May 26, 1936. E. G. HALLQUIST ET AL 2,042,151

RAILWAY CAR

Filed May 19, 1933 7 Sheets-Sheet 1

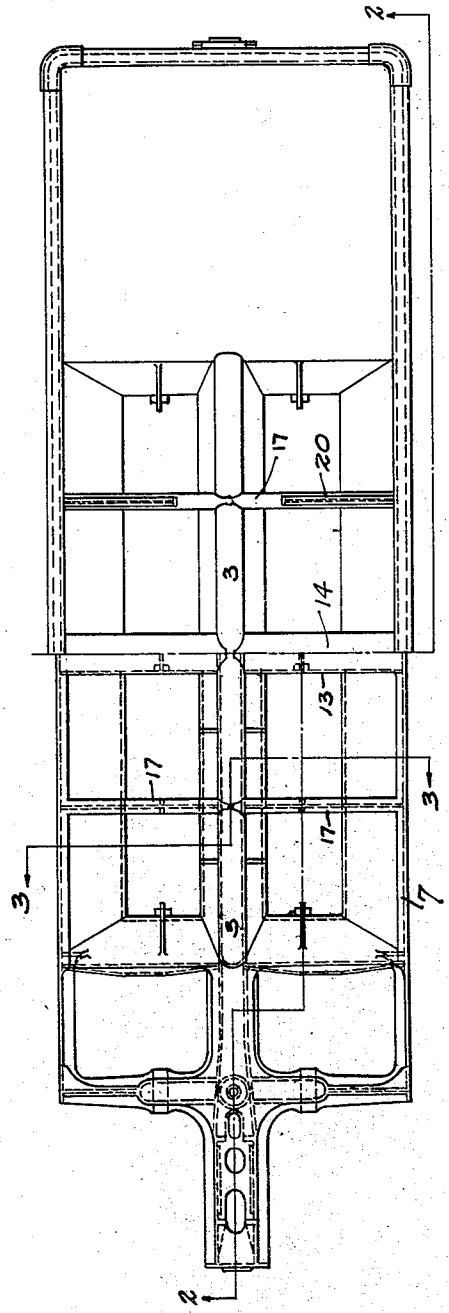


Fig-1-

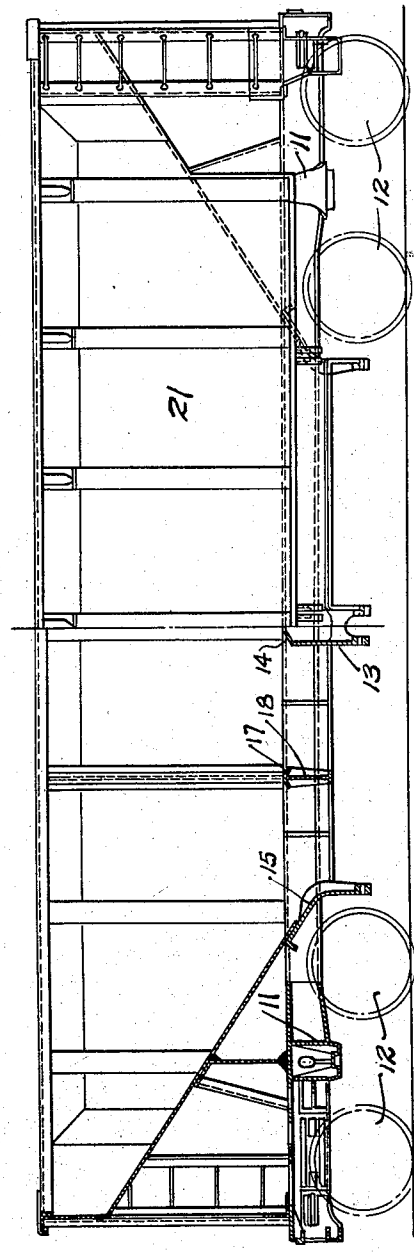


Fig-2-

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RAILWAY CAR

Filed May 19, 1933 7 Sheets-Sheet 2

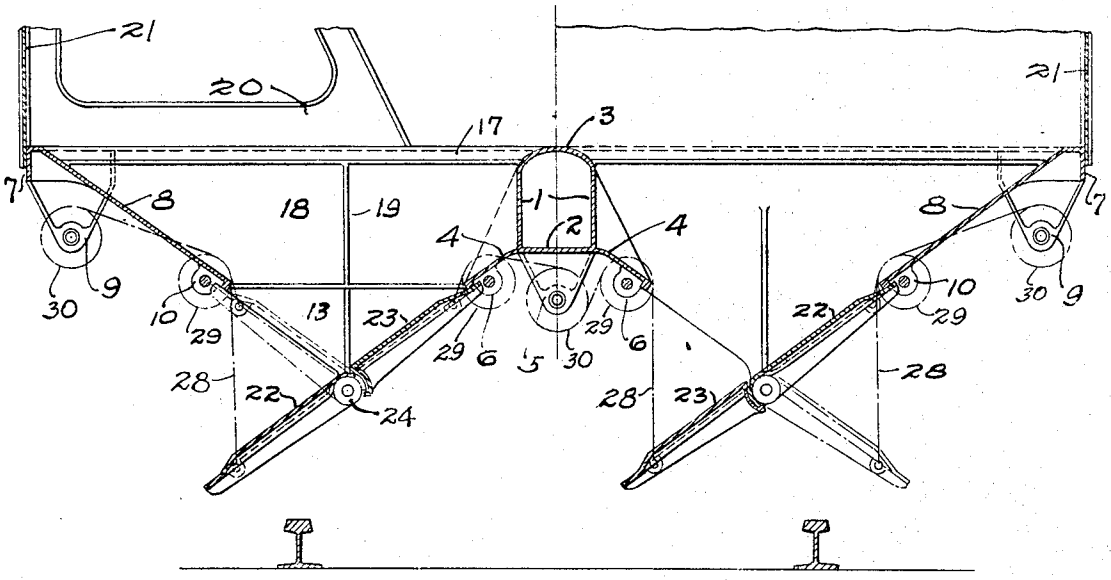


Fig-3-

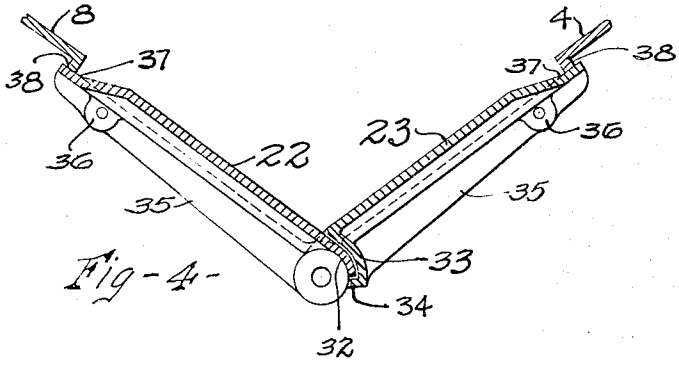


Fig-4-

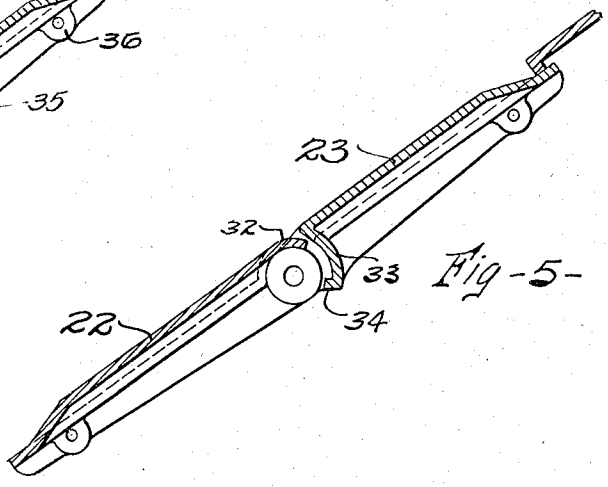


Fig-5-

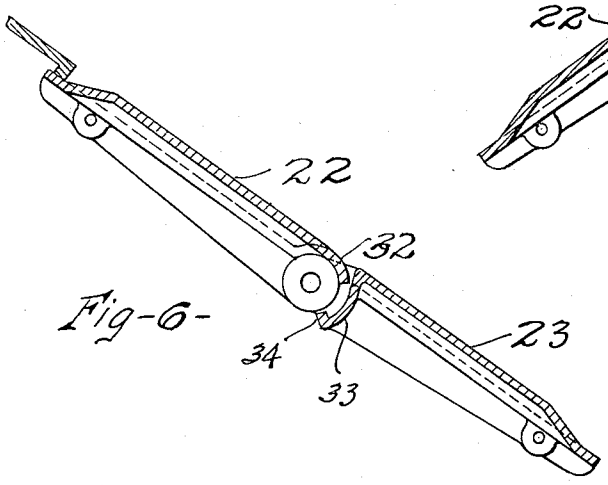


Fig-6-

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May 26, 1936. E. G. HALLQUIST ET AL 2,042,151

RAILWAY CAR

Filed May 19, 1933 7 Sheets-Sheet 3

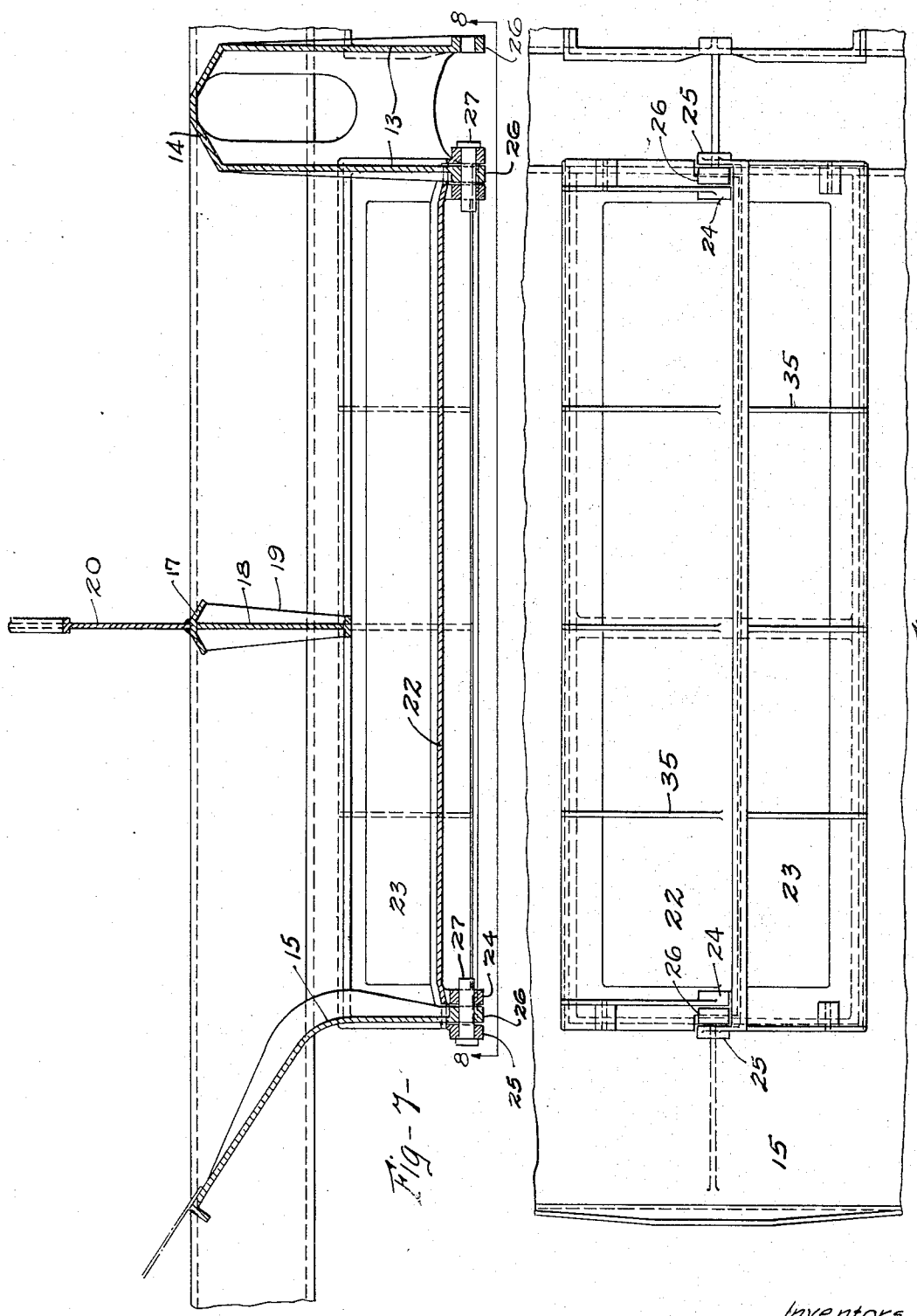


Fig-1-

Fig-8-

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RAILWAY CAR

Filed May 19, 1933 7 Sheets-Sheet 4

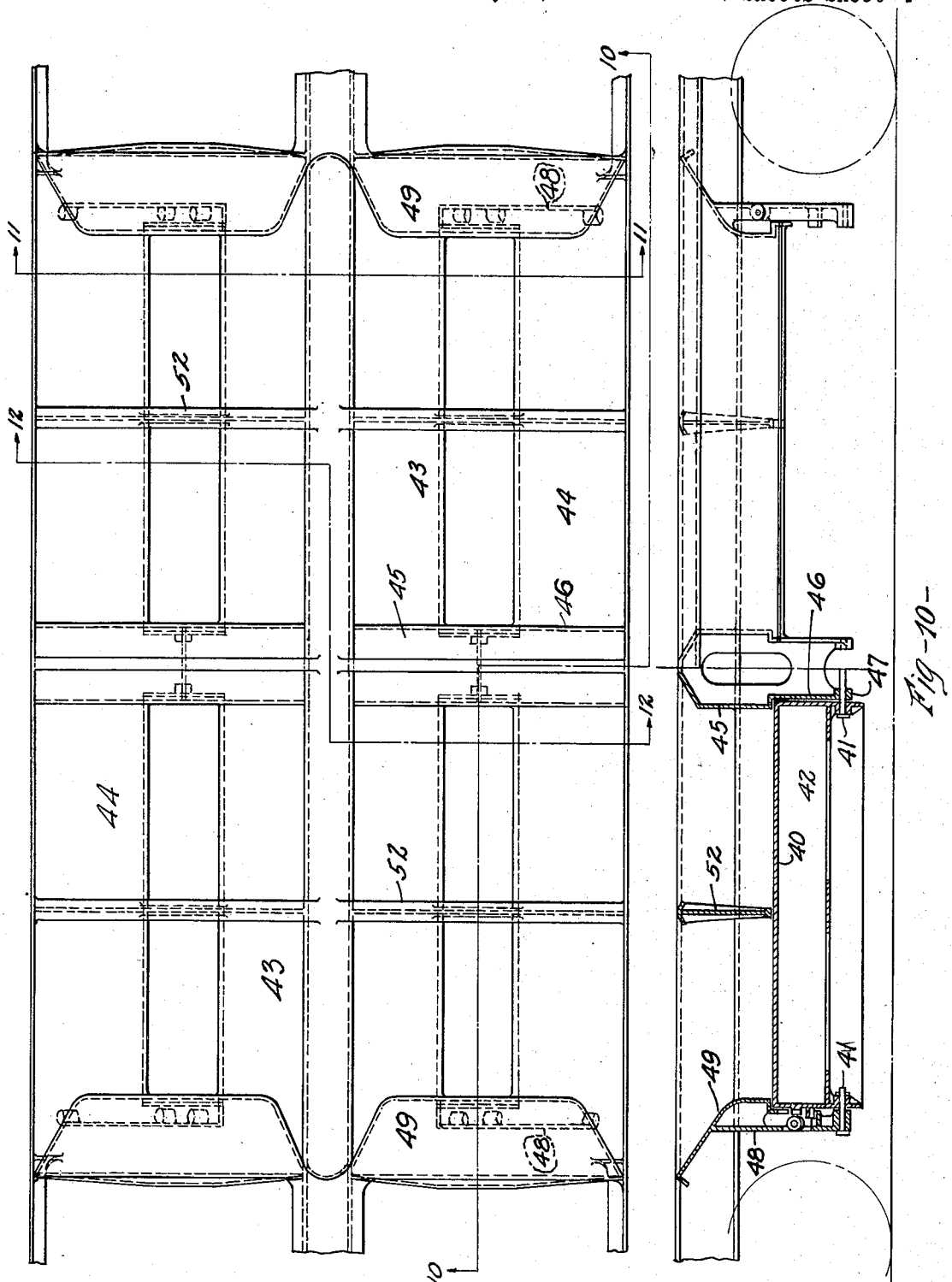


Fig-9-

Fig-10-

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May 26, 1936. E. G. HALLQUIST ET AL 2,042,151

RAILWAY CAR

Filed May 19, 1933 7 Sheets-Sheet 5

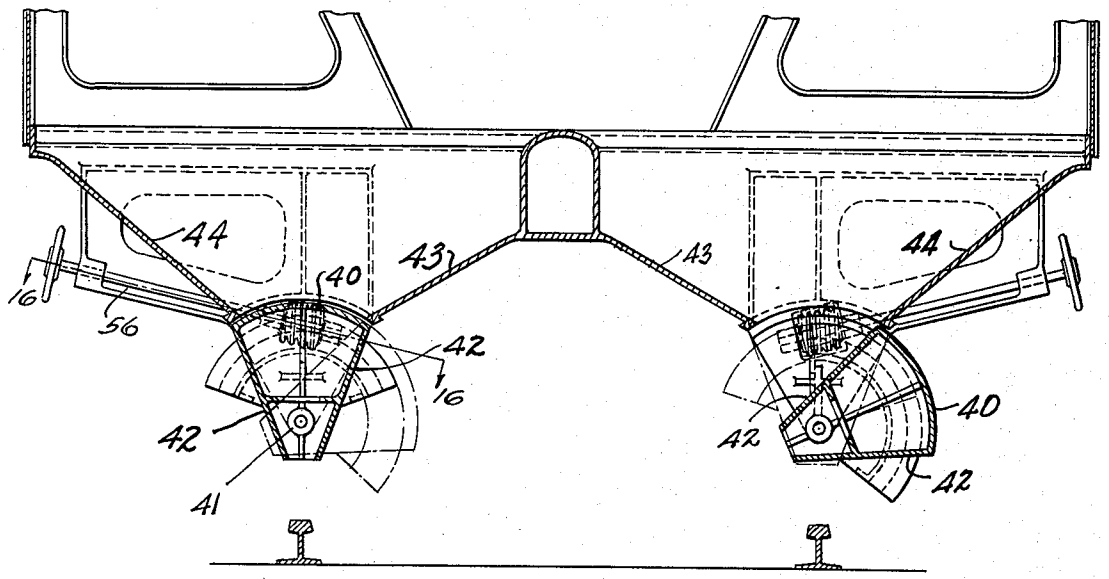


Fig -11-

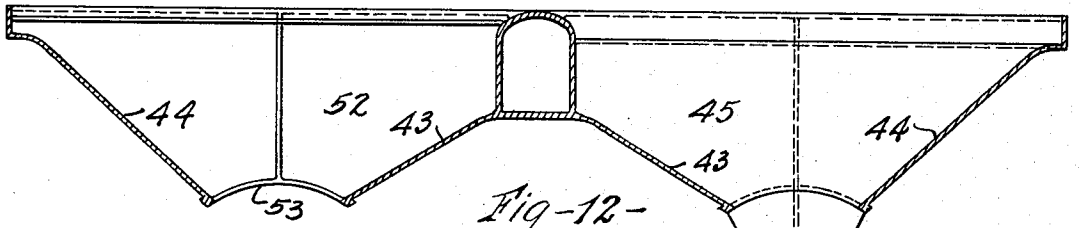


Fig -12-

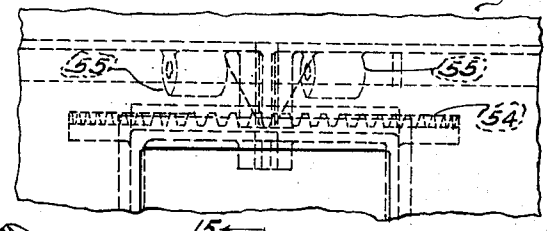


Fig -13-

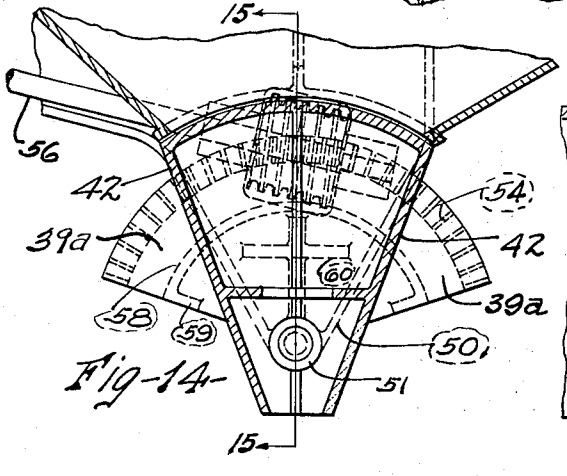


Fig -14-

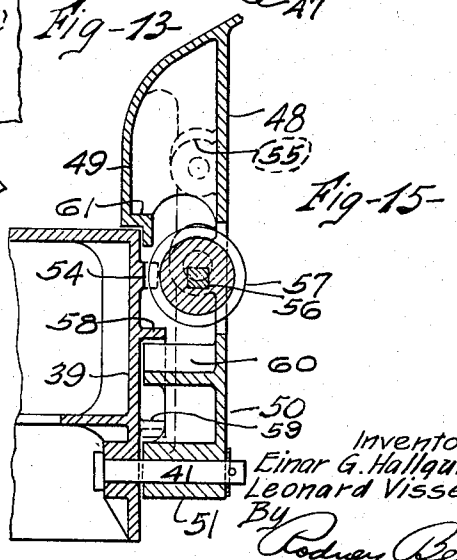


Fig -15-

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RAILWAY CAR

Filed May 19, 1933 7 Sheets-Sheet 6

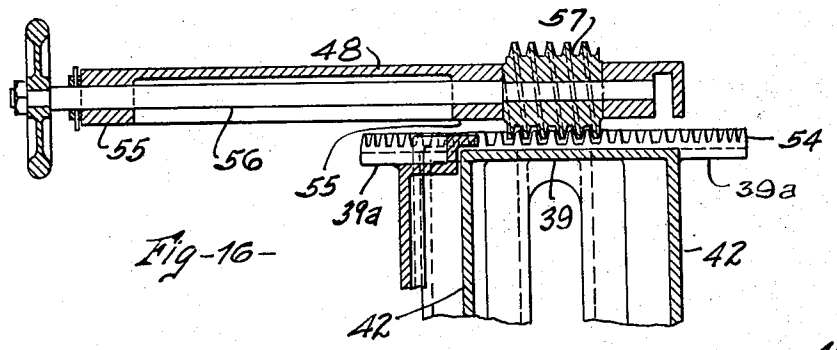


Fig-16-

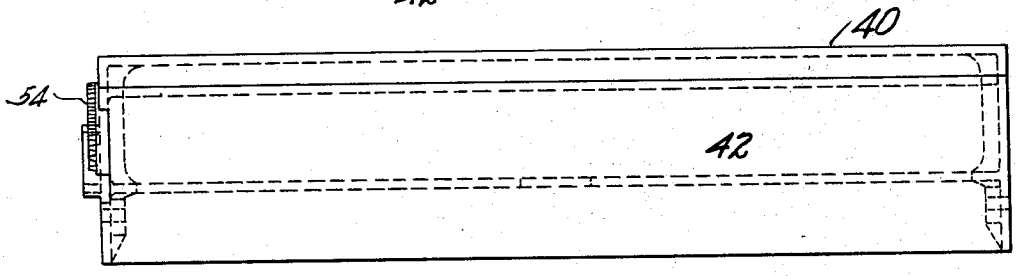


Fig-17-

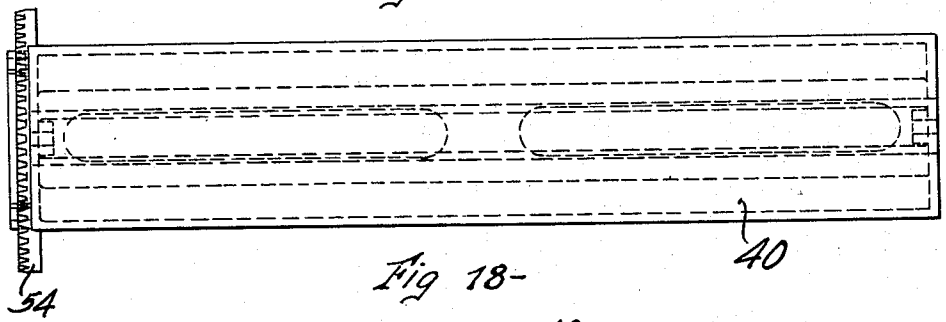


Fig 18-

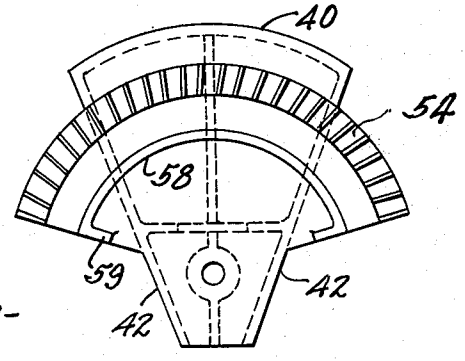


Fig-19-

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RAILWAY CAR

Filed May 19, 1933 7 Sheets-Sheet 7

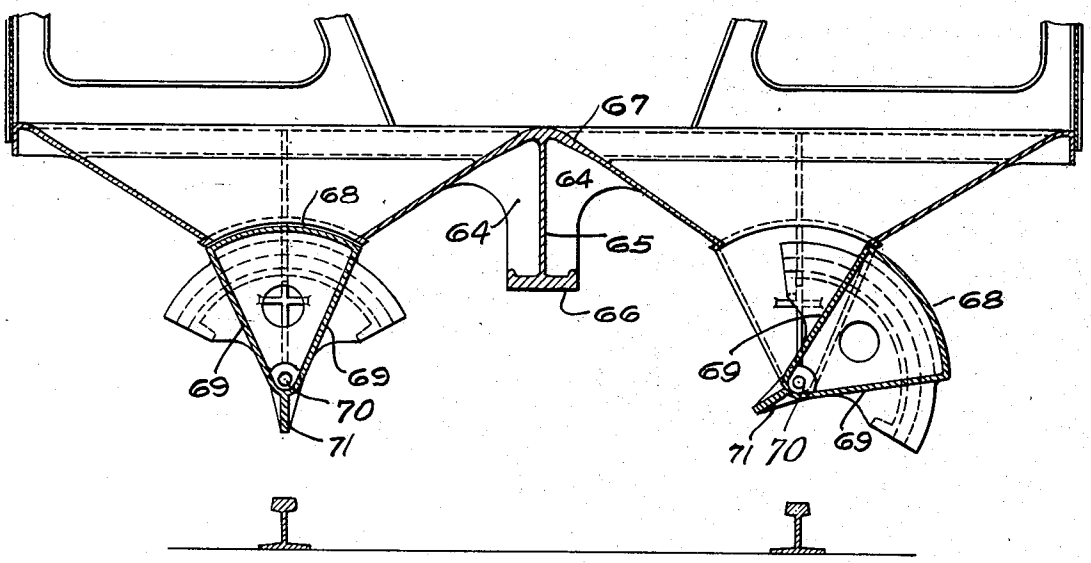


Fig-20-

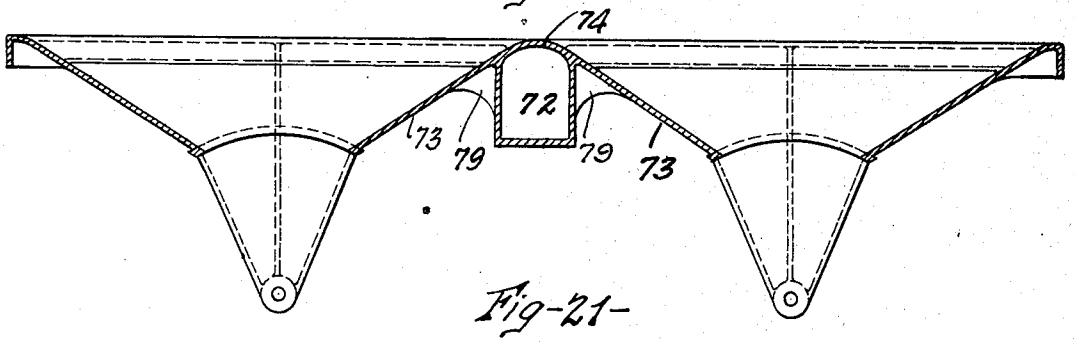


Fig-21-

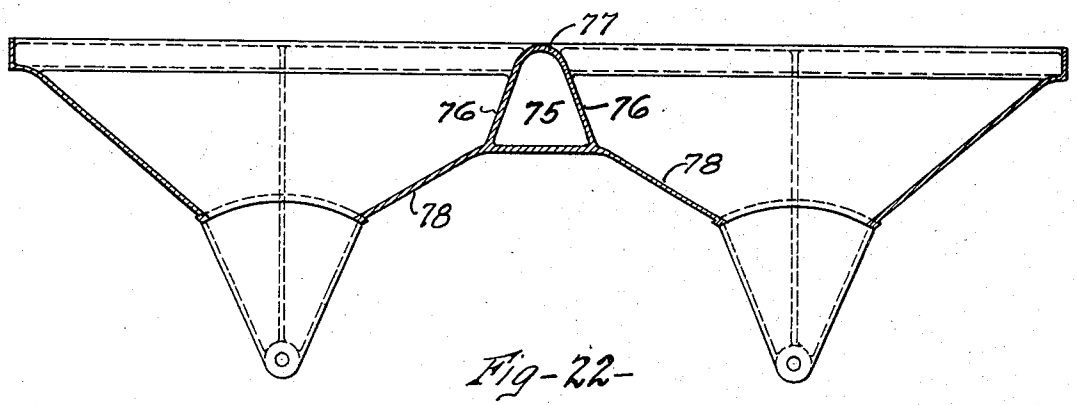


Fig-22-

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Patented May 26, 1936 2,042,151

UNITED STATES PATENT OFFICE

2,042,151

RAILWAY CAR

Einar G. Hallquist, Wallingford, Pa., and Leonard Visser, Granite City, Ill., assignors to General Steel Castings Corporation, Granite City, Ill., a corporation of Delaware

Application May 19, 1933, Serial No. 671,854

17 Claims. (Cl. 105—251)

The invention relates to railway rolling stock and more particularly to hopper cars, and consists in a novel hopper and hopper door construction including associated car underframe parts and accessories.

One of the objects of the invention is to provide a hopper car construction approaching the maximum capacity possible for such cars, but at the same time arranged to discharge the carload between the rails or outside of the rails, as desired.

Another object of the invention is to provide hoppers having sides and discharge openings of greater length than are usually provided without detracting from the rigidity of the underframe and without making the underframe sills and hopper walls of substantially heavier construction than ordinarily required.

Another object of one form of the invention is to provide a simple, effective door operating mechanism which eliminates winding shafts, chains, ratchets, etc., and includes simple, rugged parts formed integrally with the door and hopper.

These and other detailed objects as will be referred to later are attained by the structures illustrated in the accompanying drawings, in which—

The left hand portion of Figure 1 is a top view of the car underframe, and the right hand portion is a top view of the car body.

Figure 2 is in part a side elevation and in part a longitudinal vertical section and is taken on the line 2—2 of Figure 1.

Figure 3 is a vertical transverse section drawn on an enlarged scale and taken on the line 3—3 of Figure 1.

Figure 4 is a detail transverse section through the hopper door structure showing the same in hopper closing position.

Figure 5 illustrates the same door structure in position to discharge the hopper load towards the left.

Figure 6 illustrates the same door structure in position to discharge the hopper load to the right.

Figure 7 is a longitudinal vertical section through one of the hoppers as indicated in Figure 1, but showing the door structure in closed position.

Figure 8 is a bottom view of the structure shown in Figure 7 as indicated by the line 8—8.

Figure 9 is a top view of a hopper portion of a modified form of the invention.

Figure 10 is a vertical longitudinal section and side view taken on the line 10—10 of Figure 9.

Figures 11 and 12 are vertical transverse sections taken on the corresponding section lines of Figure 9.

Figure 13 is a detailed top view illustrating door operating mechanism.

Figure 14 is a transverse section through the door illustrating the same mechanism.

Figure 15 is a longitudinal section through the door taken on the line 15—15 of Figure 14.

Figure 16 is a section inclined slightly to the horizontal and taken on the line 16—16 of Figure 11.

Figure 17 is a side view, and Figure 18 is a top view, and Figure 19 is an end view of one of the doors only.

Figures 20, 21 and 22 are transverse sections through modified constructions illustrating different center sill arrangements and, in Figure 20, illustrating a different door arrangement.

In the construction shown in Figures 1 to 8, inclusive, the underframe comprises a box section center sill having side walls 1, a bottom wall 2 and a convex top wall 3, and including outwardly and downwardly inclined webs 4 forming the inner sides of the hoppers. Depending from this center sill construction are suitable brackets 5 and 6 forming bearings for door operating shafts and sheaves.

The underframe includes side sill-like elements 7 having as integral parts thereof downwardly and inwardly inclined webs 8 forming the hopper outer sides. The side sill and hopper side structure 7—8 include depending brackets 9 and 10 for mounting door operating mechanism.

The underframe includes bolsters 11 by which the car body is mounted upon the truck indicated by the wheels 12. Intermediate the bolsters is a central transom-like structure including spaced vertical webs 13 and an inverted V-shaped top plate 14. Between the structure 13—14 and each bolster is a web 15 having a vertical portion and an inclined portion. Webs 13, 14 and 15 form the ends of the hoppers and also transverse transoms of the underframe structure. Preferably, all of the parts referred to above are cast integrally with each other whereby maximum strength for a given amount of material is possible and the labor and material required for assembling separately formed parts is eliminated and the necessity of frequent inspection and tightening in order to maintain the rigidity of the structure is avoided.

The construction described, when applied to

a car having the outside dimensions common to large capacity railway hopper cars, provides for narrower center and side sills than previous constructions, and produces four hoppers of substantially greater area at the top than the usual hoppers and each having a large opening at the bottom of a length substantially greater than its width.

To reinforce the underframing in view of the large hoppers, there are provided transverse ties each having an inverted V-like top member 17 extending substantially from side sill to side sill and merging with the webs 3 and 8. Each tie also includes a vertical web 18 merging with the center sill webs 1 and with the hopper walls 4 and 8. Vertical webs 18 are reinforced by suitable ribs 19.

Triangular braces 20 are located in the angle formed by ties and the sides 21 of the car superstructure and, preferably, are welded to these parts. These braces extend from near the top of the car sides to points on the ties 17—18 near the center sill structure and cooperate with the remainder of the underframe structure to rigidify the underframe and contribute towards hoppers that will maintain their contour notwithstanding the large area of their discharge openings.

Each door structure consists of two sections 22 and 23. Each section 22 extends between the transverse webs 13 and 15, while section 23 extends just beyond elements 13 and 15. Integral lugs 24 and 25 on door sections 22 and 23, respectively, aline with corresponding lugs 26 provided on webs 13 and 15, and pins 27 extending through lugs 24, 25 and 26 form pivots for the adjacent edges of the door sections. The unpivoted edges of the door sections are raised and lowered by means of chains or cables, indicated at 28, passing over sheaves 29 and wound on drums 30 by any familiar shaft and crank or ratchet arrangement.

As best shown in Figures 3 to 6, the door sections may be manipulated to discharge their load outwardly or inwardly of the rails. To seal the two-part door structure against loss of material when the hopper openings are closed, the two door sections cooperate to form an effective joint. The lower edge of section 22 is curved, as at 32, about the pivot axis and the body of section 23 meets the flat portion of section 22 before the curving of the latter starts. A flange 33 on the lower edge of door section 23 overlies the curved portion 32 of section 22 and terminates in a lip 34 projecting across the lower edge of the other section.

Preferably, the doors are of cast metal reinforced with suitable ribs 35, and include integral lugs 36 to which the operating mechanism may be attached. The upper portion of each door section is depressed, as at 37, and projects beneath the reinforced edges 38 of the hopper sides 4 and 8, thus providing a continuous inclined surface over which the load may pass irrespective of the arrangement of doors for dumping either inside or outside of the rail.

The general arrangement of the underframe and hopper sides in the modification shown in Figures 9 to 19 is the same as that previously described, but the door construction and assembly and operating arrangement differs from that described above. Each door includes a convexly arched top plate 40, curved about an axis coinciding with the door pivot 41, and side plates 42 depend from the outer edges of top plate 40 and converge towards a point substantially below the level of the door pivots. The door may be tilted in either direction from the hopper closing position shown in Figure 11 to a position in which one of the side plates forms a continuation of the hopper inner side 43, or to a position in which the other side plate 42 forms a continuation of the hopper outer side 44. The underframe transom 45 has an offset depending triangular extension 46 terminating in the bearing 47 for one of the door mounting pivots 41.

A vertical web 48 depends from the inclined end wall 49 at the other end of the hopper and includes a similar triangular extension 50 terminating in a bearing 51 for the other door pivot pin 41. The intermediate tie 52 has a lower portion terminating in an arcuate section 53 for accommodating the arched top plate of the door.

The outer end wall 39 of each door (Figures 16–19) is provided with extensions 39a projecting at each side beyond sides 42 and having an integral gear or rack 54 and the vertical web 48 has enlarged portions 55 for journaling a shaft 56 for the worm 57 which meshes with the gear 54 whereby the door may be oscillated in either direction to open to either dumping position or to closed position.

An arcuate reinforcing flange 58 rigidifies the end of the door and protects the teeth of gear 54, and the ends of this flange are turned inwardly, as at 59, to form stops for abutting a lug 60 on the web 48 to limit the movement of the door. The lowermost portion of wall 49 is offset, as indicated at 61, to accommodate the end of the door similarly to the offsetting of projection 46 on the center transom. The stops 59 are spaced substantially sidewardly of the door side walls 42 so that the door will be in the full open position when either stop 58 engages the center stop 60 (see right hand side of Figure 11).

By casting the door top plate, side plates, pivot bearings, and gear teeth as a unit, and by casting the hopper end wall 49, web 48, bearings 55 and lug 60 as a unit, the structure is simplified and made very rugged so as to adequately withstand the forces incident to the rough handling of heavy material which characterizes the use of cars of this type. As previously indicated, assembling and maintenance costs are minimized.

Figure 20 illustrates a modified structure in which the center sill comprises a main vertical web 65 having a heavy bottom flange 66 extending on both sides thereof and also having a top flange or flanges 67 extending downwardly and outwardly in opposite directions from the longitudinal center line of the car and forming the hopper inner sides. Flanges 67 are thickened where they merge with the vertical web 65 and thus provide adequate sill strength without necessitating a joint in the hopper side or a heavier hopper side plate. Suitable transverse webs 64 brace the remainder of the sill and hopper side structure.

The top plate 68 of the door corresponds to the top plate of the door shown in Figure 11, but the door side plates 69 merge with each other immediately below the door axis 70 and a downwardly projecting flange 71 forms a hopper extension deflector which serves to clear the rail, when the contents of the hopper are discharged, irrespective of the direction of the discharge.

In the modification illustrated in Figure 21, the center sill proper 72 corresponds to that shown in Figures 3 and 11, but the hopper sides 73 extend downwardly and outwardly from the arcuate top wall 74 of the center sill instead of from the lower

corners of the latter. This permits the door to be located a greater distance from the rail than is practical with the box section center sill and hopper sides previously described. Transverse ribs 79 brace the hopper sides from the center sill.

Figure 22 illustrates a modification embodying a substantially triangular shaped center sill 75 having upwardly and inwardly inclined side webs 76 merging in an arcuate section 77 and with the hopper inner sides 78 extending outwardly and downwardly from the lower corners of the sill.

Each of the forms of the center sill structure illustrated possesses certain advantages which may be of relative importance according to the requirements of the capacity and service demanded of the car, but all of the structures described are adapted to attain the main objects of the invention set forth in the introductory portion of the specification. Various other modifications and details of the sill, hopper wall, and door construction may be made without departing from the spirit of the invention and the exclusive use of all such modifications is contemplated.

What is claimed is:

1. In a hopper car metal underframe, a center sill and a side sill, transverse framing members therebetween, said sills having integral elements inclined downwardly therefrom and forming the sides of a hopper, and an upright web forming a tie above the hopper discharge opening intermediate its ends and merging with said elements and having downwardly inclined top flanges.

2. A hopper car cast metal underframe including center and side framing members, elements inclined downwardly from said center and side framing members and forming hopper sides, elements inclined downwardly from and extending between said center and side framing members and forming hopper ends, and an upright web of substantial depth forming a tie above the hopper discharge opening intermediate said ends and merging with said center and side framing members and with said hopper sides.

3. In a hopper car, an underframe including a center sill, a side sill, and transoms, a superstructure side wall extending up from said side sill, hopper sides and ends extending downwardly from said sills and transoms, a tie extending across the hopper opening and between said sills and intermediate said ends, and a brace between portions of said tie and said wall spaced substantially from said side sill.

4. In a hopper car, a cast metal underframe including a center sill and a side sill, inclined hopper sides extending downwardly from said sills, inclined hopper ends extending between said sills and merging with the latter and with said hopper sides, a superstructure side wall extending upwardly from said side sill, and a brace intermediate said ends extending between the inner of said hopper sides and the upper portion of said side wall.

5. In a hopper car, an underframe including side and center sill structures and transoms, superstructure side walls extending up from said side sill structure, a hopper between said center sill structure and each of said side sill structures and having sides and ends extending downwardly from said sill structures and transoms, a tie intermediate the ends of said hoppers and extending from side to side of the underframe across the hopper openings, and individual, triangular braces between said tie and each of said side walls and extending from near the top of said walls to said tie at points near said center sill structure.

6. A hopper car underframe having a box-shape center sill, the top wall of which is curved and which continues outwardly and downwardly from the upper portions of the side webs of the sill to form the inner sloping sides of the hoppers.

7. A hopper car underframe having a center sill of triangular cross-section with its apex pointing upwardly, and hopper walls merging with the bottom horizontal member thereof.

8. A hopper car underframe having a center sill substantially triangular shaped in cross section, two walls of said sill being inclined upwardly and towards each other, and having an arcuate connection at the top, the other wall of said sill forming a horizontal member extending between the lower edges of said side walls, and inclined hopper walls merging with said center sill at the intersection of said side walls and horizontal member.

9. A hopper car integral center sill structure comprising a single main vertical web and hopper side wall forming webs projecting and tapering in thickness downwardly and outwardly from the upper portion thereof and constructed and arranged to form horizontal force-transmitting parts of the center sill structure.

10. A hopper car center sill integral structure as described in claim 9 which also includes a transverse reinforcing flange on the lower portion of the main vertical web, and a plurality of transverse vertical webs between said web flange and the webs forming the hopper side walls.

11. A hopper car center sill structure comprising a main vertical web and hopper side forming webs extending downwardly and outwardly from the upper portion of said web and decreasing in thickness from the vertical web outwardly.

12. A hopper car center sill structure as described in claim 11 which also includes a transverse reinforcing flange on the lower portion of the main vertical web, and a plurality of transverse vertical webs between said main vertical web and said hopper side forming webs.

13. A car frame of the character described, comprising a center sill having inclined top surfaces adapted to shed lading therefrom, integrally formed cross ties having inclined top surfaces adapted to shed lading therefrom, and integrally formed inclined walls projecting downwardly and away from said center sills on each side thereof throughout the extent of said center sill which is coextensive with the space between said cross ties, said inclined walls providing slope sheets as portions of hoppers on each side of said inner sill and also providing integral strengthening members for said center sill.

14. A car frame of the character described comprising a center sill having inclined top surfaces adapted to shed lading therefrom, integrally formed cross ties having inclined top surfaces adapted to shed lading therefrom, and, integrally formed inclined walls projecting downwardly and away from said center sills on each side thereof throughout the extent of said center sill which is coextensive with the space between said cross ties, said inclined walls providing slope sheets as portions of hoppers on each side of said center sill and also providing integral strengthening members for said center sill, and integrally formed wall members carried between said cross ties and spaced outwardly from said center sill and providing hopper walls extending downward-

ly and toward said inclined walls of said center sill.

15. An integrally formed car frame of the character described, comprising a longitudinally disposed center sill, a pair of side sills spaced from and disposed parallel to said center sill and integrally connected thereto by cross ties, and integrally formed wall members carried by said cross ties disposed in the space between, and extending parallel to said center sill and said side sills, said last named members being inclined inwardly and downwardly and serving as slope sheets for hoppers on each side of said center sill.

16. An integrally formed car frame of the character described, comprising a longitudinally disposed center sill, a pair of side sills spaced from and disposed parallel to said center sill and integrally connected thereto by cross ties, and integrally formed members carried by said cross ties disposed in the space between, and extending parallel to said center sill and said side sills, said last members being inclined inwardly and downwardly and serving as slope sheets for hoppers on each side of said center sill, and inclined wall portions integral with said center sill and projecting downwardly and toward said inclined wall members providing inner slope sheets for said hoppers and strengthening members for said center sill.

17. An integrally formed car frame of the character described, comprising a longitudinally disposed center sill, a pair of side sills spaced from and disposed parallel to said center sill and integrally connected thereto by cross ties, and integrally formed wall members carried by said cross ties disposed in the space between, and extending parallel to said center sill and said side sills, said last members being inclined inwardly and downwardly and serving as slope sheets for hoppers on each side of said center sill, and inclined wall portions integral with said center sill and projecting downwardly and toward said inclined wall members providing inner slope sheets for said hoppers and strengthening members for said center sill, said center sill and cross ties having upper inclined surfaces for shedding lading therefrom.

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