

April 7, 1964

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3,127,851

RAILWAY HOPPER CARS

Filed July 13, 1960

2 Sheets-Sheet 1

FIG. 1

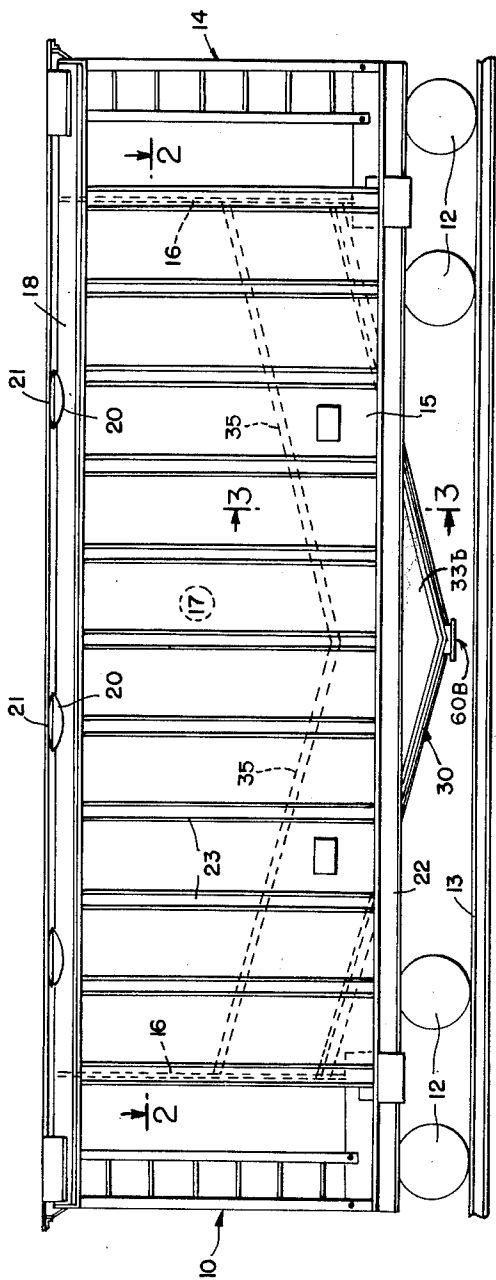
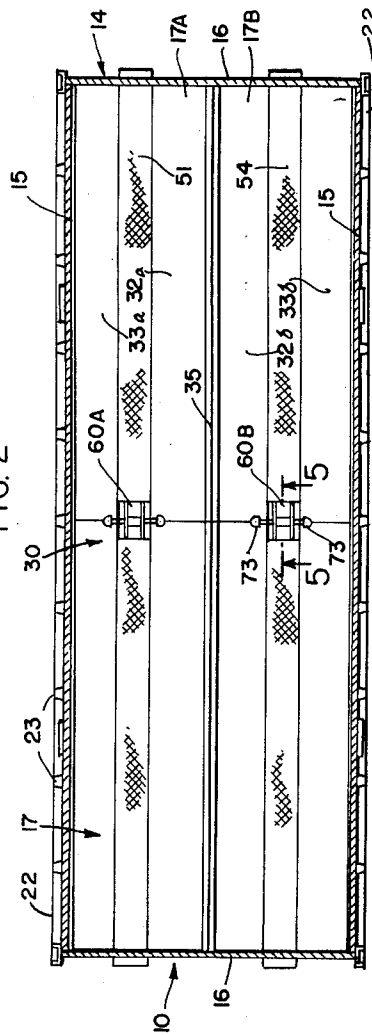


FIG. 2



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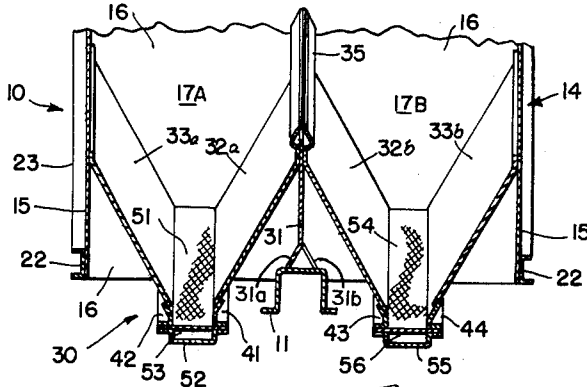


FIG. 3

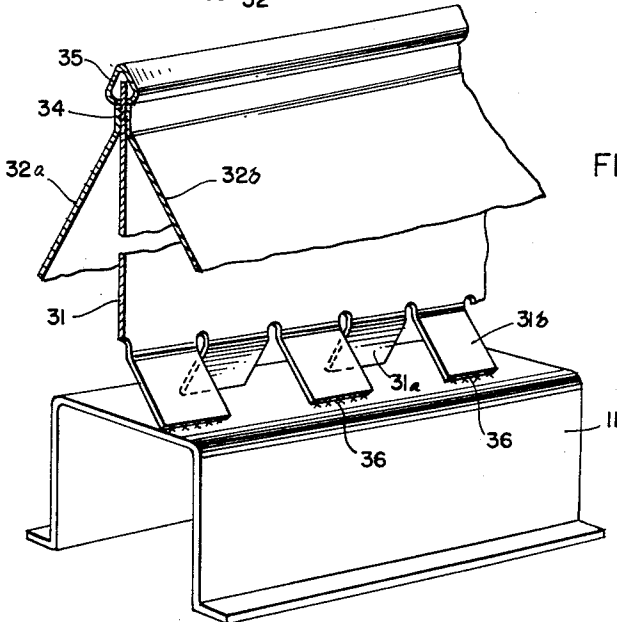


FIG. 4

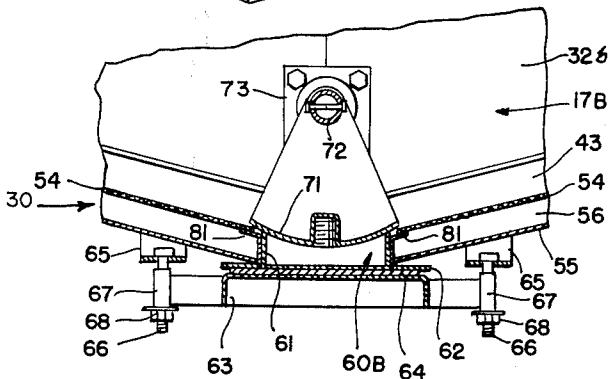


FIG. 5

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**RAILWAY HOPPER CARS**

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Filed July 13, 1960, Ser. No. 42,547

5 Claims. (Cl. 105-248)

The present invention relates to railway hopper cars for storage and transportation of finely divided or granular materials, such, for example, as flour, malt, plastic resin beads, or the like; and it is a general object of the invention to provide an improved railway hopper car of the general construction and arrangement of that disclosed in U.S. Patent No. 2,789,739, granted on April 23, 1957 to Edmund R. Aller.

Another object of the invention is to provide in a railway hopper car comprising a rigid underframe including an elongated rigid center sill, and a body carried on top of the underframe, improved structure arranged within the body and dividing the interior thereof into a plurality of hoppers adapted to receive the granular material; wherein the structure comprises an elongated upstanding divider sheet disposed above the center sill and provided with a plurality of feet on the bottom edge thereof directly engaging the top of the center sill and rigidly secured thereto, and a pair of elongated hopper sheets respectively disposed on opposite sides of the divider sheet and respectively sloping downwardly and outwardly therefrom in opposite directions, wherein the pair of hopper sheets respectively constitute portions of an adjacent pair of the hoppers, the top edges of the hopper sheets being respectively rigidly secured to the adjacent upper portions of the divider sheet well above the center sill, whereby at least portions of the loads of granular material respectively supported by the hopper sheets are transmitted through the divider sheet to the center sill.

A further object of the invention is to provide a railway hopper car of the character described, wherein the feet provided on the bottom edge of the divider sheet are formed integrally therewith, odd ones of the feet being offset outwardly from the adjacent one side of the divider sheet, and even ones of the feet being offset outwardly from the adjacent other side of the divider sheet.

A still further object of the invention is to provide a railway hopper car of the character described, wherein both the center sill and the divider sheet are formed of metal, and the feet provided on the bottom edge of the divider sheet are welded to the engaged top of the center sill.

Further features of the invention pertain to the particular arrangement of the elements of the railway hopper car, whereby the above-outlined and additional operating features thereof are attained.

The invention, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following specification, taken in connection with the accompanying drawings, in which:

FIGURE 1 is a side elevational view of a railway hopper car embodying the present invention;

FIG. 2 is a fragmentary horizontal sectional view of the railway hopper car, taken in the direction of the arrows along the line 2-2 in FIG. 1, and illustrating the structure arranged within the body thereof and dividing the interior of the body into a pair of longitudinally extending and laterally spaced-apart hoppers;

FIG. 3 is a fragmentary vertical sectional view of the railway hopper car, taken in the direction of the arrows along the line 3-3 in FIG. 1, and illustrating the arrangement of the divider sheet supporting the pair of centrally disposed longitudinally extending hopper sheets

respectively constituting portions of the pair of hoppers mentioned;

FIG. 4 is a greatly enlarged fragmentary front perspective view, taken through the central portion of the body of the railway hopper car, as shown in FIG. 3, and further illustrating the construction and arrangement of the dividing structure mentioned; and

FIG. 5 is a greatly enlarged vertical sectional view of the railway hopper car, taken in the direction of the arrows along the line 5-5 in FIG. 2, and illustrating the valve arrangement disposed in the bottom of one of the pair of hoppers provided in the body thereof.

Referring now to FIGS. 1 to 4, inclusive, of the drawings, the railway hopper car 10 there illustrated and embodying the features of the present invention is especially adapted for storage and transportation of finely divided or granular materials, such, for example, as flour, malt, plastic resin beads, or the like; and the car 10 comprises a rigid underframe, including a longitudinally extending center sill 11; which underframe is supported adjacent to the opposite ends thereof by a pair of trucks provided with track wheels, indicated at 12, and cooperating with an associated railway track, indicated at 13. The underframe carries a body 14 comprising wall structure, including a pair of longitudinally extending and laterally spaced-apart side walls 15 and a pair of laterally extending and longitudinally spaced-apart end walls 16 cooperating to define therein a lading compartment, indicated generally at 17. The body 14 also includes roof structure 18 and bottom wall structure, indicated at 30 and described more fully hereinafter. Also, the roof structure 18 includes a number of longitudinally spaced-apart filling hatches 20 disposed on either side thereof and provided with removable hatch covers 21. The lower edges of the side walls 15 are suitably reinforced by a pair of longitudinally extending and laterally spaced-apart side sills 22; and each of the side walls 15 is suitably reinforced by a plurality of longitudinally spaced-apart upstanding posts 23; whereby the body 14 is of strong rigid construction to prevent bulging thereof when the lading compartment 17 is filled with the finely divided or granular material.

The bottom wall structure 30 arranged in the lower portion of the body 14 divides the lading compartment 17 into a pair of longitudinally extending and laterally spaced-apart hoppers 17A and 17B; which structure 30 includes a longitudinally extending upstanding divider sheet 31, a pair of longitudinally extending inside hopper sheets 32a and 32b respectively disposed on opposite sides of the divider sheet 31 and a pair of outside hopper sheets 33a and 33b respectively disposed adjacent to the side walls 15. The inside hopper sheets 32a and 32b respectively slope downwardly and outwardly from the opposite sides of the divider sheet 31; and the outside hopper sheets 33a and 33b respectively slope downwardly and inwardly from the adjacent side walls 15. Accordingly, the cooperating pair of hopper sheets 32a and 33a converge downwardly to define the bottom of the hopper 17A; and likewise, the cooperating pair of hopper sheets 32b and 33b converge downwardly to define the bottom of the hopper 17B. The elements 15, 31, 32a, 32b, 33a and 33b are normally formed of steel; the upper edges of the outside hopper sheets 33a and 33b are respectively rigidly secured, as by welding, to the adjacent inside surfaces of the side walls 15; and the adjacent upper edges of the inside hopper sheets 32a and 32b are respectively rigidly secured, as by welding, to the adjacent upper surfaces of the divider sheet 31. More particularly, as best shown in FIG. 4, the adjacent upper edges of the inside hopper sheets 32a and 32b are disposed in facing relation with each other with the top edge of the divider sheet 31 disposed therebetween to define a three-layer sandwich con-

struction; which sandwich construction is secured in assembled relationship by welding therethrough, as indicated at 34. The extreme top edge of the divider sheet 31 projects somewhat above the adjacent top edges of the inside hopper sheets 32a and 32b and receives an associated longitudinally extending cap 35 that is disposed in a covering relation therewith. Preferably, the cap 35 has a general pyramidal configuration in lateral cross-section, so that it also projects laterally outwardly over the adjacent top edges of the inside hopper sheets 32a and 32b; whereby the cap 35 prevents the accumulation of finely divided or granular material upon the top edges of the divider sheet 31 and the inside hopper sheets 32a and 32b incident to unloading of the material from the lading compartment 17 through the two hoppers 17A and 17B, as explained more fully hereinafter.

As best shown in FIG. 4, the bottom edge of the divider sheet 31 carries a plurality of feet 31a and 31b formed integrally therewith, odd ones of the feet 31a being offset laterally therefrom toward the inside hopper sheet 32a, and even ones of the feet 31b being offset laterally therefrom toward the inside hopper sheet 32b, whereby the feet 31a and 31b are disposed in staggered relation. The feet 31a and 31b directly engage the top of the center sill 11 that may have the general configuration of an inverted channel section, the center sill being normally formed of steel. The feet 31a and 31b engaging the top of the center sill 11 are rigidly secured in place, as by welding, as indicated at 36. Accordingly, it will be understood that when the lading compartment 17 is filled with the finely divided or granular material, the weight thereof is supported primarily by the hopper sheets 32a, 32b, 33a and 33b. The inside hopper sheets 32a and 32b are supported fundamentally by the divider sheet 31 that, in turn, is supported directly through the feet 31a and 31b by the center sill 11. Of course, the outside hopper sheets 33a and 33b are supported fundamentally by the adjacent side walls 15 that are reinforced by the outside posts 23 and further supported by the side sills 22.

The lower edges of the hopper sheets 32a and 33a respectively carry longitudinally extending elements 41 and 42 that are rigidly secured thereto, as by welding, each of the elements 41 and 42 having a generally angularly lateral cross-section and normally formed of steel; similarly, the lower edges of the hopper sheets 32b and 33b respectively carry longitudinally extending elements 43 and 44 that are rigidly secured thereto, as by welding, each of the elements 43 and 44 having a generally angular lateral cross-section, and normally formed of steel. The elements 32a, 33a, 41 and 42 define the downwardly converging hopper 17A of trough-like configuration having a longitudinally extending bottom opening that is, in turn, covered by a longitudinally extending fabric sheet 51 that is held in place by an associated longitudinally extending cover 52 having a generally channel-shaped configuration in lateral cross-section and defining a plenum chamber 53 disposed below the fabric sheet 51. Similarly, the elements 32b, 33b, 43 and 44 define the downwardly converging hopper 17B of trough-like configuration having a longitudinally extending bottom opening that is, in turn, covered by a longitudinally extending fabric sheet 54 that is held in place by an associated longitudinally extending cover 55 having a generally channel-shaped configuration in lateral cross-section and defining a plenum chamber 56 that is disposed below the fabric sheet 54.

As indicated in FIG. 1, and as shown in FIGS. 3 to 5, inclusive, the elements defining the hoppers 17A and 17B also slope downwardly from the opposite end walls 16 toward the center of the body 14; whereby each of the textile sheets 51 and 54 slopes downwardly from the opposite end walls 16 toward the center of the body 14; and two bottom outlet structures 60A and 60B are respectively provided in the bottoms of the hoppers 17A and 17B adjacent to the center of the body 14 and in laterally spaced-apart relation with each other, as best shown in

FIG. 2. Referring now to FIG. 5, the bottom outlet structure 60B there illustrated essentially comprises an upstanding substantially rectangular throat element 61 communicating between the central portion of the hopper 17B and the exterior of the body 14, the throat element 61 terminating below the adjacent cover 55 in an outwardly directed rectangular flange 62. The lower open end of the throat element 61 is normally closed by an exterior gate 63 that is detachably secured in place below the flange 62 with a sealing gasket 64 disposed therebetween. More particularly, the exterior gate 63 is detachably secured in place upon the cover 55 by an arrangement including a plurality of depending brackets 65 carried by the lower surface of the cover 55 and a plurality of cooperating bolts 66 carried by the brackets 65 and cooperating with a plurality of arms 67 carried by the exterior gate 63, the arms 67 being normally secured in place by nuts 68 carried on the extreme outer ends of the bolts 66.

In the bottom outlet structure 60B, the upper open end of the throat element 61 is selectively closed by a cooperating valve element 71 that is carried by a laterally extending trunnion 72 that is mounted upon a pair of laterally spaced-apart bearing members 73 respectively carried by the hopper sheets 32b and 33b. Accordingly, the valve element 71 is arranged in the bottom of the hopper 17B and is selectively rotatable with the trunnion 72 between open and closed positions with respect to the upper open end of the throat element 61 the valve element 71 being shown in its closed position in FIG. 5. Also, the upper end of the throat element 61 joins the adjacent portions of the textile fabric sheet 54, the adjacent portions of the textile fabric sheet 54 being secured in place upon outwardly directed flanges carried by the upper portion of the throat element 61 by rivets, or the like, as indicated at 81.

Again reverting to FIG. 4, it is pointed out that while the hopper sheets 32a, 32b, 33a and 33b slope downwardly from the opposite end wall 16 toward the center of the body 14, the center sill 11 is disposed in a substantially horizontal position; whereby the upstanding divider sheet 31 is itself tapered. More specifically, the top edge of the divider sheet 31 adjacent to each of the end walls 16 is disposed above the feet 31a and 31b a relatively great distance, and the top edge of the divider sheet 31 adjacent to the center of the body 14 is disposed above the feet 31a and 31b a relatively small distance. This construction insures that the fundamental loads carried by the inside hopper sheets 32a and 32b are supported uniformly longitudinally therealong through the longitudinally extending upstanding divider sheet 31 upon the longitudinally extending substantially horizontally disposed center sill 11, and notwithstanding the downward sloping of the inside hopper sheets 32a and 32b from the end walls 16 toward the center of the body 14.

In view of the foregoing description of the bottom structure 30 of the body 14, it will be understood that the hopper 17A converges downwardly laterally toward the textile fabric sheet 51 and converges downwardly longitudinally toward the bottom outlet structure 60A. Similarly, the hopper 17B converges downwardly laterally toward the textile fabric sheet 54 and converges downwardly longitudinally toward the bottom outlet structure 60B. The textile fabric sheet 51 is thus downwardly inclined longitudinally from the opposite end walls 16 toward the bottom outlet structure 60A; and the textile fabric sheet 54 is thus downwardly inclined longitudinally from the opposite end walls 16 toward the bottom outlet structure 60B. The textile fabric sheet 51 is of porous structure, so that it adequately stoppers or closes the bottom of the hopper 17A, while accommodating the upward passage therethrough of air under slight gauge pressure from the associated plenum chamber 53 defined by the associated cover 52, for the purpose of fluidizing the bottom of the bed of finely divided or granular material contained in the hopper 17A. Sim-

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ilarly, the textile fabric sheet 54 is of porous structure, so that it adequately stoppers or closes the bottom of the hopper 17B, while accommodating the upward passage therethrough of air under slight gauge pressure from the associated plenum chamber 56 defined by the associated cover 55, for the purpose of fluidizing the bottom of the bed of finely divided or granular material contained in the hopper 17B. Of course, it will be understood that the railway car 10 comprises suitably pump machinery, not shown, for the purpose of supplying, when required, air at slight gauge pressures into the plenum chambers 53 and 56 for the purpose of fluidizing the bottoms of the beds of finely divided or granular material respectively contained in the hoppers 17A and 17B.

Considering now the general mode of loading the finely divided or granular material into the lading compartment 17 of the body 14, the bottom outlet structures 60A and 60B are closed and the loading hatches 20 are opened by the removal of the associated hatch covers 21. The finely divided or granular material is normally blown through the loading hatches 20 into the lading compartment 17; whereupon the loading hatches 20 are closed by returning the associated hatch covers 21 back into their sealed positions. For example, the bottom outlet structure 60B provided in the bottom of the hopper 17B is closed, both by operating the valve element 71 into its closed position with respect to the top opening in the throat element 61 and by placing the exterior gate 63 in its closed position covering the bottom opening into the throat element 61.

In unloading the finely divided or granular material from the lading compartment 17, the bottom outlet structures 60A and 60B are opened and normally several of the hatch covers 21 are removed from the associated loading hatches 20. Specifically, in order to open the bottom outlet structure 60B, the exterior gate 63 is removed from the bottom outlet into the throat element 61 and the valve element 71 is operated into its open position with respect to the top opening into the throat element 61. At this time, the finely divided or granular material in the hopper 17B is free to fall out through the bottom outlet structure 60B; and in order to facilitate this unloading of the material from the hopper 17B, air under slight gauge pressure is supplied into the plenum chamber 56 and passes upwardly through the associated textile fabric sheet 54, so as to effect fluidizing of the bottom of the bed of finely divided or granular material contained in the hopper 17B. More particularly, the material at the bottom of the bed contained in the hopper 17B is fluidized and slides downwardly along the upward surface of the textile fabric sheet 54 in both directions longitudinally from the end walls 16 toward the bottom outlet structure 60B; whereby the material is unloaded from the hopper 17B and falls through the open bottom outlet structure 60B in an obvious manner.

The unloading of the hopper 17A is the same as that described above in conjunction with the unloading of the hopper 17B and is not repeated in the interest of brevity.

After the finely divided or granular material has been completely unloaded from the lading compartment 17 of the body 14, the hatch covers 21 are returned into their normal sealed positions with respect to the loading hatches 20 and the bottom outlet structures 60A and 60B are returned into their normal closed positions. Specifically, the bottom outlet structure 60B is returned into its normal closed position, both by the return of the valve 71 into its closed position and by the replacement of the exterior gate 63.

In view of the foregoing, it is apparent that there has been provided in a railway hopper car improved bottom structure arranged in the body thereof and dividing the lading compartment defined in the body into a plurality of hoppers adapted to receive finely divided or granular material, wherein the bottom structure affords complete support for the hopper sheets incorporated therein so

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as to prevent bulging or other undue distortion of the hopper sheets when the hoppers are loaded with the material mentioned.

While there has been described what is at present considered to be the preferred embodiment of the invention, it will be understood that various modifications may be made therein, and it is intended to cover in the appended claims all such modifications as fall within the true spirit and scope of the invention.

What is claimed is:

1. A railway car comprising a rigid underframe including an elongated rigid longitudinally extending center sill, an elongated longitudinally extending upstanding substantially box-like body carried on top of said underframe, and structure arranged within said body and dividing the interior thereof into a pair of elongated longitudinally extending and laterally spaced-apart hoppers adapted to receive granular material; said structure comprising an elongated longitudinally extending upstanding divider plate arranged directly above said center sill and provided with a plurality of longitudinally spaced-apart feet on the bottom edge thereof directly engaging the top of said center sill and rigidly secured thereto, and a pair of elongated longitudinally extending hopper sheets disposed in laterally spaced-apart relation and respectively arranged on opposite sides of said divider plate and respectively sloping downwardly and laterally outwardly therefrom in opposite directions, said pair of hopper sheets respectively constituting portions of said pair of hoppers, the top edges of said hopper sheets being respectively rigidly secured to the adjacent upper portions of said divider plate well above said center sill, whereby at least portions of the loads of granular material respectively supported by said hopper sheets are transmitted directly through said divider plate to said center sill.

2. The railway car set forth in claim 1, wherein said feet provided on the bottom edge of said divider plate are formed integrally therewith, odd ones of said feet being offset laterally outwardly from the adjacent one side of said divider plate, and even ones of said feet being offset laterally outwardly from the adjacent other side of said divider plate.

3. The railway car set forth in claim 2, wherein both said center sill and said divider plate are formed of metal, and said feet are welded to the engaged top of said center sill.

4. The railway car set forth in claim 1, wherein the top edges of said hopper sheets are disposed in facing relation with each other with the top edge of said divider plate positioned therebetween to define a 3-layer sandwich construction, said divider plate and said hopper sheets being formed of metal, and the top portion of said divider plate and the top portions of said hopper sheets being secured together by welding through said 3-layer sandwich construction.

5. A railway car comprising a rigid underframe including an elongated rigid longitudinally extending center sill, an elongated longitudinally extending upstanding substantially box-like body carried on top of said underframe, and structure arranged within said body and dividing the interior thereof into a pair of elongated longitudinally extending and laterally spaced-apart hoppers adapted to receive granular material; said structure comprising an elongated longitudinally extending upstanding divider plate arranged directly above said center sill and provided with a plurality of longitudinally spaced-apart feet on the bottom edge thereof directly engaging the top of said center sill and rigidly secured thereto, a pair of elongated longitudinally extending hopper sheets disposed in laterally spaced-apart relation and respectively arranged on opposite sides of said divider plate and respectively sloping downwardly and laterally outwardly therefrom in opposite directions, said pair of hopper sheets respectively constituting portions of said pair of hoppers, the top edges of said hopper sheets being re-

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respectively rigidly secured to the adjacent surfaces of said divider plate adjacent to the top edge thereof, whereby at least portions of the loads of granular material respectively supported by said hopper sheets are transmitted directly through said divider plate to said center sill, and an elongated longitudinally extending cap secured to the top edge of said divider plate and disposed in covering relation therewith and with the top edges of said hopper sheets, thereby to prevent the accumulation of granular material upon the top edge of said divider plate and the

top edges of said hopper sheets incident to unloading thereof from said pair of hoppers.

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