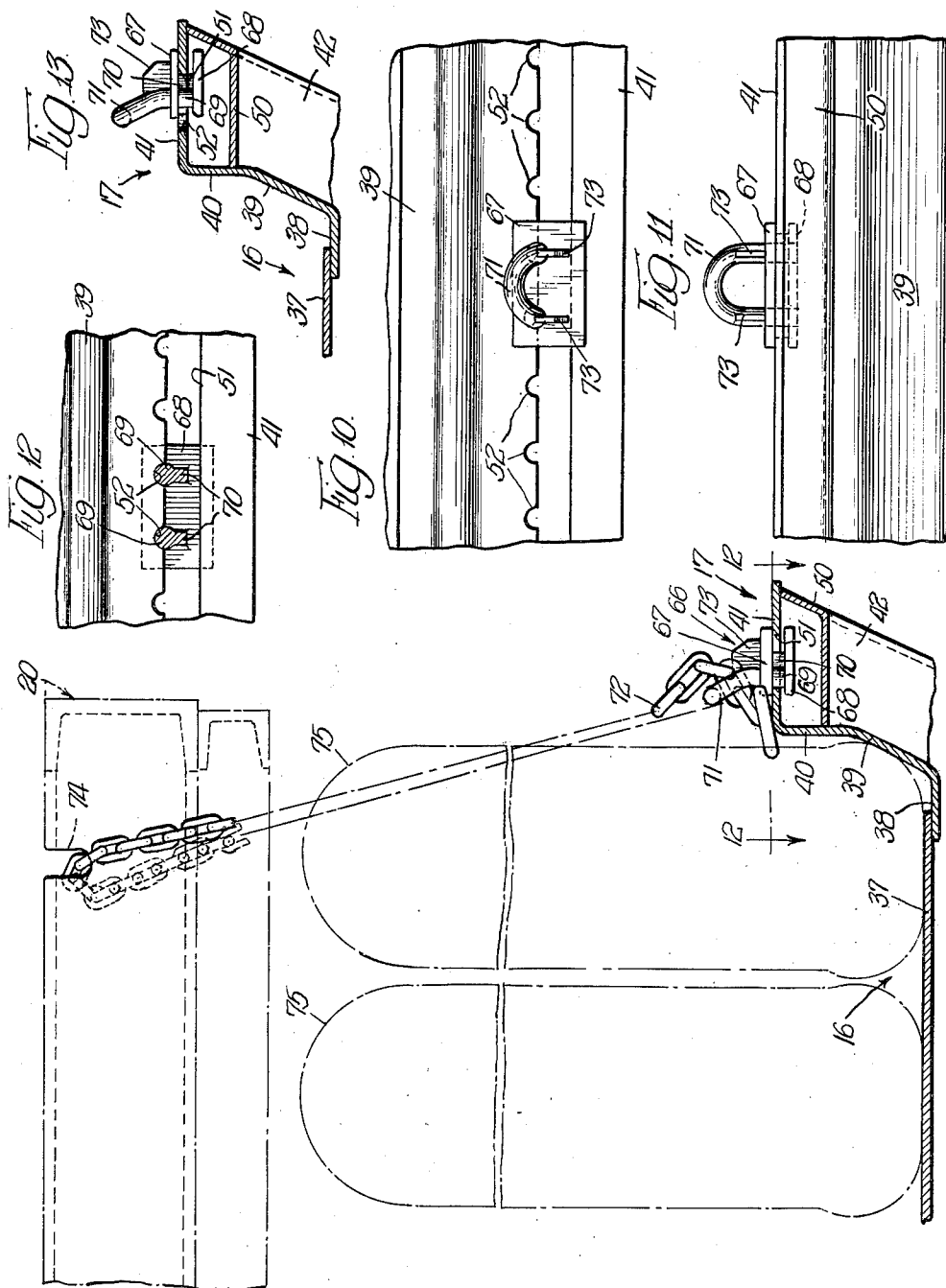
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FLAT CAR FOR RAILWAY FREIGHT UNIT LOADING

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7 Sheets-Sheet 7



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FLAT CAR FOR RAILWAY FREIGHT UNIT LOADING

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Filed Sept. 12, 1960, Ser. No. 55,560
9 Claims. (Cl. 105—368)

The present invention relates to a new and improved railway car adapted for freight unit piggyback operation. More specifically, the invention is directed to a new and improved railway car construction and freight unit attachment arrangement for railway cars, the railway car construction being of new and improved design and incorporating special features particularly adapting the same for use in piggyback operation with wheel supported trailer-type freight units.

Long distance hauling of truck trailers by railroads has been practiced to a substantial extent. Improvements in truck trailer design and nationwide highway systems has resulted in a substantially steady increase in overall trailer length and, in certain instances, trailer height. Conventional flat cars designed for piggyback operation are in danger of being obsoleted due to operational restrictions imposed by changing truck trailer designs. By way of example, conventional flat cars initially designed to transport two truck trailers of specified lengths and heights are incapable of accommodating a pair of trailers of greater length and/or height not only due to the lack of adequate overall length of the flat car but also due to the height of the flat car which with added trailer height prevents transportation of the larger trailers through existing tunnels and other overhead structures of fixed clearance. The cost of operating a piggyback flat car between two given points remains fixed regardless of the amount of freight carried by the car. Accordingly, flat cars of conventional length cannot be economically operated if they are capable of only carrying a single new trailer of greater length.

Conventional flat cars used in piggyback operation have been designed and fabricated in conjunction with the use of the parallel beam principle. This principle entails the use of three parallel beams the center beam carrying the couplers, wheel trucks, etc., and the outer side beams being laterally tied in with the center beam. Standard terminology identifies the center beam as the center sill and the outer side beams as the side sills. Where parallel beams are used, the stress in each is in proportion to the depth. Thus if the center sill is 30 inches deep and the side sills are 10 inches deep, the side sills will be stressed to the extent of $\frac{1}{3}$ of the stress of the center sill. To increase car strength it is common to increase the depth of the side sills. By way of example, most flat cars for general service have side sills which are 26 inches deep so that the stress is about $\frac{7}{8}$ of that of the center sill. With this principle of design each beam functions basically as a separate beam insofar as load bearing properties are concerned, the individual beams being tied together so that when a load is applied to the center sill only, a portion of the load will be transmitted to the side sills and vice versa, causing each of the parallel beams to deflect to substantially the same extent.

If the parallel beam principle would be used in designing and constructing piggyback flat cars of increased length to accommodate a pair of truck trailers of increased length, and bearing in mind that the overall load would also be increased, it would be necessary to increase the depth of the various parallel beams, particularly the side sills, to accommodate the additional stresses expected and to maintain deflection within safe operational

2

limits. This design practice would result in a substantial increase in car cost and car weight to an extent that might well be considered impractical. Furthermore, added depth in the parallel beams would restrict reduction in car height to an extent that operation would still be limited to exclude areas of tunnels or overhead structures of fixed inadequate clearances.

It is an object of the present invention to provide a new and improved railway car of general freight unit hauling utilization, the car being of low height and long length construction particularly adapting the same for piggyback operation.

A further object is to provide a new and improved railway car adapted for use in piggyback operation, the car being of generally low sided, open deck construction and incorporating features of design providing for new and improved efficiencies in longitudinal loading of wheel supported trailer-type units.

Another object is to provide a railway car adapted for use in piggyback operation, the car being of low height and long length single beam construction, the construction involving the utilization of a box section central beam structure having a top chord structure which forms the entire floor or deck portion and side sills.

Still a further object is to provide a new and improved railway car particularly adapted for truck trailer hauling, the car including a low sided deck portion which includes means for efficient truck and trailer wheel guiding and alignment during loading and unloading of the car.

A further object is to provide new and improved freight unit attachment means of a design particularly adapting the same for incorporation in a railway car, particularly the new and improved railway car of the present invention.

Other objects not specifically set forth will become apparent from the following detailed description of the present invention made in conjunction with the accompanying drawings wherein:

FIG. 1 is a perspective of the new and improved railway car of the present invention illustrating in phantom thereon a pair of truck trailers mounted for transporting;

FIGS. 2 through 2C cooperatively illustrate in plan view the railway car of FIG. 1 with the fifth wheel stands, bridging end plates, coupler unit and hand brake unit removed therefrom;

FIGS. 3 through 3C illustrate the basic car body design in longitudinal section taken generally along lines 3—3, 3A—3A, 3B—3B and 3C—3C respectively in FIGS. 2 through 2C;

FIG. 4 illustrates in transverse section a portion of the car taken generally along line 4—4 in FIG. 2A;

FIG. 5 illustrates another portion of the car in transverse section taken generally along line 5—5 in FIG. 2A;

FIG. 6 illustrates still another portion of the car in transverse section taken generally along line 6—6 in FIG. 2;

FIG. 7 illustrates another portion of the car in transverse section taken generally along line 7—7 in FIG. 2;

FIG. 8 is an enlarged fragmentary section of the threshold portion of the car as viewed generally along line 8—8 in FIG. 1, this view further illustrating in fragmentary section operative association of a bridging plate of an adjacent car therewith;

FIG. 9 is a fragmentary transverse section of a portion of the side sill structure of the car taken generally along line 9—9 in FIG. 2A and illustrating a freight unit attachment arrangement forming a part of the present invention, this view further including an illustration in phantom of a portion of a wheel supported trailer;

FIG. 10 is a fragmentary top plan view of the attachment arrangement of FIG. 9;

3

FIG. 11 is a fragmentary side elevation of the attachment arrangement of FIG. 9;

FIG. 12 is a fragmentary section of the attachment arrangement of FIG. 9 taken generally along line 12—12 therein; and

FIG. 13 is a view similar to FIG. 9 illustrating operative use of chain anchor means forming a part of the attachment arrangement.

An embodiment of the long, low railway flat car of the present invention is illustrated in FIG. 1. This car is of single beam construction as will be more fully described and generally includes a main center beam portion or center sill area 15 interconnected through transversely directed deck plate portions defining wheel well or track areas 16 on each side of the center sill area to raised side sill rim structures 17. Wheel truck units 18 including wheels of small diameter are suitably connected to opposite end portions of the car body to support the same on rails 19. The wheel trucks 18 are of known design and do not form a part of the present invention.

The general arrangement described and illustrated in FIG. 1 establishes the car as being of low sided, open deck construction with the deck being formed with longitudinally extending, recessed wheel track areas 16 located inwardly of the side rims 17 thereof to guide and maintain longitudinal alignment of a wheel supported, trailer-type unit on the car. In this regard FIG. 1 illustrates in phantom a pair of trailer units 20 which are wheel supported at their rear ends with the wheel assemblies being received and guide in the track areas 16. The front end of each trailer 20 is supported and suitably attached through the king pin thereof on fifth wheel stands 21 and 22. These stands may be of any suitable type adapted for mounting on the top surface of the center sill portion 15 of the car and designed for collapsing into a flattened position (not shown) thereon to permit operation of a trailer and tractor thereover along the railway car during loading and unloading thereof. The fifth wheel stands 21 and 22 do not form a part of the present invention except with regard to their general use and location on the car, it being understood that any suitable fifth wheel stand construction may be utilized.

Each end of the car includes a centrally located, raised coupler housing 23 mounting a known type of railway car coupling unit 24 therein. The coupler housings 23 form a part of the center sill structure 15 and are raised above the top surface thereof to place the coupler units 24 at a conventional and standard coupling height for proper co-action with coupling units of railway cars of existing design. In this regard, the coupler housings 23 constitute raised portions over which the truck and trailer units must move during loading and unloading of the railway car. The fifth wheel stand 21 is designed to straddle the coupler housing 23 with which it is associated and in the flattened inoperative position of the fifth wheel stand 21, the height of the same is controlled to be at the most not substantially greater than the height of the associated coupler housing 23. Similarly, the fifth wheel stand 22 is designed for collapsing into its inoperative position to assume a height which also is at the most not substantially greater than the height of the coupler housings 23. In order to assure proper tractor and trailer axle unit clearance over the aligned heights of the coupler housings 23 and fifth wheel stands 21 and 22, raised deck plate members 25 span the wheel track areas 16 at opposite ends thereof on both sides of the center sill 15 co-extensive with the coupler housings 23 and the fifth wheel stand 21, and generally centrally of the car longitudinally co-extensive with the center fifth wheel stand 22. The raised deck plate members 25 are provided with sloped approach portions and function to raise the axle units of tractors and trailers to a sufficient height while the same are passing over the coupler housings 23 and collapsed fifth wheel stands 21 and 22 for adequate clearance therebetween.

The ends of the railway car include raised, transverse

4

threshold plate structures 26 which accommodate pivotally mounted bridging plates 27 mounted at opposite ends of the railway car. The bridging plates 27 are of conventional design and include a locking mechanism 28 holding the same in upright, inoperative position during operation of the railway car. Each car carries a pair of bridging plates 27 mounted at opposite ends thereof in association with alternate wheel track areas 16. The threshold plates 26 are designed to accommodate a bridging plate 27 of another coupled flat car of similar design during loading and unloading of a series of flat cars in the known manner. The loading and unloading procedure generally involves the end-to-end alignment of a series of railway flat cars of the type illustrated with the bridging plates 27 thereof being lowered to provide interconnection of the wheel track areas 16 of adjacent cars. Tractor units are operated back and forth on the interconnected cars to drop off or pick up trailers thereon. The trailers may be generally classified as freight units it being understood that the railway car of the present invention is also readily adapted to accommodate freight containers which are not wheel supported. Other suitable railway car equipment such as a hand brake unit 29 may be suitably mounted on the car, it being understood that the railway car is provided with standard equipment including a suitable brake system and the like which is not shown and which does not constitute a part of the present invention.

FIGS. 2 through 2C, 3 through 3C and 4 through 7 illustrate in detail the various basic structural features of the unique railway car of the present invention. The basic concept of design incorporated and enlarged upon in the railway car of the present invention is disclosed in our co-pending application Serial No. 36,439, filed June 15, 1960 of which the present application is a continuation-in-part. While considering these basic design features to be described in detail, it should be borne in mind that the car may be constructed with a trailer wheel supporting deck height of only 31 inches above the rail. By comparison, the railway car of the present invention is approximately one foot lower than the present standard flat car used in piggyback service. Within this dimensional concept, overhead clearance restrictions encountered with standard 12½ foot high trailers on present piggyback flat cars are removed. Thus a basic clearance problem involved in the piggybacking of new automobiles is eliminated. Furthermore, the railway car of the present invention is adapted to meet the future problem of handling 13½ foot high trailers bearing in mind that it has been estimated that during a recent period, 18% of the van-type trailers constructed were 13½ feet in height.

In addition to the lower height aspect of the new car design, the basic concept of structural design involving the use of a single beam construction permits a substantial savings in weight with full regard for necessary structural strength and center of gravity considerations. The railway car of the present invention may be constructed with an empty weight which is at least about 30% below that of present standard 85 foot cars. The rated capacity of a car of the design of the present invention can be on the order of 130,000 lbs. thus permitting the handling of two trailers of any type and gross weight of 60,000 lbs. each, or a single trailer of 73,000 lbs. gross weight. The overall length of the railway car may be on the order of 88 feet due to the advantages of the basic design features involved in single beam construction. This constitutes an added length as distinguished from standard 85 foot cars while maintaining car deflection within safe limits.

As best illustrated in FIGS. 3 through 3C, the center sill or main center beam portion 15 is of fish belly configuration having shallow opposite end portions 30 (FIGS. 3 and 3C) carrying wheel truck attachment bolster means 31. The wheel trucks 18 of FIG. 1 are mounted under the shallow end portions 30 of the center beam portion in any suitable manner. To aid in the establishment of low height between rail and deck, the wheels of the trucks 18 are of smaller diameter such as on the order of 28 inches.

5

The main center portion of the center sill 15 between the shallow end portions 30 is of substantial length and of increased depth for overall car strength. The deep center sill portion as best shown in FIGS. 4 and 5 is formed from vertical side plates 32 suitably secured to a bottom cover plate 33 the side marginal portions of which project outwardly beyond the side plates 32. The top edges of the side plates 32 are suitably interconnected by a top cover plate 34 which constitutes a deck plate and defines a raised top surface of the center sill construction. The side margins of the top plate 34 extend substantially outwardly beyond the center sill side plates 32 with their outermost marginal portions being offset downwardly to define inclined or outwardly sloping wheel track side walls 35 terminating in radially outwardly directed track plate supporting flanges 36. The side wall portions 35 are inclined in the manner illustrated to provide rub rails for the tires of a trailer and tractor during movement of the units longitudinally of the car.

The center portion of each wheel track area 16 is defined by a longitudinally extending deck or track plate 37 which along its inner margin overlaps the adjacent radial flange portion 36 of the center sill top plate 34 and is suitably attached thereto. The outer margin of each wheel track plate 37 overlaps a radially inwardly directed flange portion 38 forming a part of the side sill rim or low side sill wall structure 17. This structure includes a longitudinally extending outer side wall member having an outwardly and upwardly inclined rub rail portion 39 joined with a vertically directed portion 40 which terminates in a radially outwardly directed flange portion 41. The inclined side wall portion 39 functions as the outer rub rail relative to the inner rub rail portion 35 which therebetween define the recessed wheel track area 16 on each side of the center sill 15.

The basic car structure in the areas illustrated in FIGS. 4 and 5 is completed by the provision of rib-like, laterally extending cross bearers 42 and alternately spaced rib-like and transversely extending cross ties 43. The cross bearers 42 are positioned on opposite sides of the center sill 15 and extend from attachment with the outer surfaces of the side plates 32 outwardly below the wheel track areas 16 curving upwardly along the outer surface of the side sill structures 17 and into reinforcing attachment therewith. Each cross bearer 42 is preferably formed from one-piece metal pressings having top and bottom edge flanges 44. The inner portions of each cross bearer project upwardly along the center sill side plate 32 to which it is attached into attachment with the bottom surface of the laterally projecting flat portion of the top cover plate 34 of the center sill. The inner bottom portion of the cross bearer slants downwardly into engagement with the upper surface of the adjacent projecting side margin of the center sill bottom cover plate 33 to completely tie in the center sill structure with the laterally projecting deck plate portion including a wheel track area 16 and side sill rim structure 17. The alternate cross ties 43 are provided with top and bottom margin reinforcing flanges 45 and 46, respectively, and extend directly from innermost edge attachment with a center sill side plate 32 below the associated wheel track area 16 and in cross bearer coinciding relation about the outer surface of the side sill rim portion 17 and in attachment therewith.

The top edges of the cross bearers 42 and cross ties 43 below the wheel track areas 16 are longitudinally aligned and support thereon a longitudinally extending floor stringer 47 which, as illustrated, is in the form of an upwardly opening channel beam. Each floor stringer 47 is suitably attached to the supporting cross bearers and cross ties and is located centrally of a wheel track deck plate 37 to reinforce the same for vertical load support. Lateral tie-in between the main reinforcing cross bearers 42 of the car structure is obtained by the provision of transversely extending center sill separator plates 48 suitably attached between the center sill side plates 32 and

6

extending upwardly from the center sill bottom cover plate 33 to any desired height. The top edge of each separator plate 48 may be provided with a flange 49 for rigidifying purposes. The separator plates 48 may be used in any desired interval longitudinally of the center sill structure 15 but it has been found that the provision of these plates extending between transversely aligned cross bearers 42 is adequate for car strength purposes.

In comparing the views of FIGS. 4 and 5, it will be noted that the cross bearers 42 and cross ties 43 of the car in the section of FIG. 5 extend upwardly at their outer ends into direct attachment with the undersurface of each side sill flange or rim 41. Basically as shown in FIGS. 1 and 5-7, the side sill structures 17 include the single thickness, longitudinally continuous and radially outwardly directed flange or rim 41. However, certain areas of the side sill structure 17 are formed with internally hollow, box-like sections by the attachment of an angle plate 50 (see FIG. 4) to the outer surface of the vertical wall portion 40 and the undersurface of the radial flange portion 41 near the outer edge thereof. Where the box-like sections occur, the outer uppermost edges of the cross bearers 42 and cross ties 43 are suitably connected to the undersurface of the angle member 50. Throughout the longitudinal box-section areas of the side sills 17, the radial flange portion 41 is provided with a longitudinally extending slot 51 best shown in FIGS. 2A, 2C and 4. The extent of the slots 51 in FIGS. 2A and 2C indicate the extent of the box-like sections formed by the angle members 50. The innermost edge of each slot 51 as shown in FIGS. 2A and 2C are provided with a plurality of longitudinally spaced, groove-like recesses 52 for use with chain anchor means of the type to be described. The hollow box-like rim portions of the side sill structures 17 define storage areas for freight unit attachment means such as chains and the like.

FIGS. 6 and 7 illustrate various structural features of the end portions of the car body which are of reduced depth. FIG. 6 is a sectional view taken transversely of the car body in the area of wheel truck attachment. The center sill construction remains basically the same except that it is of reduced depth. In this regard the side plates 32 are of less vertical height while the bottom cover plate 33 and the top cover plate or deck plate 34 remain the same width and the same configuration. As illustrated, the top cover plate 34 along its marginal portions defines the inner side wall rub rails 35 terminating in the wheel track deck plate supporting flanges 36 and supporting the inner margins of the wheel track deck plates 37. The outer margins of the plates 37 are attached to the side sill structures 17 including the inner bottom flanges 38, inclined side wall portions 39, vertical side wall portions 40 and radially outwardly directed top flange or rim 41. In place of the cross bearers 42 and cross ties 43, special pressings 53 extend radially outwardly from attachment with the side plates 32, bottom plate 33 and top plate 34 under the wheel track deck plate 37 and up and around the side sill portions into attachment with the undersurface of each side sill rim 41. The pressings 53 are specially designed to accommodate wheel truck attachment and longitudinally directed channel beam stringers 54 are provided to reinforce the wheel truck bolster attachment area. The pressings 53 are provided with an outer edge flange 55 for strengthening thereof.

FIG. 7 illustrates the use of a slightly different form of special pressing 56 based on the cross tie design. This pressing is attached in the same manner as described in conjunction with the pressing 53 of FIG. 6 but is of slightly greater area to reinforce the car structure toward a coupler supporting end thereof between the end and the wheel truck mounting area. The pressings 56 are provided with outer edge continuous flanges 57 and extend from attached relation with the center sill side plates 32 below and across the wheel track areas 16 and upwardly and around the outer surface areas of the side sill structures 17 in reinforcing and supporting relation thereto.

7

The interior of the center sill portions illustrated in FIGS. 6 and 7 may also be provided with separator plates 53 of reduced area and being provided with a strengthening flange 59 along the top edge thereof. These plates function in the same manner as the plates 48 previously described and are aligned with the transversely aligned pressings 53 and 56.

As previously described in conjunction with FIG. 1, the wheel track areas 16 include spanning plates 25 the extent and location of which is illustrated in FIGS. 1, 2 through 2C, 3 through 3C and 5-7. These plates are paired on opposite sides of the coupler housings 23 at each end of the car and on opposite sides of the center fifth wheel stand 22 shown in FIG. 1. As best illustrated in FIGS. 6 and 7, the plates 25 along their inner margins overlap the top cover plate 34 of the center sill and are suitably attached thereto. The outer margins of the plates 25 abut the inclined rub rail portions 39 of the side sill structures 17 approximately midway thereof and are also suitably attached thereto. Each spanning plate 25 is preferably reinforced by a floor stringer 60 which may be supported on the wheel track deck plate 37. Where desired, the areas of wheel track deck plate 37 immediately below the spanning plates 25 may be removed and the floor stringer 60 supported solely by the cross bearers, cross ties or special pressings forming a part of the shallow center sill end constructions. Similarly, as long as the wheel track areas 16 are made inoperative in the areas of the spanning plates 25, the adjacent portions of the center sill cover plate 34 and side sills 17 may be modified to raise the flanges 36 and 38 in direct marginal support of the spanning plates 25.

As best illustrated in FIGS. 2 through 2C and 3 through 3C, each spanning plate at the ends thereof which communicate with a wheel track area 16 is provided with an inclined ramp-like plate 61 providing an inclined surface to facilitate tractor and trailer operation from wheel track area level to spanning plate level and vice versa. At each end of the car extending transversely across each wheel track area 16 is a threshold-type plate structure 26 as previously described. This structure, as best shown in FIGS. 2, 2B, 3, 3C and 8, comprises a top plate formed from an outer end horizontal plate portion 62 recessed relative to and joined with an inclined plate portion 63. The plate portions define therebetween a bridging plate receiving area which due to the recessed position of the plate portion 62 permits horizontal alignment of the top surface of the bridging plate with the top edge of the inclined plate portion 63. The inclination of the plate portion 63 provides for ready transfer of a wheel supported unit from the bridging plate 27 onto the wheel track spanning plate 25 adjacent thereto. The top plate of the threshold structure 26 is supported at its inner end by a flanged frame member 64 extending transversely across the adjacent wheel track area. The outer edge of the top plate is supported by an inwardly flanged portion of an end sill plate 65. As previously described, the bridging plate 27 shown in FIG. 8 would be pivotally carried by an adjacent railway car of the same design as shown in FIG. 1.

The basic design of the railway car of the present invention as best exemplified in FIGS. 4 and 5 is based on the principle of single beam construction. This construction includes a main center beam in the form of the center sill 15 having formed integral therewith along the top portion thereof a transversely extending deck portion. This deck portion is inclusive of the top center sill plate 34, the wheel track areas 16 and the side sill structures 17 and it will be noted in particular that all of these portions including the various elements forming the same are structurally tied in directly with the top portion of the center sill to form a unitary single beam construction. The depending center beam structure 15 provides the main strength characteristics of the car and is formed

8

along the top thereof with a wide, laterally projecting, upwardly opening deck portion which, as a result of its trough-like shape provides a freight unit loading area having low reinforced sides. The trough-like deck portion constitutes the main compression chord portion of the single beam construction which, as described in our aforementioned co-pending application, is in compression with the top portion of the center beam structure under operational stress while the lower portion of the center beam structure is in tension. The integral tying in of the side sill rim structures 17 and the wheel track structures 16 with the top portion of the center sill 15 provides for the entire deck portion carrying shear forces and the placing of the side sill rims as well as the top portion of the center sill in compression. By way of comparison, conventional parallel beam design results in each individual beam functioning as a separate beam with the top portion of each beam being in compression and the bottom portion thereof being in tension. The depth of the various beams are selected and the beams are laterally tied in to provide for uniformity in individual beam deflection and the like so that the conventional railway car will function properly. Thus in conventional car design the depth of the separate side sill beams and center sill beam are individually relied upon in retaining adequate overall strength.

The unique single beam construction of the present invention is particularly adapted for utilization in the forming of relatively long cars such as a car of 88 feet in overall length as previously described. The design concept is also particularly adapted for use in cars having a low center of gravity and especially where the car couplers are mounted relatively high for coupling with standard cars of conventional design. Thus with utilization of the single beam construction principle, the railway car of the present invention may be substantially lower than a conventional car and still be adapted to permit raised coupling mounting as illustrated with efficient coupler force accommodation. It has been found that with the design of the present invention, long cars incorporating the construction principles therein exhibit shear lag losses reduced to a virtually negligible quantity.

The cross bearers 42, cross ties 43 and special cross member pressings 53 and 56 of FIGS. 6 and 7 respectively, basically constitute external reinforcement of the side sill structures 17 to aid in holding the same against lateral deflection in response to car operational loads. These members function to maintain the fully effective and operative position of the various portions of the top compression chord or deck of a single beam construction to assure that, under operational stress, the single beam will be fully effective with regard to its original overall depth. These members function much as an outrigger might be used to aid in supporting a cantilevered area. The cross bearers and related members also function to aid in supporting vertical loads carried by the car and thus provide additional strengthening of a localized character which generally has no direct bearing or effect on the utilization of the principle of single beam construction.

As previously described, the areas of the side sill structures 17 adjacent trailer wheel location upon piggyback trailer loading of the railway car are formed with box-like, internally hollow sections by the attachment of angle members 50 to the undersurface of the side sill flanges 41 between the same and associated cross bearers and cross ties. These areas constitute a part of a freight unit attachment arrangement forming a part of the present invention and FIGS. 9-13 illustrate in detail the various elements and operative use of this arrangement. Also, as previously described the side sill flange or rim 41 in the freight unit attachment areas is provided with a longitudinally extending slot 51 the innermost edge of which is formed with a plurality of groove-like recesses 52. A special chain anchor unit 66 is mounted in the

slot 51 for fixed positioning in selected recesses 52 and for sliding along the slot 51 for selected positioning. The chain anchor 66 is formed from a pair of vertically spaced, horizontally extending plates 67 and 68, the plate 68 being received within the box-like interior of the side sill structure 17. Both plates 67 and 68 laterally overlap the opposite surfaces of the flange 41 to prevent displacement of the anchor from the side sill during operational use thereof.

The plates 67 and 68 are interconnected by a pair of vertically extending rod sections 69 which are dimensioned to be snugly received in the recesses 52 of the slot 51. Projecting rearwardly from each rod section 69 is a movement limiting block 70 arranged for abutment with the outer edge of the slot 51 to limit the extent to which the anchor 66 may be moved transversely in the slot 51.

The top plate 67 has attached thereto an upwardly directed and inwardly inclined chain attachment handle 71 through which a conventional multi-link chain 72 is received and suitably attached at one end thereof. A pair of outwardly directed guard plates 73 are also mounted on the top plate 67 to control positioning of the chain 72 relative to the attachment handle 71.

As best shown in FIGS. 9 and 12, the anchor 66 is locked in the slot 51 by reason of the rod sections 69, which function as detent means, being received in a pair of adjacent grooves 52, which function as indexing means in conjunction with the rod sections 69. The chain 72 attached to the anchor 66 as shown in FIG. 9 extends upwardly and inwardly into connection with a suitable attachment means 74 formed on a trailer body 20 and located above a pair of trailer wheels 75 positioned in the wheel track area 16. The angle of attachment of the chain 72 functions to hold the anchor 66 in its locked position with the rod sections 69 thereof received in recesses 52.

In order to change the longitudinal positioning of a chain anchor 66, chain tension is removed and the anchor 66 is free for lateral shifting in the slot 51 to back the rod sections 69 out of the associated recesses 52. The extent to which the chain anchor 66 may be shifted rearwardly across the slot 51 is limited by abutment of the outer ends of the limiting blocks 70 with the opposite edge of the slot 51. Adequate shifting is available to the extent illustrated in FIG. 13 to permit longitudinal movement of the chain anchor 66 along the slot 51 to any location desired. During non-use of the chain 72, the same is readily receivable through the slot 51 for storage in the interior of the side sill structure.

FIG. 9 illustrates the preferred angularity of the rub rail portion 39 of the side sill structure 17. This angularity is such that the bottom tread area of a trailer tire 75 engages the rub rail as distinguished from the sidewall of the tire. In providing for this type of contact between trailer or tractor tires and the rub rails of the railway car construction, any tire wear occurs where there is adequate rubber and does not result in sidewall weakening.

From the foregoing detailed description of the unique railway car construction of the present invention, it is believed apparent that this construction includes a number of important design features which individually constitute significant advancements and which are capable of the unique combination in a unitary structure. The particular railway car described removes the need for compromise in the design of piggyback cars and permits adoption of equipment ideally suited to the present and future needs of the railroads from the standpoint of clearance, weight, general economy, versatility, and compatibility. While the freight unit attachment arrangement has been described as a part of the basic car design disclosed herein, it will be understood that this arrangement can well be incorporated in railway cars of different design.

Obviously certain modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

We claim:

1. A railway car of single longitudinal beam design adapted for use in piggyback operation, said car comprising a center longitudinal beam portion having wheel trucks mounted therebeneath, said center beam portion including a longitudinally continuous top cover plate fixed thereto, cross bearer means spaced longitudinally of said center beam portion and projecting radially outwardly therefrom on either side thereof in fixed attachment therewith, a longitudinally continuous upstanding side sill fixed to the outer ends of said cross bearer means to each side of said center beam portion, and longitudinally continuous floor plates spanning the transverse space between said center beam portion and side sills and fixed to said center beam portion and said side sills, said floor plates being recessed below the top surfaces of said cover plate and side sills to define relative thereto wheel track areas with the projecting top portions of said center beam portion and side sills providing wheel guide surfaces, the mass of said center beam portion, side sills, floor plates and cover plate being selected and located to establish a single neutral axis for the cross section of said car, which neutral axis is located so that said floor and cover plates and said side sills function in their entirety as the top compression chord of said single longitudinal beam design.

2. The railway car of claim 1 wherein each end of said center beam portion is formed with a coupler housing which extends above the top surface of said cover plate and is adapted to mount a car coupler therein, and raised floor plate means spanning each wheel track area along the sides of such coupler housing to maintain a wheel supported trailer-type unit at a height adequate to clear said coupler housing during loading and unloading of said car.

3. The railway car of claim 1 wherein each side sill extends vertically upwardly and terminates in a longitudinally continuous reinforcing tubular portion, said tubular portion being longitudinally slotted for the storage of chain-like piggyback unit attachment means therein, a chain anchor slidably mounted in the slot of each tubular portion, and cooperating indexing means forming a part of the slot and anchor for releasably fixing said anchor at points along said slot.

4. A railway car of single longitudinal beam design adapted for use in piggyback operation, said car comprising a center longitudinal beam portion having wheel trucks mounted therebeneath, said center beam portion including a longitudinally continuous top cover plate fixed thereto and having side margins projecting outwardly and sloping downwardly to either side of said center beam portion and below the top surface thereof, cross bearer means spaced longitudinally of said center beam portion and projecting radially outwardly therefrom on either side thereof in fixed attachment therewith, a longitudinally continuous upstanding side sill fixed to the outer ends of said cross bearer means to each side of said center beam portion, each side sill including an intermediate longitudinal portion which is inclined away from said center beam portion above said cross bearer means in substantial transverse alignment with the side margins of said top cover plate, and longitudinally continuous floor plates spanning the transverse space between said cover plate and side sills and fixed to said cover plate and side sills, said floor plates being recessed below the top surfaces of said cover plate and side sills to define relative thereto wheel track areas with the side margins of said cover plate and the intermediate longitudinal portions of said side sills providing wheel guide surfaces, the mass of said center beam por-

tion, side sills, floor plates and cover plate being selected and located to establish a single neutral axis for the cross section of said car, which neutral axis is located so that said floor and cover plates and said side sills function in their entirety as the top compression chord of said single longitudinal beam design.

5 The car of claim 4 wherein each of said side sills is in the form of a longitudinally continuous member of generally S-shape provided with a horizontal flange-like portion to which a floor plate is attached, said intermediate portion, and an outwardly directed top flange portion, said cross bearer means each extending outwardly and upwardly of a side sill in attachment with the outer surfaces of the intermediate and top flange portions thereof.

6 The railway car of claim 4 wherein each end of said center beam portion is formed with a coupler housing which extends above the top surface of said cover plate and is adapted to mount a car coupler therein, raised floor plate beams spanning each wheel track area along the sides of each coupler housing to maintain a wheel supported trailer-type unit at a height adequate to clear said coupler housing during loading and unloading of said car, and a threshold-type means spanning each wheel track area at each end thereof outwardly and immediately adjacent to a raised floor plate means, each threshold-type means being formed with a recessed top surface portion adapted to receive thereon an end of a bridging means used in transferring a unit from one car to another, the remaining portion of the top surface of said threshold-type means being arranged relative to said raised floor plate means to provide for ready transfer of a unit therefrom onto said floor plate means.

7 The railway car of claim 4 wherein each side sill extends vertically upwardly and terminates in a radially outwardly directed and longitudinally continuous flange portion, said rims being reinforced by said cross bearer means spaced longitudinally along said center beam portion and extending from attachment therewith under each floor plate portion and up and around the outer surface of each side sill into attachment with the under-surface of the flange portion thereof, a portion of each side sill including a box-like section reinforced by said cross bearer means with the side sill flange portion of each box-like section being longitudinally slotted for the storage of chain-like piggyback unit attachment means therein, a chain anchor slidably mounted in the slot of each box-like section, and cooperating indexing means forming a part of the slot and anchor for releasably fixing said anchor at points along said slot.

8 A railway car of single longitudinal beam design adapted for use in piggyback operation, said car comprising a center longitudinal beam portion having wheel

trucks mounted therebeneath, said center beam portion including a longitudinally continuous top cover plate fixed thereto and having side margins projecting outwardly and downwardly to either side of said center beam portion and below the top surface thereof, cross bearer means spaced longitudinally of said center beam portion and projecting radially outwardly therefrom on either side thereof in fixed attachment therewith, a longitudinally continuous upstanding side sill fixed to the outer ends of said cross bearer means to each side of said center beam portion, each side sill including a raised portion which is in substantial transverse alignment with the side margins of said top cover plate, longitudinally continuous floor plates spanning the transverse space between said cover plate and side sills and fixed to said cover plate and side sills, said floor plates being recessed below the top surfaces of said cover plate and side sills to define relative thereto wheel track areas with the side margins of said cover plate and side sills providing wheel guide surfaces, and longitudinal floor stringer means between said floor plates and cross bearer means in fixed attachment therewith and cooperating with the side margins of said cover plate and side sills to strengthen said floor plates for support of vertical loads applied thereto, the mass of said center beam portion, side sills, floor plates and cover plate being selected and located to establish a single neutral axis for the cross section of said car, which neutral axis is located so that said floor and cover plates and said side sills function in their entirety as the top compression chord of said single longitudinal beam design.

9 The car of claim 8 wherein each of said side sills is in the form of a longitudinally continuous member of generally S-shape provided with a horizontal flange-like portion to which a floor plate is attached, an upwardly and outwardly inclined wall portion, and an outwardly directed top flange portion, said cross bearer means each extending outwardly and upwardly of a side sill in attachment with the outer surfaces of the inclined and top flange portions thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

1,934,697	Butterworth	Nov. 14, 1933
2,001,935	Otis	May 21, 1935
2,023,971	Otis	Dec. 10, 1935
2,052,914	Williams	Sept. 1, 1936
2,835,209	Kavanaugh	May 20, 1958
2,851,963	Sheehan	Sept. 16, 1958
2,969,752	Terlechy	Jan. 31, 1961
2,970,552	Baker	Feb. 7, 1961
2,971,478	Dilworth et al.	Feb. 14, 1961