Oct. 5, 1937. S. SIMONSON 2,094,725

CAR CONSTRUCTION

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Fig. 2.

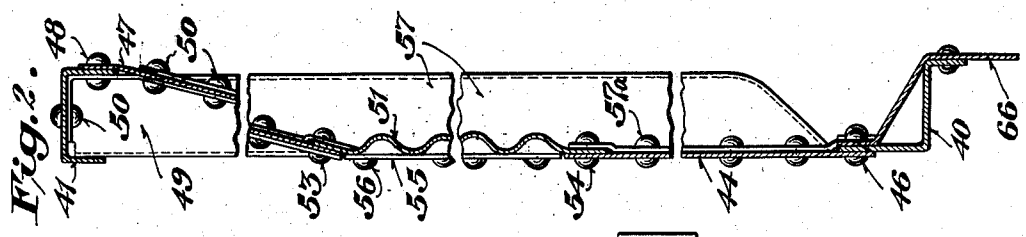


Fig. 1.

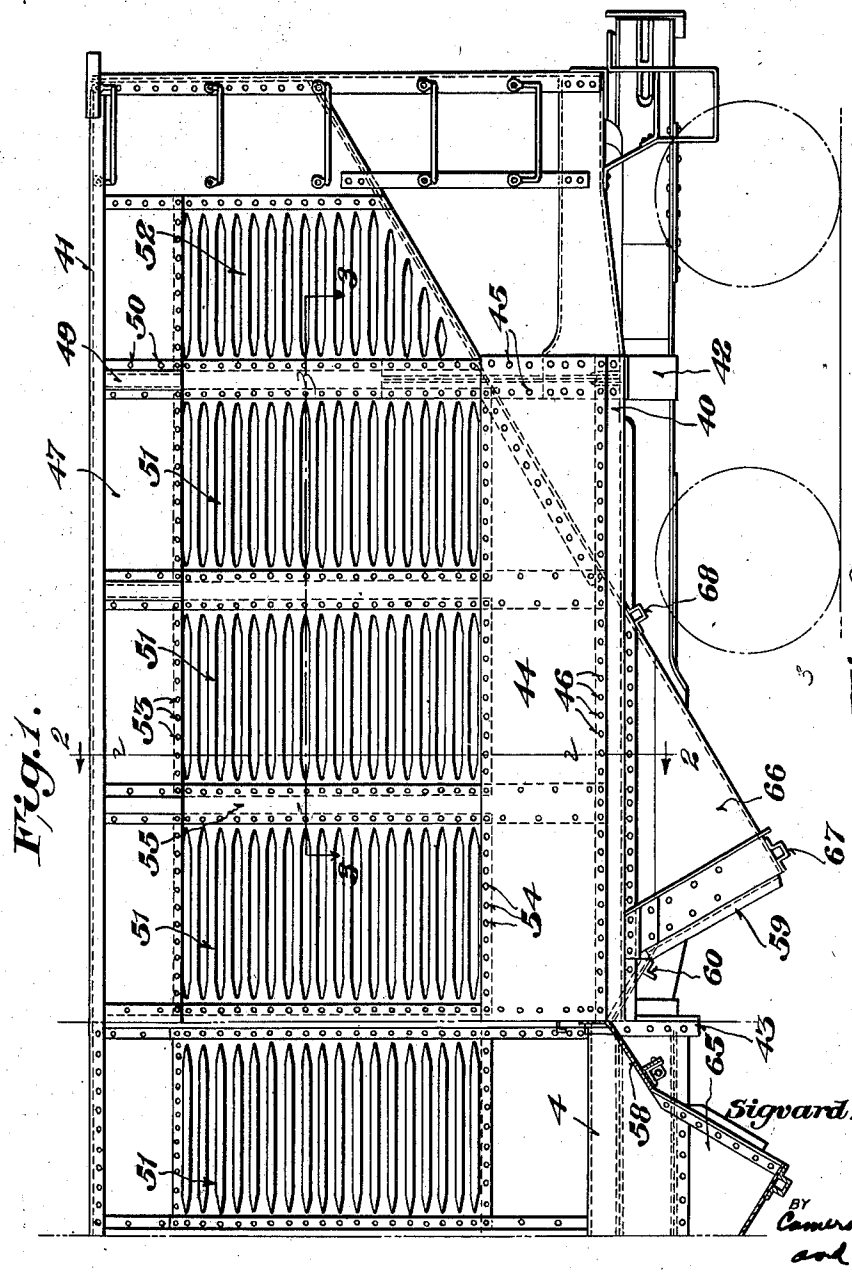
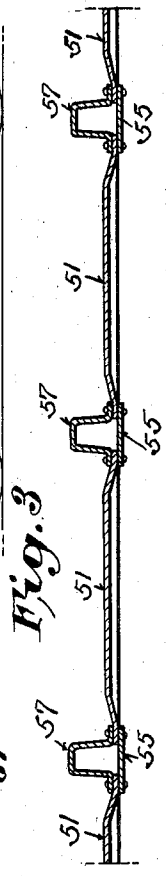


Fig. 3



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CAR CONSTRUCTION

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4 Claims. (Cl. 105—409)

This invention relates to car construction and more particularly to the construction of railroad cars of light weight.

It has been proposed to make car bodies of very lightweight structural materials such as aluminum but such materials are too expensive for ordinary use, and further the greater elasticity of these materials makes them objectionable in the conventional car. To a limited extent, weight can be reduced by using stronger materials in the conventional car body and reducing the amount of material correspondingly. Alloys such as high chrome steel are available for use to this end, but these materials are expensive and further are difficult to work because of their extreme hardness. Other alloy steels can be obtained at or near the price of the ordinary open-hearth steel which is now in general use for railway cars, for example, a steel containing about ¾% chromium, which are not only stronger but also more resistant to corrosion than open-hearth steel. The use of such materials in place of open-hearth steel is desirable, but in order to make the most effective use of such materials from the standpoint of weight reduction and to obtain the lightest possible car having the requisite stiffness and strength, the car structure must be specially designed so as to obtain the most economical and efficient distribution and arrangement of material, and practical considerations with respect to ease and facility of manufacture and assembly must be taken into account. When at the same time forces on the car body are reduced by use of the Duryea underframe and stresses due to elasticity are eliminated, maximum benefits with respect to reduction of weight are obtained.

One of the objects of the present invention is to provide a lightweight car structure embodying novel construction whereby the material in the car body is efficiently and economically employed and the ratio of the load carried by the car to the weight of the car is greatly increased.

A further object is to provide novel car construction which facilitates the use of corrugated metal sheets in the car structure, both from the standpoint of manufacture of such sheets and from the standpoint of their assembly in the car body.

The side wall of the car must be stiff against lateral deflection in order to prevent bulging under the load of the contents of the car and denting and breaking under the hard blows received in train service, and it must also provide adequate strength against shear. Heretofore it has been customary to employ sheets or plates of open-hearth steel of one-quarter inch thickness, these plates being stiffened at suitable intervals by vertical stakes or posts, the bottoms of the plates and of the posts being secured rigidly to heavy side sills and the upper edges of the plates and tops of the posts being connected together by a relatively heavy top plate. In order to reduce materially the weight of the structural elements and of the side plates, even when stronger materials are used, it is necessary to depart from the conventional construction as described briefly above and to adopt further measures to protect the car body against forces encountered in service. It has been proposed heretofore to corrugate the sides of railway cars in order to provide increased stiffness and also light weight. Corrugations, however, greatly increase the difficulty of making connections between the plates, sills, etc., unless pressed from flat plates leaving flat margins or edges and flat areas at all points where connection must be made. Moreover, unless the construction is standardized so that the plates making up the side walls of the car can be pressed in reasonably small sections or panels which are uniform with respect to the dies necessary for pressing, the cost of manufacture becomes excessive. Moreover, corrugations tend to decrease strength against shearing stresses particularly in a direction at right angles to the direction of the corrugations.

According to the present invention, the side wall of the car is formed of plane or flat sheet metal along its upper and lower edges, this construction facilitating connection to the upper and lower structural members or sills and also providing strength against shearing stresses. Intermediate these upper and lower plane sections are a plurality of corrugated panels which are so designed that they can be manufactured economically and in quantity. These corrugated panels are formed by pressing the corrugations in plates by means of dies, and the structural members of the side wall are so arranged that connections are made to the horizontal and vertical edges or margins of the corrugated panels which are left flat for this purpose and also so that substantially all of the panels making up a complete side are exactly similar. In a hopper car as shown in the drawing, the end panels of the car side are the only ones which vary from this standard construction.

The accompanying drawing illustrates the construction of a hopper car embodying the invention. It is to be expressly understood, however, that the invention is not restricted as to many

of its features to hopper cars, nor is it limited to the exact construction shown, the drawing being for purposes of illustration only and not to be construed as a definition of the limits of the invention, reference being had to the appended claims for this purpose.

In the drawing,

Fig. 1 is a side view of a portion of a hopper car embodying the invention, the side of the car being removed at the left end of the figure to show the inside of the opposite side wall and the hood sheet;

Fig. 2 is a section taken through the side of the car on the line 2—2 of Fig. 1; and

Fig. 3 is a sectional view through the center of one of the corrugated panels.

The car body, comprising side wall and end well structure and hopper structure, is supported on the car trucks by means of suitable bolster construction not shown in detail. This construction is duplicated at the opposite end of the car and the two bolsters are connected by means of a longitudinal hood sheet 4 which passes through the hopper floors or slope sheets. The bolster construction, hood sheet, and draft rigging may, for example, be similar to United States patent of Otho C. Duryea, No. 2,010,391 issued August 6, 1935, and need not be described in detail herein.

The side structure of the car comprises the usual side sill 40 and top plate 41, which are connected by the wall structure to be described. The side sills 40 are connected with the usual end sills (not shown) and with the bolster structure indicated generally at 42 in Fig. 1. Intermediate the car bolsters, one or more cross bearers are provided, one of which is shown in the drawing and indicated generally at 43. As thus far described, the body construction may be conventional in design, although reduced in weight.

Describing for purposes of illustration one side wall only, the lower section of the car side adjacent the side sill 40 comprises a plane section 44 which extends substantially the length of the car structure between the bolsters of the car and is connected at its ends to the bolster structure. This section of the car side may, if desired, comprise a single sheet or strip of material extending continuously between the bolsters, or if desired it may be broken up into two or more sections terminating at the cross bearers. As shown, this section 44 comprises a single plate suitably connected at its opposite ends to the bolster structure as by means of rivets 45 and along its lower edge to the side sill 40 as by rivets 46.

The upper section 47 of the car side also comprises a plane section which, like the lower section 44, may comprise a single strip of material extending substantially the length of the car structure or, if desired, may be broken up into sections terminating at the cross bearers. In accordance with the usual hopper car design, this upper section is at an angle to the vertical as clearly shown in Fig. 2 and is suitably connected to the top plate 41 as by means of rivets 48. At intervals along the car side, pressed members 49 are located in the angle formed by the side section 47 and the top plate 41, said pressed members being secured to both the top plate 41 and the side section 47 by suitable means such as rivets 48 and additional rivets 50. These pressed members serve to support and strengthen the top plate 41.

The section of the wall structure intermediate the lower section 44 and upper section 47 comprises a plurality of corrugated panels 51 all of which are preferably identical on both sides of the car so that all can be pressed by a single set of dies, except that in a hopper car the end panels 52 are not rectangular. These corrugated panels are made by pressing the corrugations in flat sheet metal plates, the corrugations preferably and as shown extending horizontally but terminating short of the margins or edges of the plates so as to leave flat edges for the purpose of making connections. The upper edge of each panel 51 preferably lies inside the upper section 47 and is suitably secured thereto as by means of rivets 53. Similarly the lower edge of each plate 51 lies inside the lower section 44 and is suitably secured thereto as by means of rivets 54. The adjacent flat vertical edges of each two plates 51 are connected by means of a cover plate 55 which is preferably a flat strip extending between the upper section 47 and the lower section 44 and covering the flat edges of the adjacent panels 51, being suitably secured to the latter as by means of rivets 56. Preferably the corrugations of the panels 51 are pressed inwardly from the plane of the side wall as established by the lower section 44 and the outer edge of the top plate 41, thus providing a substantially flat side wall without projections which can be brought as close as possible to the permissible contour line of the car. On the inside of the car wall opposite the cover plates 55 are pressed members 57 which extend vertically substantially the height of the side wall of the car, said pressed members in the form shown being riveted to the lower section 44 by rivets 57a and being connected with the panels 51 and cover plates 55 by means of the rivets 56 and with the upper section 47 and pressed members 49 by means of the rivets 50.

In accordance with conventional hopper car design, the portion of the car from the cross bearer 43 to the end of the car constitutes a hopper, a sloping ridge sheet 58 being provided adjacent the cross bearer to which a door 59 is hinged by means of an angle 60. The slope sheet from the end of the car to the hopper discharge opening is penetrated by the hood sheet 4 at a point slightly below the middle of the slope sheet and from this point down to its lower edge the slope sheet extends on either side of the hood sheet 4, the inner edges of the side sections being suitably connected with the hood sheet 4 and with hopper side plates 65 (Fig. 1) and the outer edges with hopper side plates 66 in order to complete the discharge hopper. Said slope sheet is supported at the discharge end by a pressed member 67 and intermediate its ends by a pressed member 68.

A car body embodying the construction described above can be reduced greatly in weight while at the same time the cost of the car is approximately the same as the cost of the conventional car of the same type and size. The car is designed as explained above to provide adequate strength against all of the forces encountered in train service, while employing much less material, and furthermore so that it can be manufactured and assembled economically. All of the connections between the various elements constituting the side structure are made between flat areas or portions of said elements. The lower plane section 44 provides strength against shear, as well as a flat surface for the many connections which must be made at the lower portion of the side wall, as for example connections to slope sheets and ridge sheets, etc. The upper plane section 47, which as shown is at an angle to the vertical, provides a smooth surface for dumping as well as for the connection thereto of the

pressed members 49, etc. At the same time, due to the arrangement shown, this is accomplished with a standard corrugated panel construction whereby all of the panels on the side of a car (with the exception of the end panels in a hopper car) can be made in small panels and with a single set of dies. The design of the side wall structure thus facilitates economical manufacture and assembly.

While only one embodiment of the invention has been illustrated in the drawing, it will be understood that the invention is not limited to this particular embodiment. For example, the invention is not restricted to hopper cars as respects the side wall construction, but many features thereof may be used in other types of cars such as box cars, gondolas, etc., with comparable saving in weight of the car body. Moreover, the invention is not restricted to the particular details of the construction as illustrated and described, but is capable of a variety of mechanical expressions which will be apparent to those skilled in the art. Reference is therefore to be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. Railway car side construction comprising top and bottom horizontal frame members and a light weight side wall extending vertically between said members and comprising a continuous sheet metal plate forming a flat upper wall section and having its upper edge secured to said top frame member, a continuous sheet metal plate forming a flat lower wall section and having its lower edge connected to said bottom frame member, the intermediate section of said side wall comprising a plurality of separate corrugated panels each having flat edges or margins, said corrugated intermediate section providing stiffness against lateral forces and said flat sections providing strength against vertical stresses in the plane of the side wall, and vertically extending connecting means each secured to said upper and lower plates and to adjacent margins of two of said intermediate panels.

2. Railway car side construction comprising top and bottom horizontal frame members and a light weight side wall extending vertically between said members and comprising an elongated sheet metal plate forming a flat upper wall section and having its upper edge secured to said top frame member, an elongated sheet metal plate forming a flat lower wall section and having its lower edge connected to said bottom frame member, the intermediate section of said side wall comprising a plurality of separate panels having substantially horizontal corrugations and flat edges or margins, the upper and lower edges of each panel being connected to said upper and lower plates, respectively, said corrugated and uncorrugated portions cooperating to provide a side wall of thin light weight material that is stiff against lateral forces and strong against vertical stresses in the plane of the wall, stiffening members on the inside of the wall and connected to said upper and lower plates, said stiffening members being also connected to the vertical edges of said panels, and cover strips extending between said upper and lower sections and each covering and secured to the adjacent vertical edges of two adjacent panels.

3. Railway car side construction comprising top and bottom horizontal frame members and a light weight side wall extending between said members, said side wall comprising a horizontally extending intermediate corrugated section and horizontally extending upper and lower uncorrugated sections, said upper and lower sections each comprising a unitary sheet metal plate, said corrugated and uncorrugated portions cooperating to provide a side wall of thin light weight material that is stiff against lateral forces and strong against vertical stresses in the plane of the wall, the upper section being connected at its upper edge with said top frame member and the lower section being connected at its lower edge with said bottom frame member, said intermediate section comprising a plurality of separate similar corrugated panels each having flat edges, the upper and lower edges of each panel being secured to the plates of said upper and lower sections respectively, and vertical stiffening members connected to the upper and lower sections and to the vertical flat edges of adjacent corrugated panels.

4. Railway car side construction comprising top and bottom horizontal frame members and a light weight side wall extending between said members, said side wall comprising a horizontally extending intermediate corrugated section and horizontally extending upper and lower uncorrugated sections, said upper and lower sections each comprising a unitary sheet metal plate, said corrugated intermediate section providing stiffness against lateral forces and said uncorrugated sections cooperating therewith to provide a side wall of thin light weight material that is strong against vertical stresses in the plane of the wall, the upper section being connected at its upper edge with said top frame member and the lower section being connected at its lower edge with said bottom frame member, said intermediate section comprising a plurality of separate similar corrugated panels each having flat edges, the upper and lower edges of each panel being secured to the plates of said upper and lower sections respectively, stiffening members on the inside of said wall, each of said stiffening members being connected to the upper and lower sections and to the vertical flat edges of adjacent corrugated panels, and cover strips on the outside of said wall, each of said cover strips extending between said upper and lower sections and being connected to the vertical flat edges of adjacent corrugated panels.

SIGVARD SIMONSON.