Sept. 20, 1971 K. N. JOHNSON 3,605,634

COVERED HOPPER CAR END CONSTRUCTION

Filed Dec. 30, 1968 4 Sheets-Sheet 1

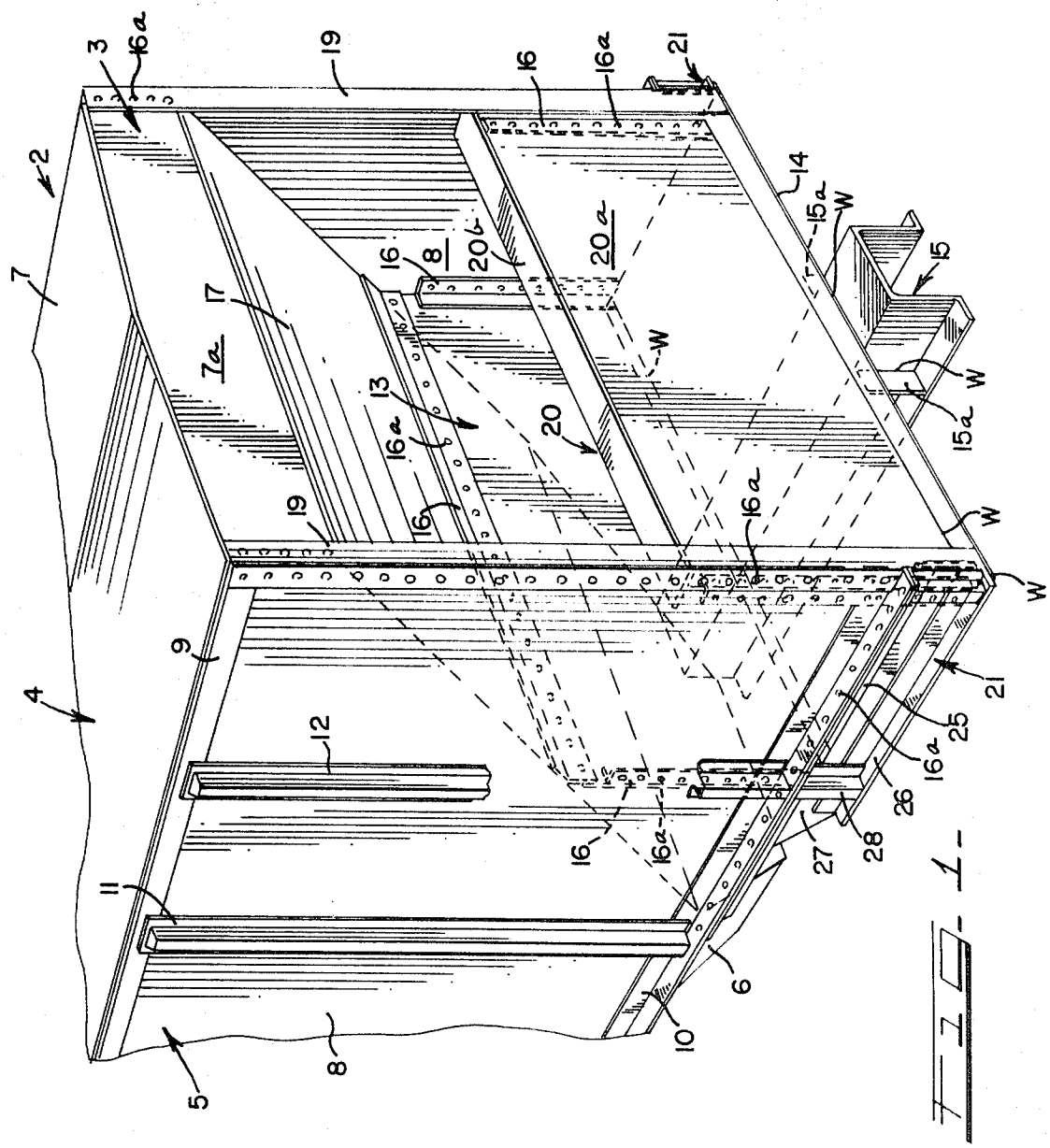


FIG. 1

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COVERED HOPPER CAR END CONSTRUCTION

Filed Dec. 30, 1968 4 Sheets-Sheet 2

FIG-2-

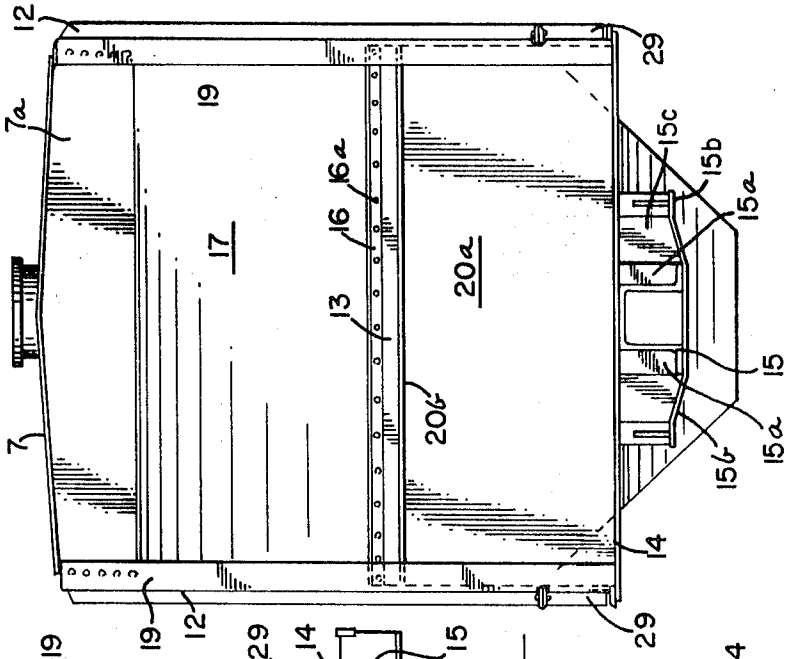


FIG-3-

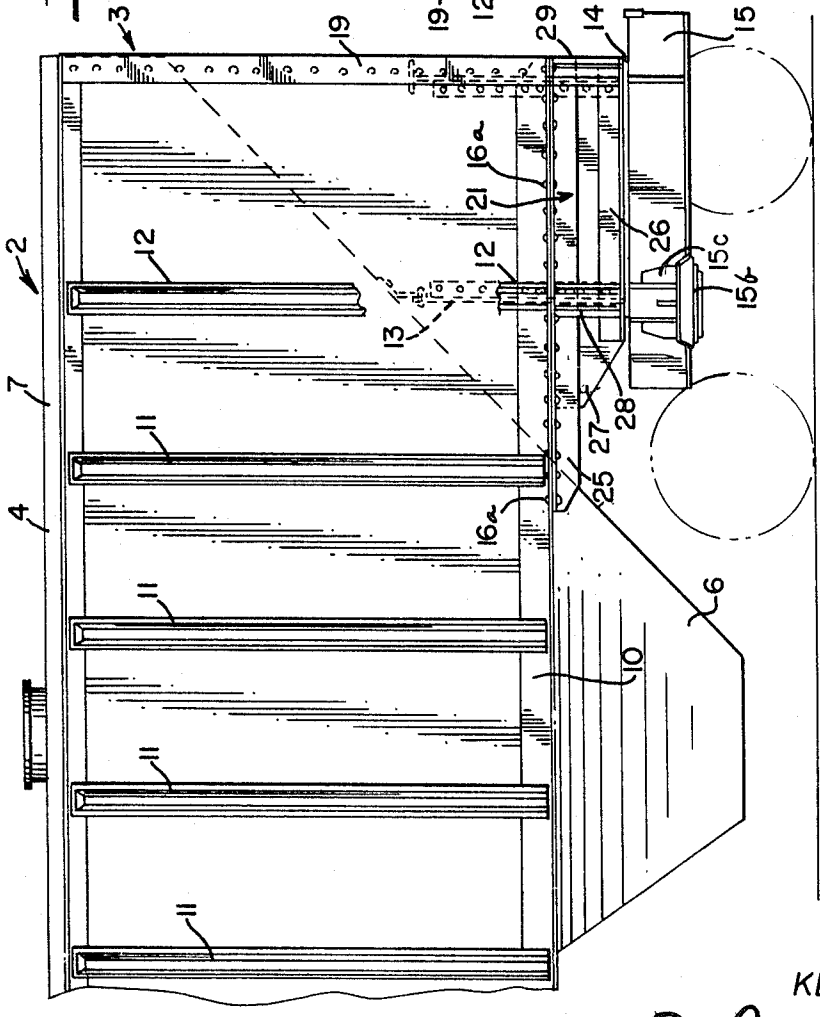
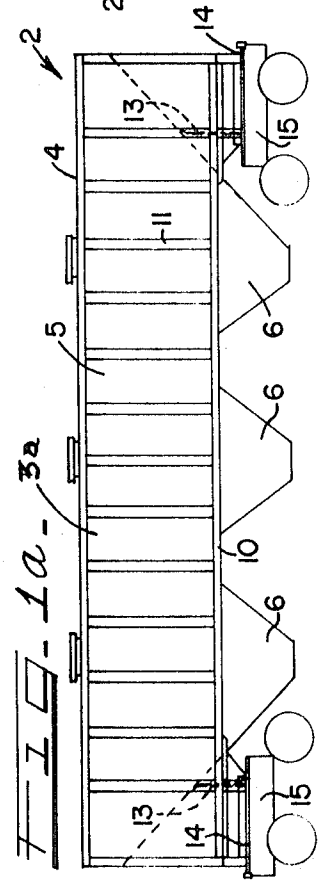


FIG-1a-



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COVERED HOPPER CAR END CONSTRUCTION

Filed Dec. 30, 1968 4 Sheets-Sheet 3

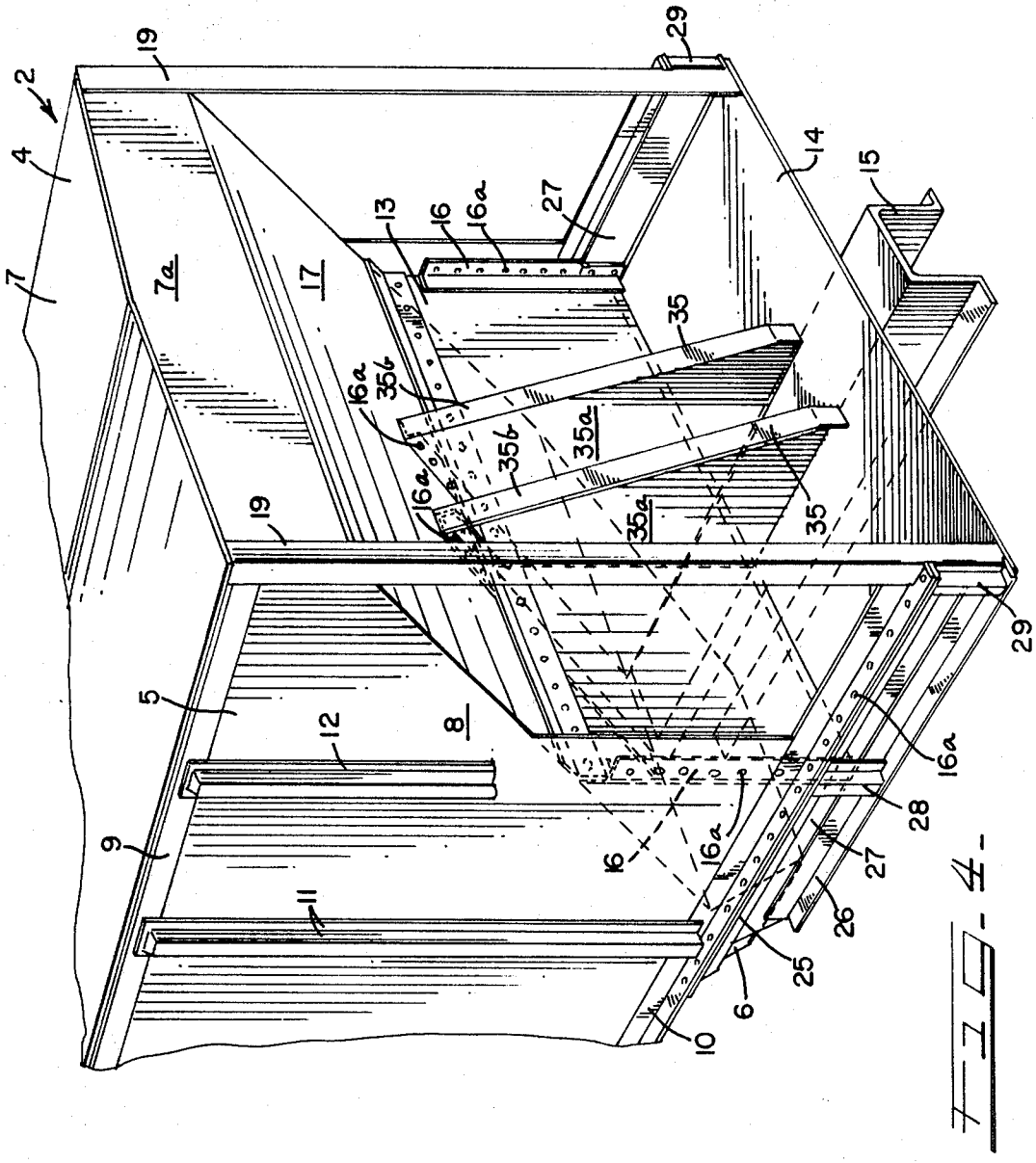


FIG. 4

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Filed Dec. 30, 1968 4 Sheets-Sheet 4

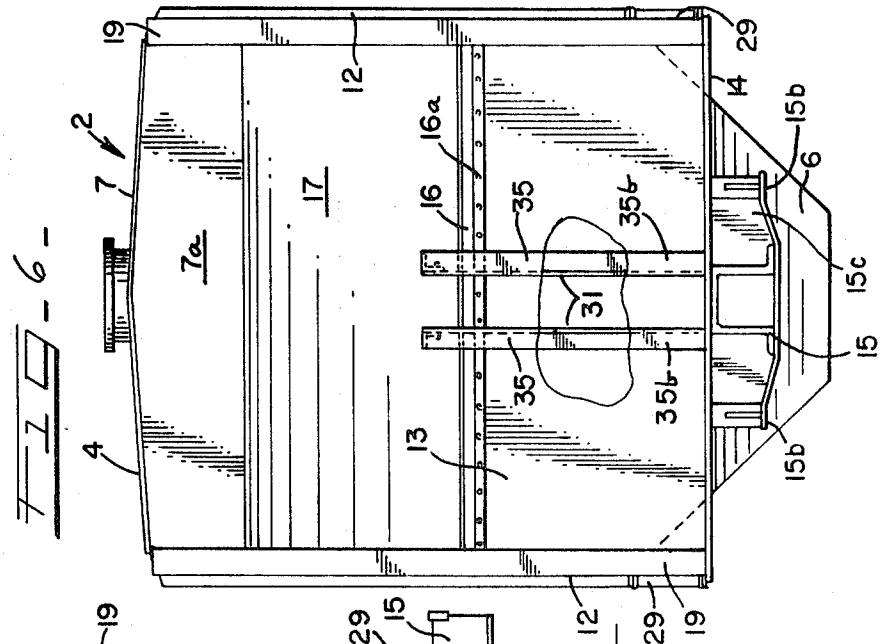


FIG. 6

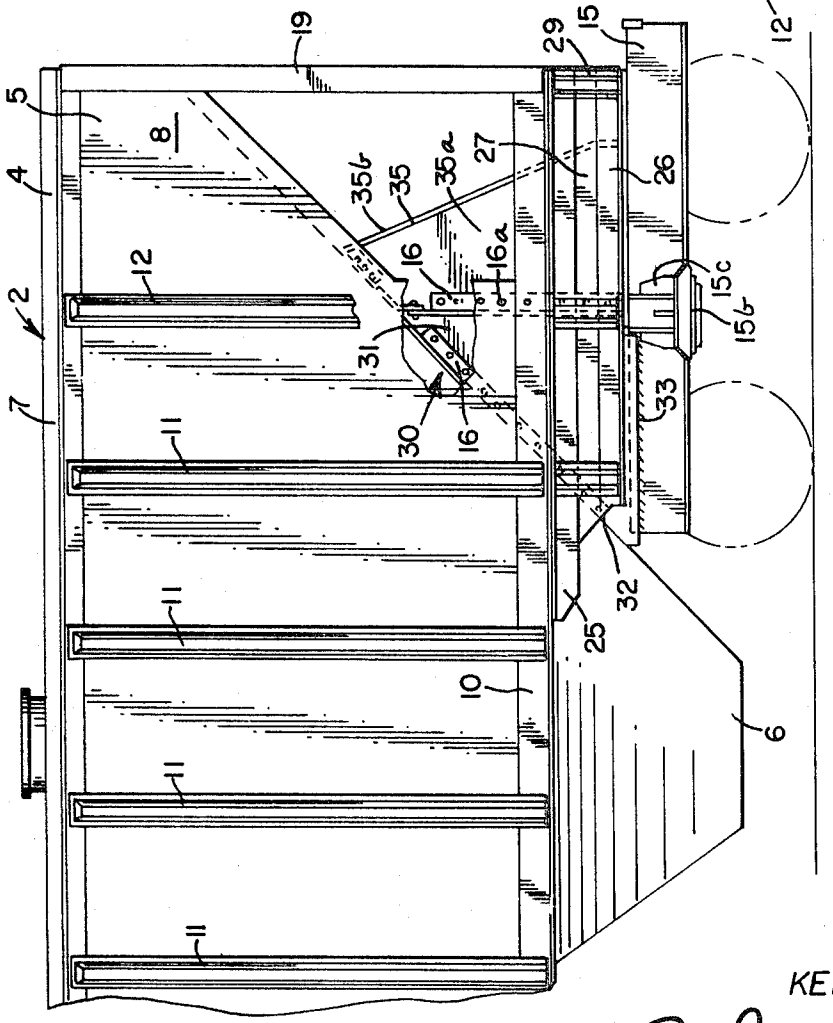


FIG. 5

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United States Patent Office 3,605,634 Patented Sept. 20, 1971

3,605,634

COVERED HOPPER CAR END CONSTRUCTION

Kent N. Johnson, South Holland, Ill., assignor to Pullman Incorporated, Chicago, Ill.

Filed Dec. 30, 1968, Ser. No. 787,942
Int. Cl. B61d 5/00, 7/00, 17/06
U.S. Cl. 105—248 13 Claims

ABSTRACT OF THE DISCLOSURE

In a center sill-less railroad hopper car, a pair of opposed end structures and a central hopper portion having opposed slope sheets, each end portion comprising a stub center sill on which is mounted a flat horizontal shear plate attached to lateral vertical side skirt means and a bolster web beam mounted on the shear plate and connecting with the side skirt means for beaming the impact loads on the center sill into the side girders of the car, the bolster web beam being attached with the respective slope sheet of the center portion by gusset means mounted on the respective stub sill or an end beam being mounted on the outer end of the shear plate beam and connecting with the sides of the car.

SUMMARY OF THE INVENTION

It is an object of this invention to provide for a center sill-less railroad car construction wherein each end beaming structure of the car may be attached to the central portion of the car in which each end construction comprises a stub center sill upon which is mounted a shear plate beam and a bolster web beam for beaming the loads into the side of the car, the shear plate beam having attached to each of its sides side skirt means attached to the side sills of the car for transferring impact loads on the stub sill into the side girders of the car.

The beaming of the loads into the sides of the car is also transferred from the floating or stub center sill by an upright end beam attached on the outer end of the shear plate and then each skirt means or by gusset reinforcing means connecting the bolster web with a respective slope sheet, the gusset means being mounted on the inner portion of the stub sill.

The invention utilizes the stub sill shear plate in spaced beam concept bolster web beam and end beam or slope sheet for beaming the stresses into the side wall structures introducing side wall skirts between the shear plate and sills. The novel combination of the invention involves a "floating" stub sill, flat shear plates and skirts used in a center sill-less car with spaced stress transferring beams.

The one arrangement of the invention is a straight two-beam arrangement of bolster web beam and end beam.

Another novel arrangement of the invention provides for a stub sill having a portion extending rearwardly of the bolster web beam with the shear plate beam stopping at the bolster web beam and utilizing gussets connecting a portion of the stub sill rearward of the bolster web beam with the shope sheet and the bolster web beam. These connecting gussets cause the slope sheet to function as a beam to transfer stresses into the side walls as one of the spaced beam elements and the bolster web beam beams the stresses into the side walls as a second beam element. The gussets are located only at the center sill with the area from the respective gussets to the side walls being open so that the slope sheet and bolster web beam are left to beam the stresses to the side walls.

It is a further object of this invention to provide side skirts for a high side car allowing the shear plate beam to remain flat or horizontal and results in the use of less side girder on each side of the car, the side girder including side sheeting and posts. The height of the side sill is

determined by the inner section of the sides of the side slope sheets of the hopper area with the side sills by this novel arrangement. The skirt means provides local structural reinforcement for the high side sill structure until such time that the portion of the side girder is aiding the side sill in carrying the buff loads into the side girder. The beam and stub sill of the end construction all form one unit which may be bolted or welded as a subassembly to the central portion of the car. Such an end construction operates as if the side sill were at the shear plate beam elevation. This construction, therefore, is uniquely applicable to aluminum cars but, of course, can also be used with steel cars. Stainless steel or aluminum may be used for that portion of the car containing the lading and, therefore, the bolster and end beam or steel gusset reinforced aluminum slope sheet beam combination. Stainless steel or aluminum is preferable for containing the lading as it is corrosive resistant whereas the end construction may be made of a mild or conventional steel where there is no corrosive problem, that is, the outside end construction of the bolster web, shear plate and gusset or end beam construction. The side sill may also then be of a different material, such as aluminum. Where the end construction is attached to an aluminum car body, bolting is the fastening means, whereas if mild or conventional steel construction is used for the end portions of the car, the end portions may be welded to a stainless steel lading bearing center portion of the car.

These and other objects, purposes and advantages of the invention will become apparent from reference to the following description, attached drawings, and appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the end portion of a railroad hopper car of the center sill-less type;

FIG. 1*a* is a side elevational view of a complete hopper car of the aforesaid type;

FIG. 2 is a partial side elevational view of the end of the hopper car;

FIG. 3 is an end elevational view of the hopper car;

FIG. 4 is another modification of a hopper car showing a perspective view of the end of the car;

FIG. 5 is a side elevational view of the end of the car as shown in FIG. 4; and

FIG. 6 is an end elevational view of the hopper car as shown in FIGS. 4 and 5.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference now to the drawings, there is shown a railroad hopper car of the general type shown in co-pending patent application of John H. Spence and William Van der Sluys, Ser. No. 739,319 filed June 24, 1968, now Pat. No. 3,557,713, issued Jan. 26, 1971 which co-pending application is incorporated herein by reference. The following embodiments, however, are directed to a high side sill car provided with side skirt means which receive stresses from a flat horizontal shear plate beam as well as two transverse beams for transmitting the loads into the side girders of the center sill-less car as will be understood by reading the following description.

With reference now to FIGS. 1, 1*a*, 3 and 4, the center sill-less railroad hopper car **2** has end portions **3**, and central portions **3***a*, a top or roof **4**, and sides **5**, and the center hopper portion being defined by hoppers **6**. The roof **4** is provided with roof sheeting **7** and each side **5** is provided with side sheeting **8** which spans vertically between upper side plate **9** and lower side sill **10** on each side **5** of the car **2**. The side plate **9**, side sill **10**, the sheeting **8** and side posts **11** which extend between and are connected to each side sill **10** and side plate **9** on one

side of the car constitute a side girder. One side post **11** is designated as a side post **12** which is aligned with the bolster web beam **13** at each end of the car. Each bolster web beam **13** spans and is connected to each longitudinally extending side sill and is fixedly mounted (by welding *w*) on the horizontal end shear plate **14** mounted over a respective stub center sill **15** by welding *w*. In the drawings the small letter *w* indicates the parts are welded together.

Each bolster web beam **13** at each end of the car extends transversely and upwardly to the downwardly inwardly sloping transversely extending hopper slope sheet **17**. The respective slope sheet **17** is attached to its respective bolster web beam by an angle clip connection or angle plate **16** which extends the width of the car. These angle clips **16** are used whenever an aluminum car part is attached to a steel car part because welding of steel to aluminum is not done in this construction but, rather, the aluminum part is bolted by means of bolts **16***a* to the steel car part. The angle plate **16** for tying the slope sheet **17** to the bolster web beam **13** is of aluminum which is welded to the slope sheet but bolted to the bolster web beam. However, a pair of opposed end angle plate connections **16** of steel are welded to the steel bolster web beam **13** but bolted to the aluminum side sheeting **8** of the car. The side posts **11**, the side sills **10** and the side plates **9** are of aluminum, as is the roof sheeting **7** and the upper end sheet **7***a*. Bolts **16***a* attach the steel corner posts **19** which, in turn, are welded to the steel shear plate beam **14** and the steel end beam **20**. The end beam **20** is attached to the side sheeting **8** on each side of the car by angle plate **16** through bolts **16***a*. The steel shear plate beam is welded as, for instance, indicated by welding *w* to the steel stub center sill **15** at each end of the car. Each slope sheet **17** at each end of the car has its outer end portions merging with the upper, outer end sheeting **7***a* attached to the roof sheeting **7**. The corner posts **19** are L-shaped structural members which are also attached by bolt means **16***a* to the respective side sheeting **8** and side plate **9**, the corner posts being structural members. The shear plate beam **14** extends from its connection with the bolster web beam **13** outwardly to the end of the car and laterally toward and underneath the aluminum side sills **10** where it is attached by welding *w* to the steel skirt means **21** to be described in detail below. The lower end beam **20** comprises a generally upright web portion **20***a* and a horizontally inwardly and outwardly turned flange portion **20***b* forming a T with the web **20***a*. Steel reaction gussets **15***a* are attached to each stub center sill **15** and to the underside of the shear plate by welding *w*. Located underneath the side post and bolster web beam and connected to the stub center sill at each end of the car is the conventional vehicle or body bolster **15***c* having the usual bolster side bearing structure **15***b*. The side post **12** extends down along the side sheeting **8** to which it is attached and is connected to the side sill **10** on a respective side.

The shear plate beam **14** extends outwardly of and is spaced outwardly and away from the slope sheet **17** to define an open box arrangement with the bolster web beam **13** and the slope sheet **17**. Therefore, there is no torque box arrangement of the shear plate bolster web and slope sheet, and loads, as in buff, are transmitted to the side skirt structures **21, 21** into the sides of the car from the center sill by means of the two-beam construction of the end beam **20** and the bolster web beam and the connection of each of these beams **20** and **13** to the shear plate beam. A portion of the shear plate beam **14** connected to the end beam **20** acts as a flange for the beam **20** and a portion of the end beam **20** that is adjacent to and connected to the shear plate beam **14** acts as a flange for the shear plate beam **14**. A portion of the shear plate beam adjacent to and connected to the bolster web beam **13** acts as a flange for the shear plate beam **14** and a portion of the shear plate beam **14** adjacent to and connected to the bolster web beam **13** acts as a flange for the bolster web beam **13**. Thus, there is a sharing of flanges between the end beam **20** and the shear plate beam **14** and between the shear plate beam **14** and the bolster web beam **13**. The bending stresses of the shear plate beam, bolster web beam and the lower end beam act as a unit under the longitudinal impact loads to produce a more efficient structure when interconnected than it would be if the above means were not interconnected as they share common flanges. The path of the impact forces in shear and in bending pass from the center sill into the shear plate beam and to the lower end beam and bolster web beams to the side skirt structures **21, 21** into the sides of the car. Because of the sharing of flanges of these three beams, bending forces subtract from one another at the connection between the end beam and the shear plate beam and between the shear plate beam and the bolster web beam, improved structural result that could not be realized if these beams were separated.

The skirt means or side skirt structures **21, 21** each depend from the respective side sill **10** and are welded to the shear plate beam **14** and the corner post **19**. Each skirt means comprises a pair of vertically spaced laterally extending L-shaped steel angle plate elements **25** at the top and **26** at the bottom. The top angle plate skirt element **25** extends from the end of the car on its respective side to approximately the outermost hopper unit **6** and is bolted by bolts **16***a* to the respective side sill **10**, as aforesaid, whereas the lower angle skirt element **26** extends slightly inwardly of the bolster web beam **13** and is connected by welding on its inner side thereof to skirt gusset plate **27** which extends up to the upper skirt element **25** and is welded thereto on the inside face of the vertical flange of element **25** by welding (the vertical flange of element **26** also being attached to the gusset **27**). The horizontal flange of the L-shaped skirt element **26** has its underside welded to the shear plate beam **14** which, in turn, is welded to the stub sill **15**. The shear plate **14** extends inwardly from the end of the car at the corner post **19** to just inwardly of the bolster web beam **13**. Inner steel side post stub **28** in vertical alignment with the side post **12** is sandwiched between and welded to the upper plate **25** and the lower plate **26**. An outer steel bolster side post stub **29** is sandwiched between and welded to the upper and lower skirt elements **25** and **26** at the corner post **19** on each side of the car. The shear plate beam **14** is a horizontal plate which, being welded to the underside of the skirt means **21** on each side of the car, is spaced below the respective side sill **10** and each skirt means **21** is a vertical structure reinforcing structural unit extending up from the shear plate means to the side sill up from which extends the side girder on each side of the car. Therefore, loads transmitted into the stub center sill **15** are beamed to the shear plate and into the skirt means **21, 21** and into the side or side girders of the car.

By such an arrangement as described above, the end construction of bolster web beam, end beam and shear plate may be bolted to an aluminum central hopper portion where the end construction is steel or the end construction which may be of steel may be welded to a central portion which is of steel. The flat shear plate beam construction provides for a high side sill with less side girder construction resulting in a structural advantage and a weight saving in order to carry greater payloads. The skirt means reinforces the end construction where there is a higher side sill providing for beaming of loads into the side girders that come from the shear plate beams. The selection of materials need not be limited to steel or aluminum and welding of parts may be substituted where bolting of parts together is not required.

A second modification is shown in FIGS. 4, 5 and 6 and in all respects is like the embodiment shown in FIGS. 1, 1*a*, 2 and 3 except that the end beam has been omitted and the slope sheet is provided with gusset means **30**

connecting with the bolster beam **13** whereby in the absence of the end beam the bolster web beam **13** in conjunction with the slope sheet **17** acts as means for beaming the loads into the side of the car. Therefore, where there is like structure in the second embodiment with reference to the first embodiment, like reference characters are used. The gusset means **30** comprise triangular-shaped inner gusset steel elements **31**, **31** which are bolted by bolts **16***a* to the underside of the slope sheet **17** from the intersection of the slope sheet with the bolster web beam **13** downwardly to where the hopper portion **6** begins as indicated by **32** on FIG. 5. Each gusset plate **31** is attached to the slope sheet by an aluminum angle plate **16** by welding, which plate **16** is bolted by bolt **16***a* to the inner triangulated gusset **31**, the vertical outward edge of the steel gusset means **31** being welded to the inner face of the steel bolster web **13**, and the lower horizontal edge of each inner gusset plate **31** being welded to the respective side of the stub center sill **15** as indicated by numeral **33** in FIG. 6. In this second embodiment the stub sill **15** extends further inward toward the hopper **6** and adjacent thereto in order to support and carry each inner gusset steel element **31**. The elements **25**, **26** and **27** of the skirt structure **21** in the second modification also extend adjacent to the hopper **6** whereby the skirt structure **21** and the gusset elements **31** aid in more directly dumping or beaming the loads from the shear plate beam into each side girder of the car. Outer gusset plates **35**, **35** forming outer gusset means are mounted on the shear plate beam and are triangular in shape. These gusset members **35**, **35** are of steel construction, being welded to the upper surface of the horizontal shear plate and also being bolted to the aluminum slope sheet by bolt **16***a* to where the slope sheet **17** intersects with the bolster web beam **13** and then each external gusset element **35** extends downwardly and has its inner vertical edge welded to the steel bolster web beam **13** along the face thereof till the intersection with the shear plate beam **14**. The outer gusset elements consist of triangulated web portion **35***a* and outwardly to side turned flange **35***b* for structural reinforcement. Thus, the second embodiment discloses a stub sill having a portion extending rearwardly of the bolster web beam **13** with the shear plate beam **14** stopping at the bolster web beam **13** and utilizing internal gusset means **31** connecting the portion of the stub sill **15** rearward of the bolster web beam **13** with the slope sheet **17** which also acts as a beam now in this embodiment, and the bolster web beam. The outer gusset means **35** provide additional reinforcement structure. The connecting gussets **31** cause the slope sheet to function as a beam to transfer the stresses into the side or side girders or walls as one of the spaced beams or beam elements and the bolster web beam beams the stresses into the side walls or girders as the second beam element. The gusset arrangement is not a torque box design. The gussets **31** are located at the stub center sill **15** with the area from the respective gussets **31** to the side walls or side structures being open so that the slope sheet **17** and the bolster web beam **13** are left to beam the stresses to the side walls or structures.

The foregoing description and drawings are given merely to explain and illustrate the invention, and the invention is not to be limited thereto since those skilled in the art who have the disclosure before them will be able to make modifications and variations therein without departing from the scope of the invention.

What is claimed is:

1. In a center sill-less railroad hopper car, a pair of opposed end portions and a central portion and side girders including side sills connecting with the end portions, each end portion comprising:

a stub center sill,

a flat horizontal shear plate beam mounted on the stub center sill below the side sills,

vertical side skirt means attached to the lateral sides of said shear plate beam and extending upwardly therefrom and connecting with the side sills, and

an upright bolster web beam means mounted over the vehicle bolster and on the shear plate beam intermediate its ends and connecting with the side skirt means for beaming impact loads on the center sill into the side girders of the car.

2. The invention according to claim **1**, and

end beam means mounted on the outer end of the shear plate beam means and connecting with said side skirt means for providing additional beaming of the impact loads from the stub center sill into the side skirt means and into the side girders of the car above the side skirt means.

3. The invention according to claim **1**, and

each end portion stub sill and beam means being of steel construction and said central portion of the hopper and said side sills being of aluminum construction whereby the end portions are bolted to the central portion.

4. The invention according to claim **1**, and

said end portion stub sill and beam means being of steel, and said central portion and said side sills being of stainless steel whereby the end portion is welded to the central portion.

5. The invention according to claim **1**, and

said skirt means comprising a skirt structure on each side of the car, each skirt structure comprising:

a pair of longitudinal elements spaced vertically of one another and connected with a horizontally extending intermediate element.

6. The invention according to claim **5**, and

side post stubs mounted on said skirt means for reinforcing same at the bolster and at the end of the car.

7. The invention according to claim **1**, and

said central portion including hopper means having opposed slope sheets connecting with the side girders, and

said bolster web beam means being attached with the respective slope sheet of the central portion.

8. The invention according to claim **7**, and

the stub center sill being spaced outwardly and away from the slope sheet to provide for an open box arrangement between the bolster web beam means, the slope sheet, and the shear plate beam which is spaced outwardly and away from the slope sheet.

9. The invention according to claim **7**, and

internal gusset means mounted on the inner portion of said stub center sill between the bolster web beam means and the slope sheet and reinforcing the slope sheet which acts as an additional beam for beaming impact loads from the center sill into the side skirt means and then into the said girders thereabove.

10. The invention according to claim **9**, and

said internal gusset means comprising a pair of longitudinally extending laterally spaced apart generally triangulated gusset plates attached to the side of the stub center sill underneath the slope sheet and being attached to the slope sheet thereabove and to the inside of the bolster web beam means.

11. The invention according to claim **9**, and

said internal gusset means being located only at the stub center sill with the area from the respective gussets to the side girders being open so that the slope sheet and the bolster web beam means transmit the stresses to the side girders.

12. The invention according to claim **9**, and

exterior gusset means being mounted on the shear plate beam and over the stub center sill and connecting with the bolster web beam means and extending outwardly of the bolster web beam means for structurally reinforcing said end portion.

13. The invention according to claim 12, and said outer gusset means comprising a pair of parallel longitudinally extending laterally spaced gusset elements mounted over said stub center sill on said flat horizontal shear plate beam.

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U.S. Cl. X.R.

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