W. P. MURPHY.
CORRUGATED SHEET METAL END STRUCTURE FOR RAILWAY CARS.
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INVENTOR

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BY

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ATTORNEYS.
To all whom it may concern:

Be it known that I, WALTER P. MURPHY, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Corrugated-Sheet-Metal End Structures for Railway-Cars, of which the following is a specification.

My invention relates to a sheet metal end for railway cars, particularly box cars, and consists in certain novel structures and combinations whereby a car end is provided which will be light in weight and very strong and rigid so as to be capable of withstanding shocks and pressures, for example, the inertia thrusts of shifting cargoes, and so as to act as a reinforcement for the car superstructure as a whole, and which may be manufactured and installed more economically and conveniently than the sheet metal ends heretofore employed in the construction or repair of railway cars.

Having in view particularly the hard usage to which the ends of freight box cars are subject due to shifting cargoes and like causes, cars of this sort have been equipped, either in their original construction or in the repair of broken ends, with end structures consisting of one or more sheet metal elements formed with horizontal ribs or pressed corrugations which carry the stresses exerted thereon as beams to the corner posts of the car.

One of the principal objects of the invention is to provide a sheet metal end structure for railway box cars in which the end sheets are provided with vertical corrugations extending substantially from the roof to the floor of the car and which comprises transverse members at the upper and lower part of the structure to take the stresses from the corrugations and transmit them to the side frame members of the car.

A further object of the invention is to decrease the cost of manufacture of a car end of the general type indicated.

The invention has for further objects such other new and improved constructions, arrangements and devices relating to sheet metal car ends as will be hereinafter described and claimed.

The invention is illustrated in the accompanying drawings in which—

Figure 1 is an end elevation of a box of a car or body of a freight box car provided with a sheet metal end wall structure embodying my invention.

Fig. 2 is a vertical sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is a sectional plan on line 3—3 of Fig. 1.

Fig. 4 is a fragmentary elevation of a modified form of the invention.

Fig. 5 is a sectional view taken on line 5—5 of Fig. 4.

Fig. 6 is a view, in perspective, of the upper attaching and rigidifying member which may be employed as part of either of the two constructions shown in the preceding figures, and

Fig. 7 is a similar view of the bottom attaching member.

Like characters of reference designate like parts in the several figures of the drawings.

The car end is shown for purposes of illustration as applied to a wooden box car of standard construction. The wooden end plate of the car framing is designated 10, the end sill 11 and the corner posts 12. 13 indicates the roof, 14 the end fascia plate 90 and 15 the flooring of the car.

The end structure shown in Figs. 1 to 3 inclusive is composed of a corrugated panel consisting of two sheet metal elements 16, an upper rigidifying and attaching member or metal end plate element 17 (Fig. 6) and a lower angular rigidifying and strengthening member 18 (Fig. 7). The end sheets 16, 18 are formed with vertical corrugations 19 which extend across the sheets from top to bottom, that is, from the upper end to the lower edges thereof. The sheets are formed on their outer lateral edges with angular flanges 20 which are secured to the corner posts 12 by any suitable means, for example, the bolts 21. The meeting edges of the sheets 16 are preferably provided with angularly disposed flanges 22 fastened together by rivets 23.

The top member or metal end plate 17 is secured to the wooden end plate 10 by bolts 24, or other suitable attaching devices and has flanges 17' (Fig. 6) overlapping and secured to the side wall of the car. The lower edge of the top member overlaps the upper edge of the panel 16, 16 and has a corrugated or undulatory configuration corresponding with the corrugated configuration...
of the panel. The panel and top member are secured together preferably by rivets indicated at 25. The bottom member 18 is in the form of an angle bar having a flat flange 26, secured to the top of the end sill 11 by bolts 27, and an upstanding flange 28 which is corrugated or given an undulatory configuration to fit the corrugations of the panel 16, 16. Preferably the upstanding flange 28 is arranged on the inside of the panel, the latter being secured thereto by rivets 29. In order to make the car grain proof the horizontal flange 26 of the bottom member extends preferably under the floor 15.

In Figs. 4 and 5 I have shown a modification in which the panel is divided into two sheets (there might be more, if desired) on horizontal lines. The construction consists, in addition to the top and bottom pieces which may be substantially the same as those employed in the first described construction, of two sheets 30, 31, extending across the car from side to side and formed with corrugations which, in each case, extend from one edge of the sheet to the other. The upper sheet overlaps the under sheet and is secured thereto by rivets 32. The top member, designated 17, overlaps the upper edge of the upper sheet 30. The bottom member 18 is overlapped by the lower edge of the lower sheet 31 as in the other construction.

In both typical embodiments of the invention a car end is provided having corrugations extending, in effect, from the roof to the floor of the car so as to form load bearing elements capable of carrying some of the weight of the roof. Moreover, these corrugations, because of their vertical arrangement, materially strengthen and stiffen the end as against the tendency of the car to weave, that is, to become distorted on diagonal lines. The construction, in each case, is waterproof. A sheet metal car end constructed as shown and described, besides having the structural advantages noted can be very cheaply manufactured. The ordinary corrugated sheet metal car ends in which the corrugations terminate short of the edges of the sheets or panels leaving flat marginal portions for attaching the end to the framing of the car, the marginal portions at the ends of the corrugations serving also to stiffen the structure, on lines transverse to the direction of the corrugations, are quite costly to make for several reasons. The corrugations have to be formed by a hot process in a press which, from its size, is necessarily expensive both to build and to operate. The dies required by the operation are expensive because of their large size and are easily broken because of the weight of the sheets of metal on which they operate. Moreover, the pressing tends to thin out the metal of the sheets at certain places, making the end structures weaker in some places than in others. Besides this the sheets in pressing are considerably distorted so that they have to be trimmed; this involving additional labor and some waste of material. In some cases the marginal portions are crimped or bent during the cooling which follows the pressing operation and have to be flattened out by a further pressing operation before the sheets are available for use. By forming the sheets with corrugations extending from one edge to the other the corrugating operation may be performed in an ordinary corrugating machine by a continuous process and in some cases without heating the metal. There is no tendency to thin down any part of the sheet. The corrugating operation is very much simplified and cheapened. If sheets so formed were used without the top and bottom members 17, 18, that is, if there were fastened directly to the framing of the car along their top and bottom edges, the structure would have little or no strength to resist deflection. It would bend on lines parallel to the corrugations. It will be seen that the top and bottom members 17, 18, provide, in the first place, rigidity to the arrangement extending in a direction transverse to the corrugations so that deflection by the pressing out of the corrugations which would otherwise take place when the end was subjected to a heavy cargo thrust, is effectively prevented.

Each corrugation acts as a post or up-right beam transmitting stresses, such as the thrusts of the lading to the upper and lower edges of the sheet. In the construction described the metal end plate or top member 17 takes the stresses thus transmitted to the upper edges of the sheets and carries them to the side frame members of the car. In effect, the corrugations extend over upon the metal end plate, although this is not essential to the function in question. With a vertically corrugated end it is important that the upper edges of the sheets or sheets be thus provided with means for taking the stresses of the corrugations and transmitting them to the side walls of the car, since the roof of a box car is ordinarily the weakest part of the structure and is little calculated to take the heavy stresses resulting from shifting cargoes. It is also important that the lower edge of a vertically corrugated end sheet be provided with a transversely extending rigidifying member capable of taking the stresses from the corrugations and transmitting them to the car frame, because, while the end sill is more capable of taking the stresses on the corrugation than the roof of the car, ordinarily the
impact of the load on the end of the car will be nearer the floor than the roof, so that the stresses at the bottom of the end structure are greater than those at the top.

As to both upper and lower edges, the need for reinforcement is much greater than where the corrugations run horizontally, because in that case each corrugation constitutes a beam transmitting the stresses against it directly to the floor and roof posts and side walls of the car. In the end wall construction described, each corrugation preferably merges into the next, so that the structure has a sinuous configuration in cross-section. As a result, end stresses against the corrugation are transmitted in part to the adjacent corrugations with the result that undue deflection at any given point or along any given line which might result in rupture of the metal is avoided.

Moreover, the top and bottom members provide a convenient means for attaching the end section to the open and lower frame members of the car. The structure at these places is perfectly waterproof. The angular configuration of the bottom piece 18 makes the end structure tight at the flooring of the car. This is important as box cars are used very extensively for carrying grain.

While I have described my invention in certain preferred embodiments, modifications might be made without departing from the principle of the invention. Therefore, I do not wish to be understood as limiting the invention to the precise constructions, arrangements and devices shown and described except so far as the claims are so limited by their express language.

This application is division of my copending application No. 733,369 filed November 25, 1912. The subject matters common to the two applications are claimed in application Serial No. 152,767, filed July 23rd, 1912, as a continuation in part of the aforesaid application 733,369. I do not claim, specifically the construction shown herein in Figs. 1, 2 and 3, as this construction was made the subject of another divisional application, Serial No. 1970 filed January 13, 1915, this application covering, however, the invention common to both the modifications herein shown and described.

1. A metal end wall structure for railway cars comprising a sheet metal panel formed with vertical corrugations extending to the upper and lower edges thereof, and a rigid attaching and stiffening top member secured to the framing of the car, the lower edge of which conforms to the corrugated configuration of the panel which is secured thereto, and an angular bottom attaching and stiffening member having an upstanding flange to which the lower edge of said panel is secured which is also conformed to the corrugated configuration of the panel.

2. A metal end wall structure for railway cars comprising a sheet metal panel formed with vertical corrugations extending to the upper and lower edges thereof, and a rigid attaching and stiffening top member secured to the framing of the car, the lower edge of which conforms to the corrugated configuration of the panel which is secured thereto, and an angular bottom attaching and stiffening member having an upstanding flange to which the lower edge of said panel is secured which is also conformed to the corrugated configuration of the panel.

3. A metal end wall structure for railway cars comprising a sheet metal panel formed with vertical corrugations extending to the upper and lower edges thereof, and a rigid attaching and stiffening top member secured to the framing of the car, the lower edge of which conforms to the corrugated configuration of the panel which is secured thereto, and an angular bottom attaching and stiffening member having a flange which is secured to the top of the end sill of the car, and an upstanding flange to which the lower edge of said panel is attached, said upstanding flange having a configuration corresponding to the corrugated configuration of the panel.

4. A metal end wall structure for railway cars comprising a sheet metal panel formed with vertical corrugations extending to the upper and lower edges thereof, and a rigid attaching and stiffening top member secured to the framing of the car, the lower edge of which conforms to the corrugated configuration of the panel which is secured thereto, and an angular bottom attaching and stiffening member having a flange which is secured to the top of the end sill of the car, and an upstanding flange to the outer face of which the lower edge of the panel is secured, said last mentioned flange having a configuration corresponding to the corrugated configuration of the panel.

5. A metal end wall structure for railway cars comprising a sheet metal panel formed with vertical corrugations extending to the upper and lower edges thereof, and a rigid attaching and stiffening top member secured to the framing of the car, the lower edge of which overlaps the upper edge of the panel and has a configuration corresponding to the corrugated configuration of said panel, and an angular bottom attaching and stiffening member having a flange which is secured to the top of the end sill of the car, and an upstanding flange to the outer face of which the lower edge of the panel is secured, said last mentioned flange having a configuration corresponding to the corrugated configuration of the panel.
6. A metal end wall structure for railway cars comprising a sheet metal panel formed with vertical corrugations extending to the upper edge of the same, and a rigid attaching and stiffening member secured to the framework of the car and extending across the same from side to side and which overlaps and is secured to the upper edge of said panel, the overlapping part thereof having a configuration corresponding to the corrugated configuration of the panel.

7. A metal end wall structure for railway cars, comprising a sheet metal panel formed with vertical corrugations extending to the lower edge thereof, and a rigid stiffening and attaching member having a flat portion secured to the framework of the car and a portion having a configuration corresponding to the corrugated configuration of the panel against which the lower edge of said panel is secured.

8. A metal end wall structure for railway cars comprising a sheet metal panel formed with vertical corrugations extending to the lower edge thereof, a rigid angular attaching and stiffening member having a flat flange secured to the top of the end sill of the car, and an upstanding flange having a configuration corresponding to the corrugated configuration of the panel to which the edge of said panel is secured.

9. The combination with the end framing of a box car, of a sheet metal end wall structure for the same formed with vertical corrugations extending from substantially the roof of the car to the floor and merging one into the next so that the corrugated portion of the structure forms a sinuous curve in horizontal cross-section, said structure being provided with flat side flanges for attachment to the car frame and with flat upper and lower attaching flanges which by extending transversely of the corrugations stiffen and reinforce the structure so as to prevent bulging under cargo thrusts.

10. The combination with the end framing of a box car, of a sheet metal end wall structure for the same composed of a plurality of sheet metal members overlapped and secured one to the other and formed with vertical corrugations extending from substantially the roof of the car to the floor and merging one into the next so that the corrugated portion of the structure forms a sinuous curve in horizontal cross-section, said structure being provided with flat side flanges for attachment to the car frame and with flat upper and lower attaching flanges which by extending transversely of the corrugations stiffen and reinforce the structure so as to prevent bulging under cargo thrusts.

11. In a railway box car the combination with the under frame and side walls of the car, of an end plate comprising a flat metal element extending across the upper part of the car and secured to the side walls thereof, a sheet metal end wall panel secured to the side walls of the car and formed with vertical corrugations, means for securing the upper edge of said sheet metal end wall panel to the said metal end plate element and means for securing the lower edge of said panel to the under frame of the car.

12. In a railway box car the combination with the under frame and side walls of the car, of an end plate comprising a flat metal element extending across the upper part of the car and secured to the side walls thereof, a sheet metal end wall panel secured to the side walls of the car and formed with vertical corrugations, the lower edge of said metal end plate element being overlapped, fitted to and secured to the upper edge of said sheet metal end wall panel providing a water shedding connection.

13. In a railway box car the combination with the under frame and side walls of the car, of an end plate comprising a metal element extending across the upper part of the car and secured to the side walls thereof, a sheet metal end wall panel secured to the side walls of the car and formed with vertical corrugations extending to the upper and lower edges of said panel, said panel being overlapped by said end plate element, means for securing the upper edge of said sheet metal end wall panel to the metal end plate element and means providing a flange angularly disposed with respect to the end wall panel for securing the lower edge of the same to the under frame.

14. In a railway box car the combination with the under frame and side walls of the car, of an end plate comprising a metal element extending across the upper part of the car and secured to the side walls thereof, a sheet metal end wall panel secured to the side walls of the car and formed with vertical corrugations extending to the upper and lower edges of said panel, said panel being overlapped by said end plate element, means for securing the upper edge of said end wall panel to said metal end plate element and an angle bar secured to the lower edges of the end wall panel and to the under frame of the car.

15. In a railway box car the combination with the side walls, end sill and flooring of a railway box car, of an end plate comprising a metal element extending across the upper part of the car and secured to the side walls thereof, a sheet metal end wall panel secured to the side walls of the car and formed with vertical corrugations, means for securing the upper edge of said wall panel to said metal end plate element, and an angle bar secured to the lower edge of the same and extending and intervening be-
between the flooring of the car and the end sill and attached to the latter.

16. In a railway box car the combination with the corner posts, end sill and end plate of the car, the latter comprising a metal element extending across the car from side to side and provided at its extremities with angularly disposed flanges overlapping and secured to the sides of the car; of a sheet metal end wall panel provided with flanges at its outer vertical edges overlapping and secured to said corner posts, and means for securing the lower edge of said end wall panel to the end sill of the car; the lower edge of said metal end plate element being offset so as to overlap and fit the upper edge of said end wall panel and its flanges providing a water shedding connection.

17. In a railway box car the combination with the side walls, end sill and end plate of the car, the latter comprising a metal element extending across the car from side to side and attached to the side walls thereof, of a sheet metal end wall panel formed with vertical corrugations which extend to the upper and lower edges of said structure and having its upper edge secured to said metal end plate element, and means for securing the lower edges of said panel to the car frame providing a horizontally disposed flange which overlies and is secured to the end sill of the car.

18. In a railway box car the combination with the corner posts, end sill and end plate of the car, the latter comprising a metal element extending across the car from side to side and attached to the side walls thereof, of a sheet metal end wall panel secured to the corner posts along its vertical edges, with its upper edge secured to said metal end plate element, means for securing the lower edge of the same to the car frame providing a horizontally disposed flange which overlies and is secured to the end sill of the car, said end wall panel being formed with vertical corrugations which extend substantially from the top to the bottom of the end structure of the car so as to transmit stresses exerted against the same to the metal end plate element and to the flange attached to the end sill.

19. In a railway box car the combination with the under frame and side walls of the car, of an end plate comprising a metal element conforming to the slope of the roof of the car extending across the upper part of the car and secured to the side walls thereof, a sheet metal end wall panel secured to the side walls of the car along its vertical edges and formed with vertical corrugations, means for securing the upper edge of said panel to the said metal end plate element and means for securing the lower edge of the same to the under frame of the car.

20. In a metal end structure for railway cars, the combination of a plurality of end sheets provided with vertical corrugations extending to the edges of the sheets, said sheets extending across the end of the car from side to side and being overlapped one upon the other and secured together along horizontal lines, means for rigidifying and securing the upper edge of the upper sheet to the frame of a car and means for rigidifying the lower edge of the lower sheet and for securing the same to the frame of the car.

21. The combination with the framing of a railway car, of an end structure for the car comprising a sheet-metal end panel having vertical corrugations extending to the edges of the panel, one corrugation merging into the next so that the panel forms a sinuous curve in horizontal cross-section, a transverse rigidifying and attaching member at the upper edge of said panel for securing the same to the framing of the car and a transverse rigidifying and attaching member at the lower edge of the panel for securing said edge to the framing of the car, said members being disposed so as to receive and transmit to the car framing the stresses on said corrugations.

WALTER P. MURPHY.