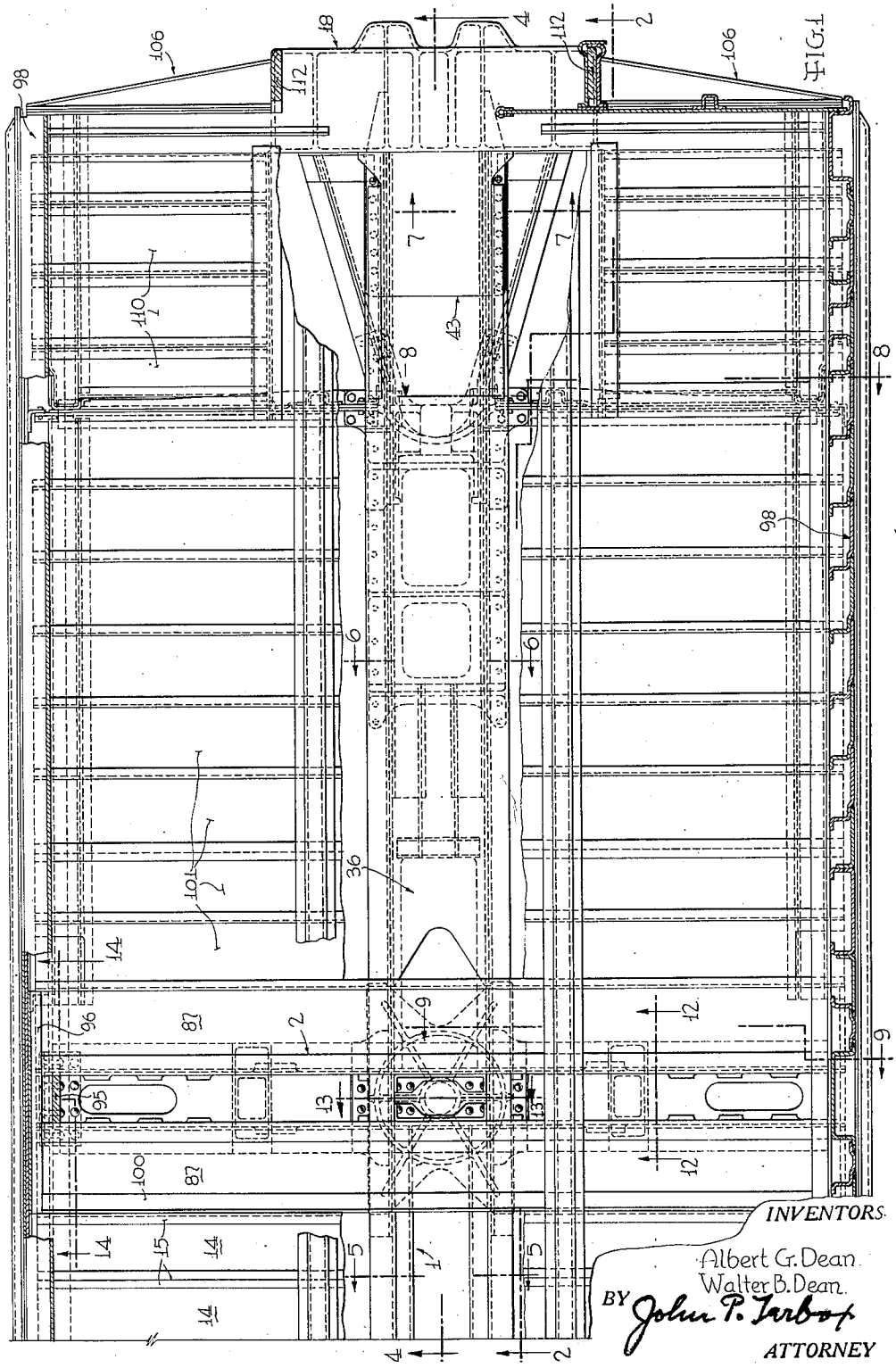
April 18, 1950 A. G. DEAN ET AL 2,504,112

END UNDERFRAME CONSTRUCTION FOR VEHICLES, ESPECIALLY RAILWAY CARS

Filed April 17, 1945 7 Sheets-Sheet 1

FIG. 1



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END UNDERFRAME CONSTRUCTION FOR VEHICLES, ESPECIALLY RAILWAY CARS

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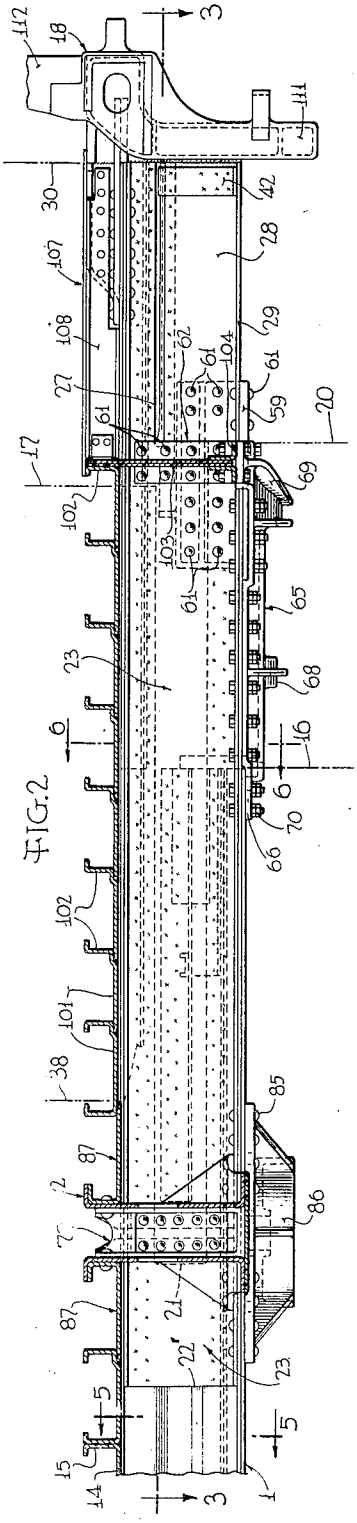


FIG. 2

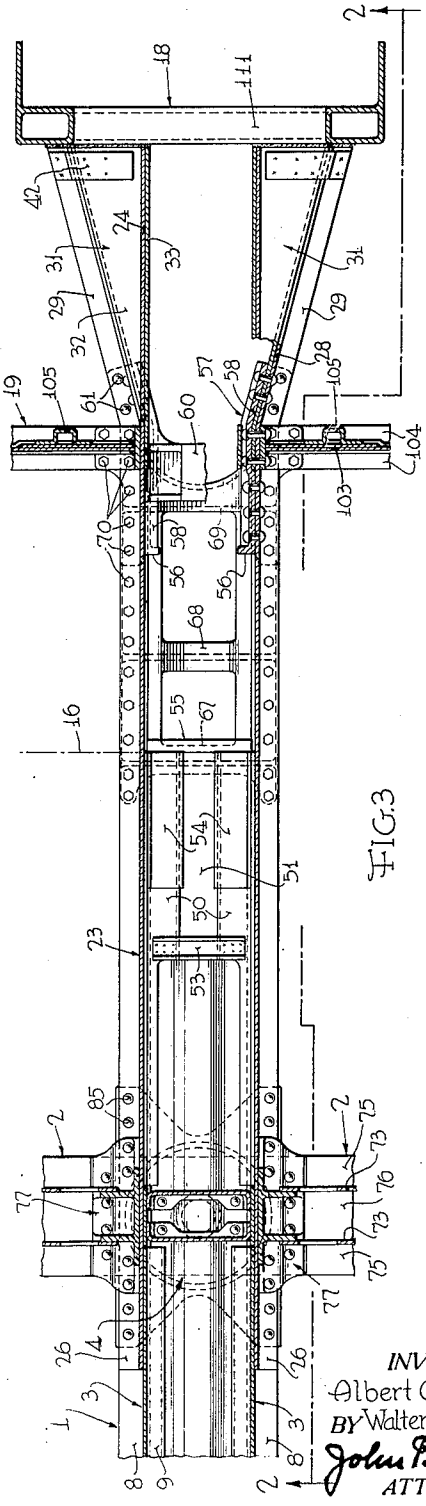


FIG. 3

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END UNDERFRAME CONSTRUCTION FOR VEHICLES, ESPECIALLY RAILWAY CARS

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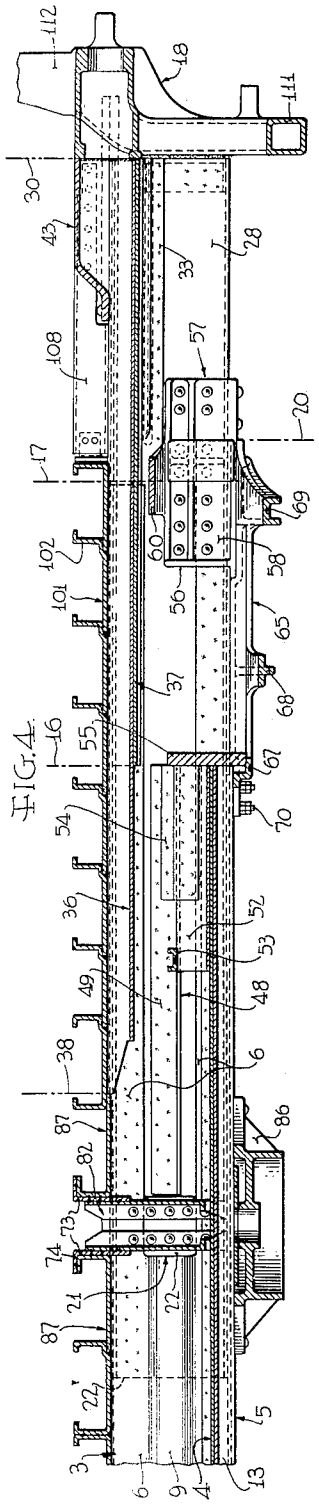


FIG. 4.

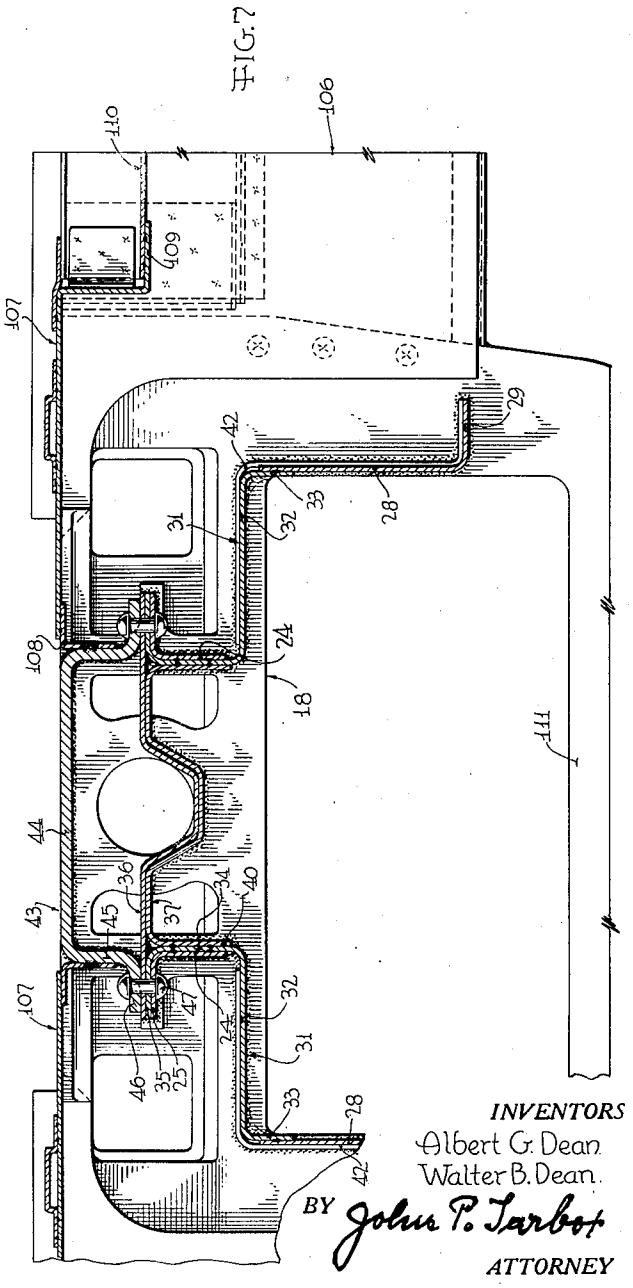


FIG. 7.

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END UNDERFRAME CONSTRUCTION FOR VEHICLES, ESPECIALLY RAILWAY CARS

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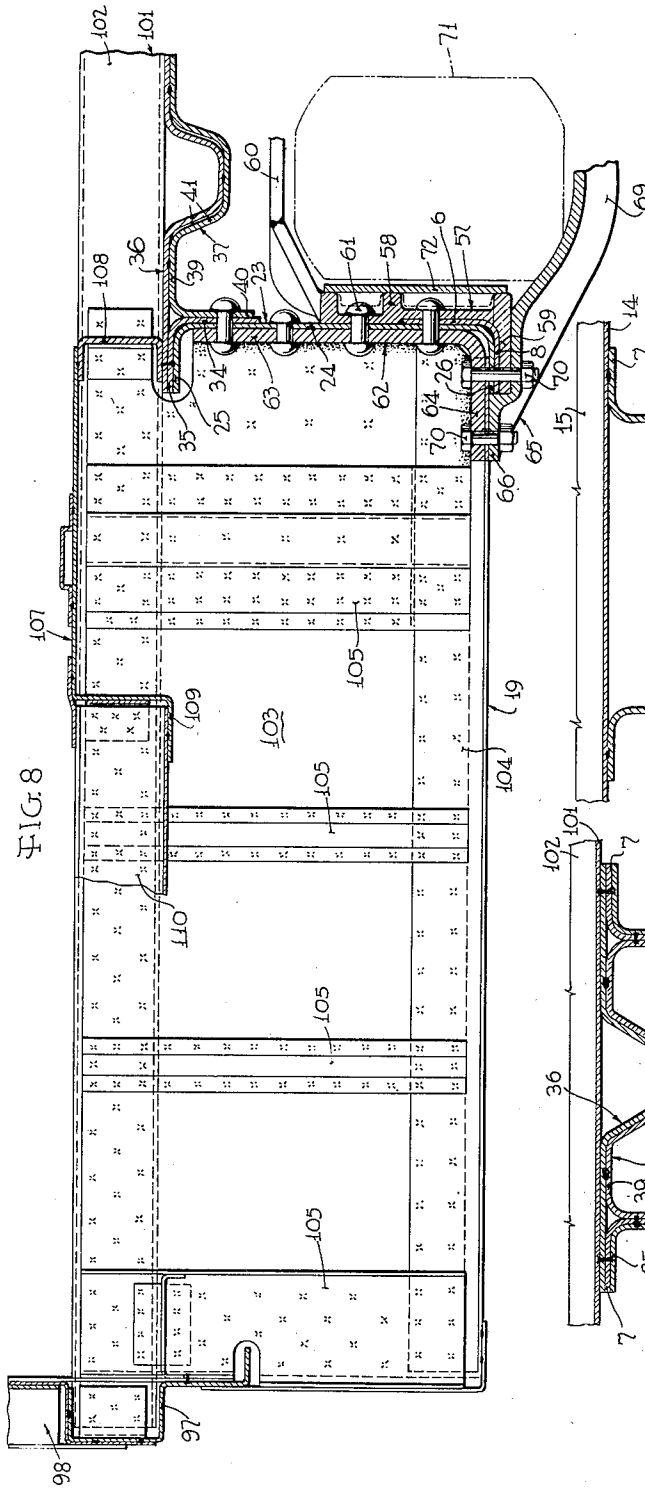


FIG. 8

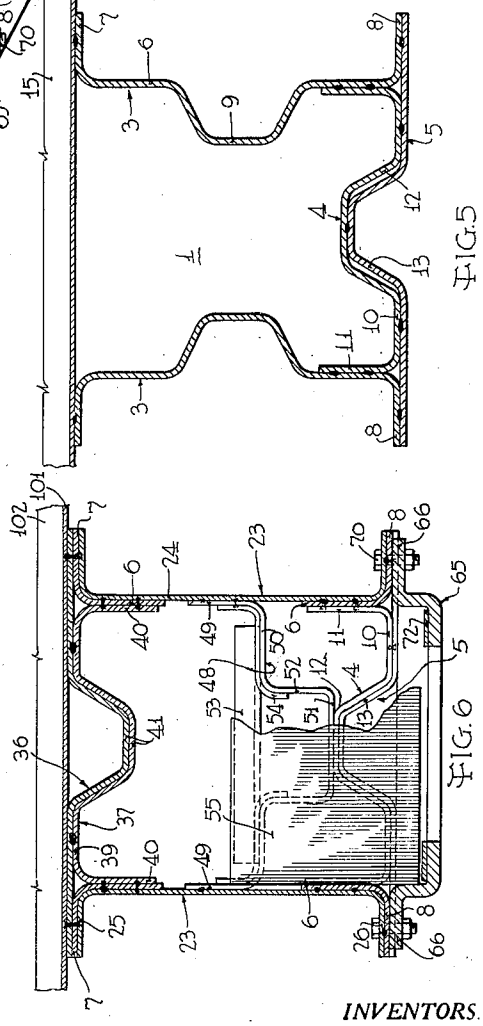


FIG. 5

FIG. 6

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END UNDERFRAME CONSTRUCTION FOR VEHICLES, ESPECIALLY RAILWAY CARS

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FIG. 9

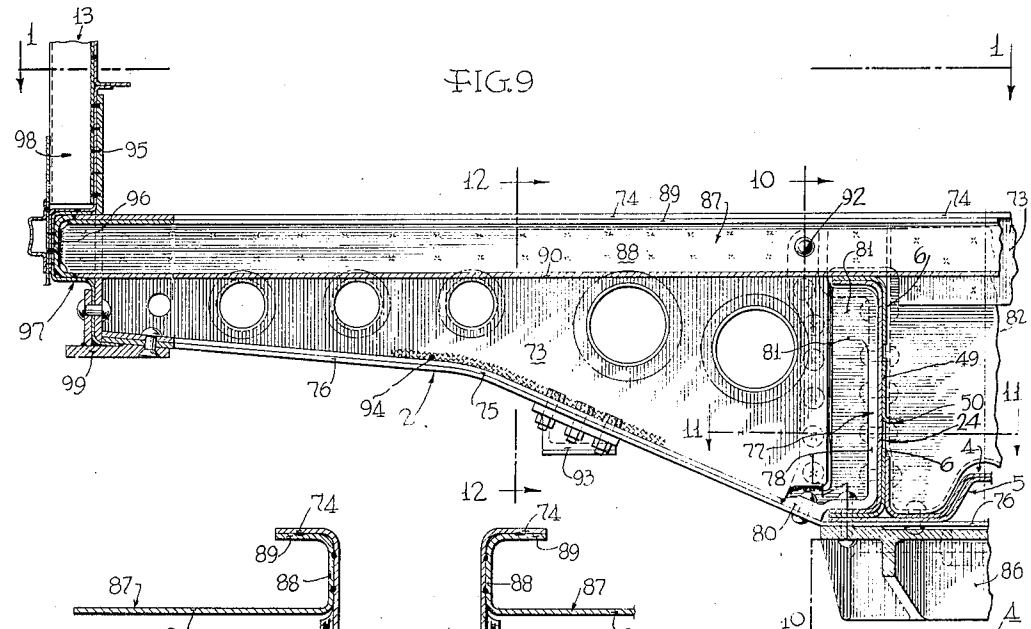


FIG. 12

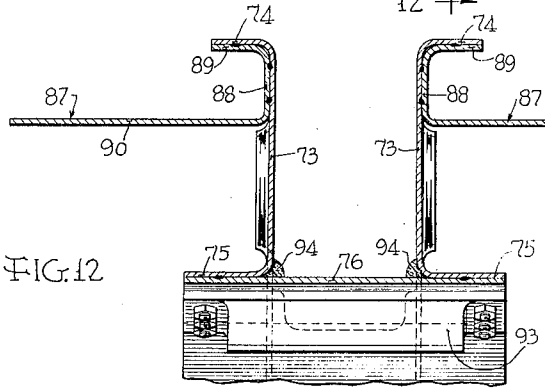


FIG. 11

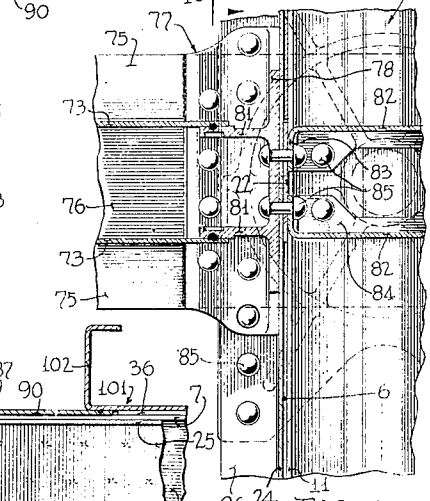
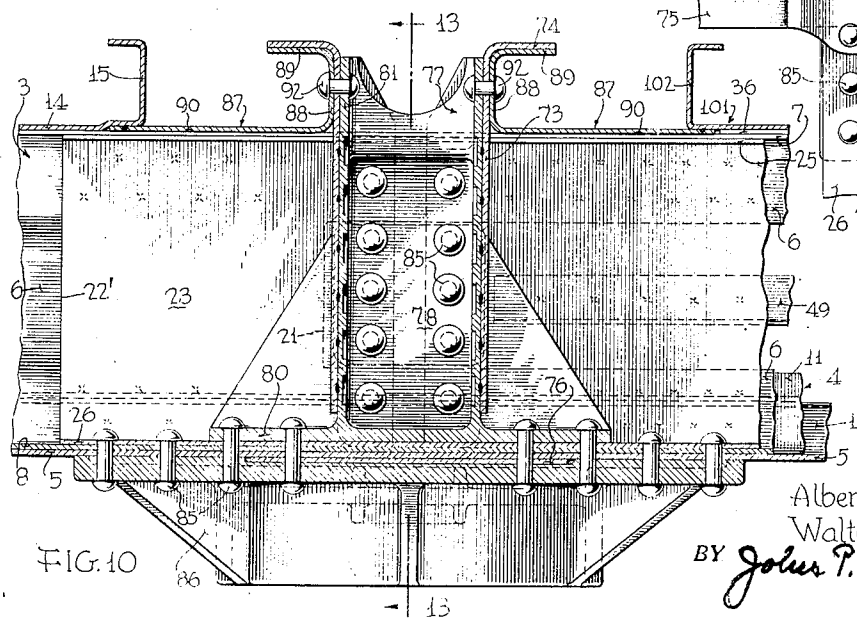


FIG. 10



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END UNDERFRAME CONSTRUCTION FOR VEHICLES, ESPECIALLY RAILWAY CARS

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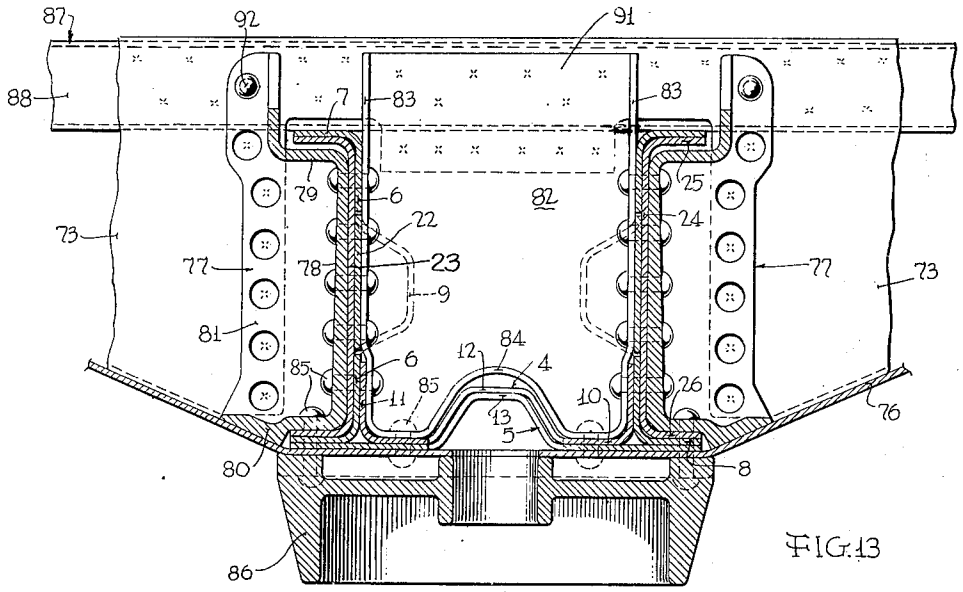


FIG. 13

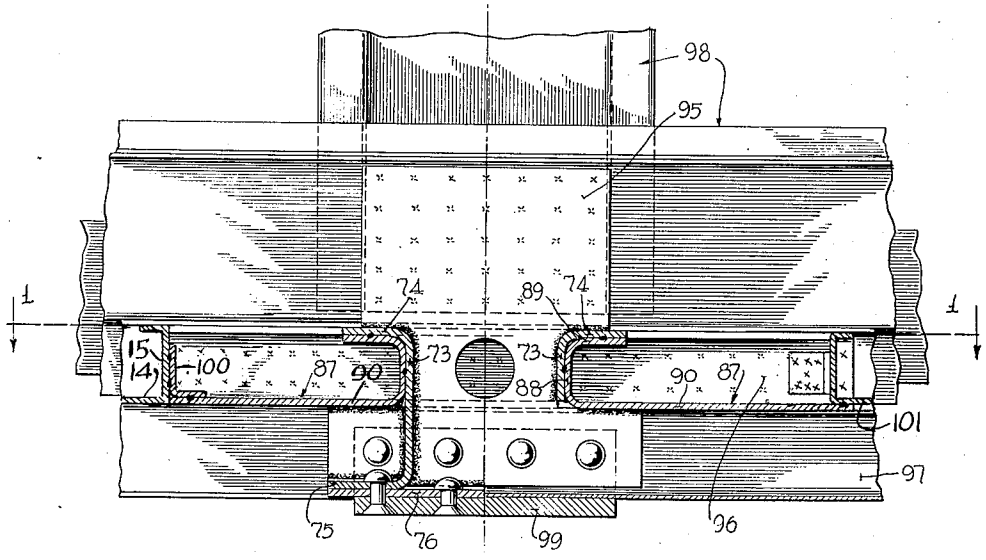


FIG. 14

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END UNDERFRAME CONSTRUCTION FOR VEHICLES, ESPECIALLY RAILWAY CARS

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FIG. 15

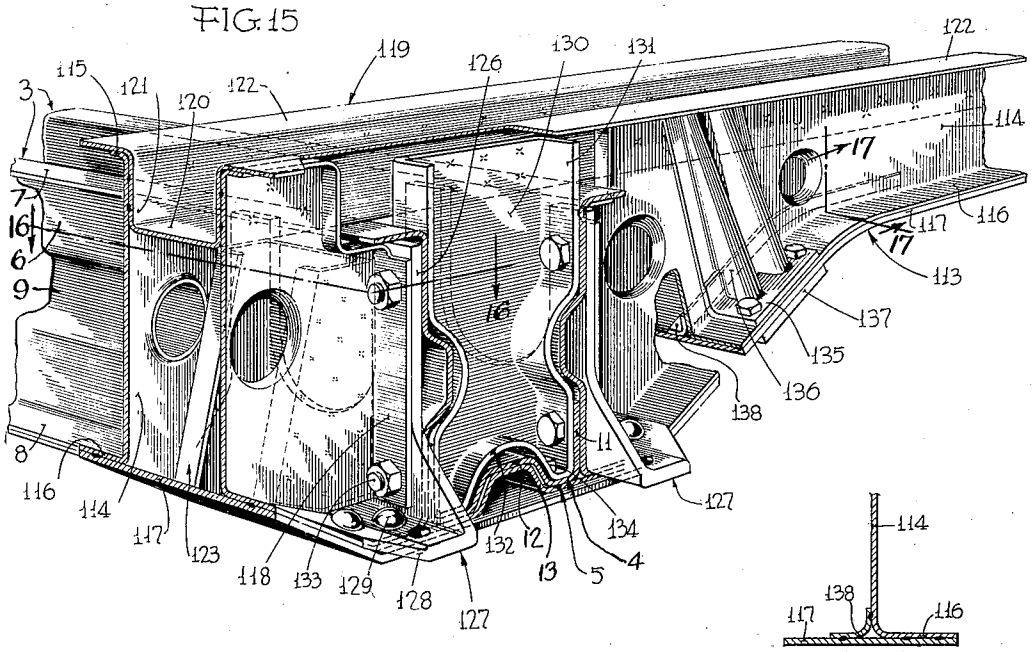


FIG. 17

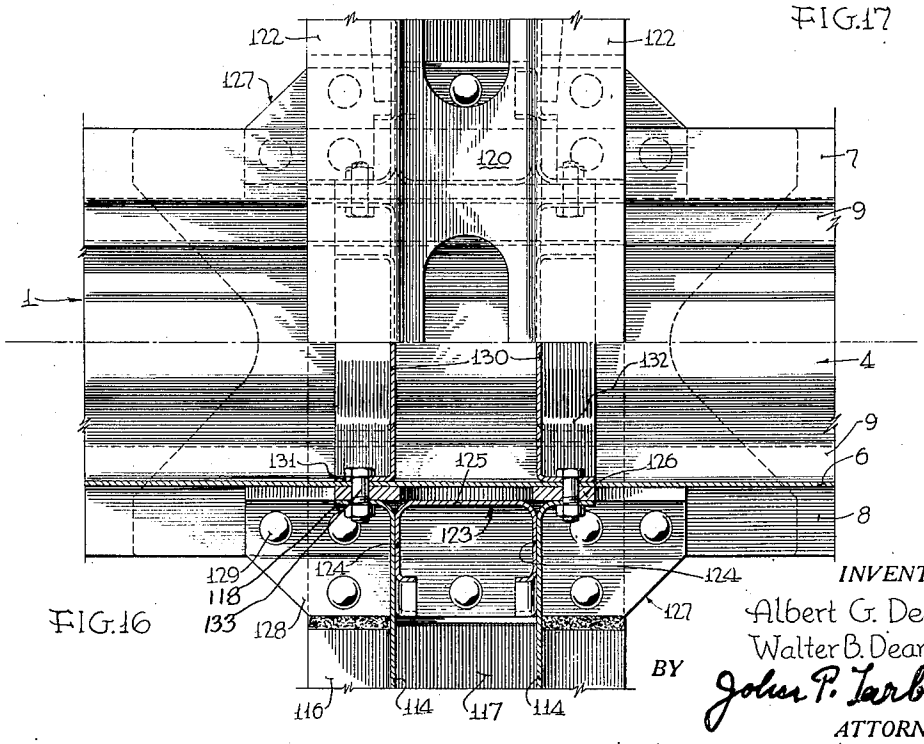


FIG. 16

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Patented Apr. 18, 1950 2,504,112

UNITED STATES PATENT OFFICE

2,504,112

END UNDERFRAME CONSTRUCTION FOR VEHICLES, ESPECIALLY RAILWAY CARS

Albert G. Dean and Walter B. Dean, Narberth, Pa., assignors to The Budd Company, Philadelphia, Pa., a corporation of Pennsylvania

Application April 17, 1945, Serial No. 588,760

12 Claims. (Cl. 105—414)

1

The invention relates to an underframe for vehicle bodies especially of railway cars, and more particularly to an end underframe which is largely composed of sheet metal members integrally connected with each other by electric spot welding.

Among the objects of the invention is an end underframe having a center sill portion which constitutes an integral continuation of the middle portion of the body center sill so as to transmit the longitudinal stresses, mainly introduced over the bumpers and the buffing and draft gear, without abrupt change in direction and without undue stress concentrations.

Another object of the invention is a center sill of the indicated type which combines ample strength with light weight.

A still further object of the invention is an end underframe which lends itself to the easy and convenient fabrication and assembly of its component parts.

Among the objects is also an end underframe which constitutes an extension of a body center sill according to the simultaneously filed application Serial No. 588,866 on Underframe for vehicles especially railway cars, of the co-inventor W. B. Dean and which contributes to the desired functioning of such body center sill.

A still further object of the invention is an underframe having a bolster or similar transverse beam of lightweight construction coupled with great strength and good accessibility for making the assembly joints.

In addition to the aforesaid simultaneously filed application, the invention has special advantages in combination with, although it is by no means restricted to the constructions disclosed in the applications Serial No. 580,646, "Body for vehicles, especially rail cars," of the co-inventor W. B. Dean, and Serial No. 580,647, "Body construction, especially for rail cars," of R. J. Theriault, both filed on March 2, 1945.

The above indicated objects of the invention and its features as well as further objects and advantages are fully disclosed in the attached drawings showing two embodiments and in the following description of the latter.

In the drawing:

Figure 1 is a fragmentary plan view of one end of a railway car underframe, together with adjoining portions of side and end walls in section substantially along the planes of lines 1—1 of Figures 9 and 14; certain parts of the floor structure and of one side sill being broken away so as to more clearly show the structure therebeneath;

Figure 2 is a fragmentary side elevation of the center sill and a section through the adjoining transverse members along line 2—2 of Figure 1;

Figure 3 is a horizontal fragmentary section of

2

the center sill and adjoining members substantially along line 3—3 of Figure 2;

Figure 4 is a fragmentary longitudinal and vertical section through the center sill and adjoining parts substantially along line 4—4 of Figure 1, that is along the longitudinal center line of the frame;

Figures 5 and 6 are transverse vertical sections through the center sill along lines 5—5 and 6—6, respectively, of Figure 1, yet on a larger scale;

Figure 7 is a fragmentary section through the center sill along line 7—7 of Figure 1 together with a fragmentary end elevation of part of the end sill;

Figure 8 is a fragmentary section through the center sill and the adjoining part of the floor structure, side sill and side wall along line 8—8 of Figure 1 together with an end elevation of a cross bearer;

Figure 9 is a fragmentary end elevation of the bolster beam and a section through adjoining portions of the center sill, the side sill and side wall construction substantially along line 9—9 of Figure 1;

Figure 10 is a longitudinal vertical section through the bolster beam and a side elevation of the adjoining parts of the center sill, the section being taken along line 10—10 of Figure 9 but on a larger scale;

Figure 11 is a fragmentary horizontal section through adjoining portions of the center sill and the bolster beam substantially along line 11—11 of Figure 9 and on the same scale;

Figure 12 is a section through the middle portion of the bolster beam along lines 12—12 of Figures 1 and 9 and on the scale of Figure 10;

Figure 13 is a fragmentary vertical section on the scale of Figure 10 through the connection between center sill and bolster beam, the section being taken substantially along lines 13—13 of Figures 1 and 10;

Figure 14 is a section through the outer end of the bolster beam and a fragmentary elevation of adjoining side wall portions, the section being taken substantially along line 14—14 of Figure 1 and on a similar scale as Figure 10;

Figure 15 is a fragmentary perspective, partly sectional view of a modified form of the bolster beam and its connection to the center sill,

Figure 16 is a fragmentary plan view of and a horizontal middle section along line 16—16 of Figure 15 through the connecting zone between center sill and bolster beam; and

Figure 17 is a fragmentary local section through the bottom and side wall connection of the bolster beam along line 17—17 of Figure 15.

The end underframe illustrated in the drawing has a center sill 1 and a bolster beam 2 forming two of its main strength members. Inboard of the bolster beam 2, the center sill 1 is substan-

tially identical with the construction disclosed in the simultaneously filed application Serial No. 588,866 of the co-inventer, Walter B. Dean, mentioned hereinbefore.

The sill 1 as shown in cross section in Figure 5, has side members 3 and bottom wall members 4 and 5. The side members 3 are outwardly facing U-sections having a vertical wall or web 6, top and bottom walls or flanges 7 and 8 and a longitudinally extending reinforcing groove 9 in the middle of the web 6. The upper bottom wall member 4 is an upwardly facing U-section with a horizontal web 10 and upstanding arms 11 which latter overlap and are secured to the insides of the lower portions of the webs or side walls 6. The other, lower, bottom wall member 5 is secured to the web 10 of the member 4 and to the bottom flanges 8 of the members 3. Both members 4 and 5 are formed with an upwardly directed reinforcing groove 12 and 13, respectively, along the longitudinal vertical center plane, line 4—4 in Figure 1, of the underframe and of the body as a whole. Secured to the top flanges 7 is a shear panel 14 reinforced by vertical transversely extending webs or arms 15, see also Figures 1, 2 and 10, as is more fully described in the aforesaid simultaneously filed application.

The bottom wall members 4, 5 extend without change in cross section across the location of the bolster 2 in outboard direction to a plane designated in Figures 2, 3 and 4 by line 16, that is nearly halfway from the bolster to the outboard end of the underframe. The upper flanges 7 and the upper web portions 6 of the side wall members 3 above the grooves 9 extend to the plane 17 (Figures 2 and 4), that is to a region about halfway between the ends of members 4, 5 and the outboard end of the underframe, whereas the flanges 8 and the web portions 6 below the grooves 9 extend further outboard and end short of the end casting 18 near the outboard side of the so-called second end beam 19 at the plane indicated by the line 20 (Figures 4 and 5). The groove 9 terminates just inboard of the bolster beam as indicated by the dotted line 21 in Figures 2 and 10 and as marked by the same numeral in Figure 4. The space between the upper and lower web portions of the side wall adjoining the end of the groove 9 is filled in on each side by a short plate 22 (Figures 4, 11 and 13), the purpose of which will become apparent from the later description of the bolster beam construction and attachment.

The side wall members 3 of the center sill are supplemented from the line marked by the numeral 22' (Figures 2, 4 and 10) inboard of the bolster beam to the end casting 18 by outer U-section members 23 each having a vertical web 24, a top flange 25 and a bottom flange 26 (Figures 2, 3, 6, 7, 8, 10, 11 and 14). The webs 24 overlap the webs 6, and the flanges 25, 26 overlap the flanges 7 and 8 of the members 3 and are secured thereto by spot welding or other means as indicated by the heavy black dots in such sectional figures as Figure 6 and by asterisks in Figures 2 and 10. The upper portions of the webs 24 with their flanges 25 extend uninterruptedly to the end sill casting 18 whereas the lower portions of the webs 24 with their flanges 26 are separated in the end region by a longitudinal slot 27 (Figure 2) in each member from the upper portions and diverge outwardly; these diverging web and flange portions are marked respectively, 28 and 29 (Figures 2, 3, 4 and 7).

The members 23 with their straight upper portions 24, 25 and diverging lower portions 28, 29 extend to the plane 30 defining the inner face of the end casting 18 (Figures 2 and 4). A member 31 on each side bridges with its triangular web 32 the space between the margins of the slot 27, and has a downwardly extending outer arm 33 fastened to the inside of arm 26 and its upwardly directed inner arm 34 fastened to the inside of web 28 (Figures 3, 4 and 7). A horizontal, outwardly directed flange extension 35 of the arm 34 overlaps arm 25, Figure 7. The members 31 extend between the planes 17 and 30 so that their arms 34, 35 form outboard extensions of the upper portions of the webs 6 and the top flange 7 of the center sill side members 3.

Two superimposed top wall profiles 36 and 37 extend respectively from a plane 38 outboard of and adjacent the bolster beam and from plane 16 to the plane 30 at the casting 18 (Figures 2, 4, 6 to 8 and 10). These members are similar to the bottom wall profiles 4 and 5. The upper top member 36 overlaps in succession the top flanges 7, 35 and the lower top member 37 has its web 39 secured to the member 36 and its arms 40 in succession to the upper parts of webs 6 and to the arms 34. Both members 36 and 37 have a longitudinal reinforcing groove 41.

The end margins of the members 23, 31, 36 and 37 are secured, preferably by arc welding, to the casting 18 along lines where the latter is reinforced by longitudinal walls or interior webs. The end zones of the webs and flanges 28, 29 and 32 are reinforced by bands 42 (Figures 2, 3 and 7) spot welded to them and arc welded to the casting 18.

The casting 18 is similar to the end casting of the before mentioned simultaneously filed application Serial No. 588,866, but it has in addition an inboard extension 43 of that section with a top wall 44, side walls 45 and a marginal flange 46 extending continuously along the sides and around the inboard end of the extension. The side portions of flange 46 are secured by rivets 47 to the overlapping marginal portions of top wall 36 and flanges 25, 35 (Figures 2, 4 and 7).

From the outboard side of the plates 22 at the bolster beam location to the plane 16, a longitudinal structure 48 is secured by its marginal flanges 49 to the insides of webs 24 between the upper and lower web portions 6 (Figures 2, 4, 6, 9 and 10). The flanges 49 adjoin horizontal marginal web portions 50 interconnected by a channel section portion having a bottom wall 51 and side walls 52. A transverse brace 53 arranged near the middle between the ends of the structure 48 interconnects the web portions 50. The described full cross section 49, 50, 51, 52 extends only between the brace 53 and the end at the plane 16 whereas inboard of brace 53 the structure 48 is only formed on each side by flange 49 and a narrow strip of the web portions 50. The outboard end regions of the flanges 49, the web portions 50 and the walls 52 are reinforced by Z-section members 54 snugly fitting over and secured to them.

A transverse vertical plate 55 abuts and is secured, by arc welding, to the outboard margins of the bottom wall members 4, 5, the structure 48, 54 and the webs 6 and 24 (Figures 3, 4 and 6). The plate 55 constitutes the inboard abutment for the buffing and draft gear (not shown). It is obvious how effectively the plate 55 will transmit compression forces from the buffing gear into the

bottom wall and the side walls of the center sill either directly or via the structure **48, 54**.

The outboard abutment **56** for the draft gear is formed on a reinforcing structure having a pair of cast or forged side members **57**, each mainly angle shaped in cross section with an upstanding arm **58** and an outwardly directed lower arm **59** (Figures 2, 3, 4 and 8). The angles **58, 59** fit over the angles formed by the webs **6, 24** and the flanges **8, 26** of the center sill side walls and extend longitudinally across and in both directions a distance beyond the location of the second end sill **19**. The upper margins of the arms **58** are interconnected by a transverse bridge **60** integrally secured to or formed as a one-piece part with them. Rivets **61** connect the arms **58** along their entire length and the outboard ends of the arms **59** to the side wall portions **6, 24, 28** and **8, 26, 29**, respectively, and some of the rivets pass also through the vertical arms **63** of angle-shaped reinforcing members **62** on the outside of the side walls **24**. The other arm **64** of each member **62** extends outwardly above the respective flange **26**.

It will be noted that the structure **57, 60** extends in inboard and outboard direction across and beyond the planes **17** and **20** at which some of the longitudinal webs, flanges and members terminate or begin, and that it thereby contributes to the achievement of the necessary strength in this region. It will be noted furthermore that the members **57**, which have to transmit the draft from the draft gear into the center sill are directly riveted to such sill portions as the webs **6, 24, 28** and the flanges **8, 26, 29** which extend inboard into the middle portion or at least inboard beyond the bolster beam location of the center sill.

The space for the draft gear between the plate and members **55, 57** is, as shown in Figures 2 to 4, 6 and 8, closed in part at the bottom by a cover structure **65** having marginal side flanges **66** and three bridges **67, 68, 69**, respectively, at the inboard end, in the middle and at the outboard end. A great number of strong bolts **70** secure the structure **65** by its flanges **66** to the flanges **8, 26**, the marginal portions of the bottom wall **5**, the arms **59** of the reinforcing structures **57** and the arms **64** of the angles **62**. This cover structure **65** extends likewise longitudinally across the ends of successive center sill profiles.

The structures **57** and **65** constitute with their bridges **60** and **69** a closed ring surrounding the draft gear, the outlines of which are indicated by dot-and-dash lines **71** in Figure 8, and thereby relieve the center sill from the tendency of being spread apart or otherwise deformed under compression load with the coupler (not shown) at an angle to the longitudinal center line of the center sill. The inboard portion of the draft gear is guided and supported by bearing plates **72** provided on the arms **58** of the plates **57** and on the structure **65** (Figure 6), and the coupler will be journaled to the inboard portion just outboard of the bridges **60, 69**.

The bolster beam **2**, shown in Figures 1 to 4 and 9 to 14, has on each side of the center sill **1** a pair of longitudinally spaced webs **73** each provided along its upper and lower margins with flanges **74** and **75**. The upper portions of the webs **73** and the flanges **74** extend as a one-piece structure across the center sill as clearly shown in Figures 4, 9 and 13, so that the sides of the beam are actually formed of two members extending over the width of the underframe. A bottom web **76** bridges the space between the vertical webs **73** and is overlappingly secured, preferably by spot welding, to the flanges **75**. This bottom web **76** extends without interruption from one side of the underframe to the other and has its central portion arranged in contact with the underside of the center sill bottom plate **5** and secured thereto in a manner to be described later on.

A cast or forged bracket, **77** on each side, see Figures 2, 3, 9 to 11 and 13, has its vertically and longitudinally extending web **78** and horizontal marginal flanges **79** and **80** shaped and dimensioned to fit from the outside into the channel section sill member **23** (Figure 13) and a pair of transversely extending vertical arms **81** fitted between and secured, preferably by electric spot welding, to the inner marginal portions of the respective side walls **73** of the beam **1** (Figures 9 to 11 and 13). The lower side flanges **75** of the bolster beam end at the outer margins of the flanges **80** of the brackets **77** and are secured thereto, preferably by electric arc welding, Figures 9 and 11.

A pair of transverse bulkheads **82** are, as shown in Figures 2 to 4, 9 to 11 and 13, arranged substantially in the planes of the arms **81** in the interior of the center sill and overlap by their marginal flanges **83** and **84** respectively the insides of the webs **6**, the filler plates **22**, the arms **11** and the web **10** of the bottom member **4** of the sill. Rows of rivets **85** pass through the overlapping portions of the webs **78** and flanges **80** of the brackets **77**, the webs, walls, filler plates and flanges of the center sill, the flanges **83, 84** of the bulkheads **82**, the bolster beam bottom wall **76** and through the center plate **86**. The center plate, which is adapted for the support of the underframe on a truck (not shown) extends in longitudinal direction beyond the brackets **77** and is secured in those regions by additional rivets to the center sill.

Heavy gauge channel section members **87**, see Figures 1, 2, 4, 9, 10 and 12 to 14, extend uninterruptedly over the entire width of the underframe and have their webs and top arms **88, 89** nested in the angles formed by the webs **73** and top flanges **74** of the bolster beam side walls whereas their wider bottom walls **90** overlap and are secured to the top flanges **7, 25** of the center sill. The bottom walls or webs **88** also abut and are secured together with the central portions of webs **73** to upwardly projecting parts **91** of the bulkheads **82**, preferably by electric spot welding (Figures 4 and 13). Single rivets **92** (Figures 9 and 10) pass through the upper ends of the bracket arms **81**, the side walls **73** of the bolster beam and the webs **88** of the transverse members **87** so as to reinforce additionally the connection between these members and the center sill.

It will be understood that the flanges **75** and the bottom web **76** as well as the center sill parts connected to the web **76** constitute the lower chord of the bolster beam whereas the upper chord is constituted by the upper marginal portions of the webs **73**, and by the marginal flanges **74** and the members **87** which are arranged on the outside of the bolster beam, so that the latter is open at the top and thereby accessible for making the rivet and weld joints.

This construction of center sill and bolster beam and of their connection is believed to be much stronger than previously attempted sheet metal center sill and bolster beam structures because there is practically no interruption of the con-

tinuity of the webs and chords of the bolster beam where it intersects the center sill.

Secured to the underside of the bolster beam is on each side a side bearing **93** (Figures 9 and 12). The region where the steeply inclined inner portion and the less inclined outer portion of the bolster beam underside meet has the connections between the bottom web **76** and the vertical walls **73** reinforced by deposit, preferably arc welds **94**, thereby counteracting the tendency of the flanges **75** and the bottom web **76** to become separated under vertical bending stresses which can not be well sustained by the spot welds between these members.

Near each outer end of the bolster beam, see Figures 1, 9 and 14, a heavy vertical plate **95** is inserted between the portions of the vertical walls **73** adjoining the channel members **87**. Above and below in the region of the members **87** the plate **95** extends longitudinally in both directions beyond the walls **73** and is secured, such as by arc welding, below the bottom arms **90** to the end margins of the walls **73**, flanges **75** and bottom wall **76**. The upper portions of the walls **73**, top flanges **74** and members **87** extend through cut-outs in and a short distance outwardly beyond the plate **95** to which they too are welded, and their outwardly projecting ends are secured, such as arc welded, to a horizontal, inwardly facing U-section member **96**. The member **96** ends at the margins of the arms **90**. The aforesaid outwardly projecting portions and the channel section member **96** are nested in an inwardly facing channel section portion of the underframe side sill **97** and are secured thereto by a multitude of spot welds indicated respectively by heavy black dots and by asterisks in Figures 9 and 14.

This side sill **97** and its connection to the side wall unit **98**, as well as the connection between the side wall unit **98** and the upwardly extending plate **95** are similar to the constructions disclosed in and covered by the hereinbefore mentioned applications Serial No. 580,647, and Serial No. 580,646.

The lower part of plate **95** and a jacking pad **99** are riveted to the lower parts of the side sill and the bolster beam as shown in Figures 1, 9 and 14.

From the foregoing description and from the drawings it will have become clear that the bolster beams are secured over a wide area to the underframe side sill and to the body side wall.

The inboard member **87** is adjoined by the hereinbefore described floor plans **14**, **15**, the last of which has its vertical arm **15** secured by an angle section strip **100** to the arm **90** of the member **87** (Figure 14) or its bottom wall overlappingly secured to said arm **90** (Figures 2, 4 and 10). This means that, in regard to the connection between members **14** and **87**, Figure 14 shows a slight modification over the preceding figures.

The outboard member **87** is continued by channel and Z-section floor pans **101** of heavier gauge than the floor pans **14**, **15** and these members are likewise connected to the top of the center sill. See Figures 1, 2, 4, 10 and 14. The inboard member **101** overlaps and is secured to the marginal portions of the arm **90** of the member **87**. The last outboard member **101** has its vertical wall or arm **102** secured to the upper margin of the vertical web **103** of the second end sill **19**. This web **103** on each side of the center line has its inner end secured, such as by arc welding, to the respective reinforcing member **62**, and is reinforced by lower horizontal marginal angle sections **104** and by vertical members **105**. See Figures 2 to 4 and 8.

The end casting **18** is connected with the side portions **106** of the end sill. Adjoining the center sill on both sides and extending longitudinally between the sill **19** and the sill **18**, **106** are, as shown in Figures 2, 4, 7 and 8, Z-section members **107** secured by angle or U-section members **108** to the center sill and supporting by their outer arm **109** short channel section floor pans **110** which fill the space between the web **103** and the end sill portions **106**. A space between the inboard floor pans **110** and the web **103** permits the passage of the vertical reinforcement **105**.

The construction and arrangement of the members **14**, **15**; **101** and **106** to **110** are substantially identical with the construction disclosed at length in the aforementioned application Serial No. 588,866, of the co-inventor W. B. Dean on "Underframe for vehicles, especially railway cars," and need, therefore, not to be described here again in detail. Also the connection between the floor pans and the side sills is disclosed in the same application as well as in the hereinbefore cited U. S. applications Serial No. 580,646 and Serial No. 580,647. It will be understood that the space beneath the top wall **44** of the casting **18** and the spaces at the sides of the extension **43** of the casting beneath the members **107** serve for the housing of the buffer gear in similar fashion as disclosed in the simultaneously filed application, Serial No. 588,866, above referred to.

The illustrated and described structure consists mainly of sheet metal profiles, preferably of high tensile sheet metal such as cold rolled austenitic stainless steel. The overlapping portions of these members are practically throughout interconnected by electric spot or seam welding, the welding spots being indicated at many places by asterisks or heavy black dots at the interfaces. In limited regions only is the structure reinforced by castings and forgings and are arc welds, rivets and bolts used as connecting means. All this leads to a strong but light weight structure. Nowhere is there a sharp break in the construction of the center sill inasmuch as the joints between two consecutive members are always overlapped by members extending in both directions across such joints. There is no weakening of the center sill by the bolster beam attachment; to the contrary, the center sill is heavily reinforced in the bolster beam region. The bolster beam constitutes, as emphasized hereinbefore, a structure which has in effect through-running vertical walls and through-running top and bottom chords and is firmly secured and tied into the center sill and the center bearing.

Contributing to the fitness of the new structure for sustaining the stresses exerted thereon are also in large measure the members **57**, **60** and **65**, **68** which, on account of the fact that they constitute a closed ring of great strength and are tied into, indeed, actually form the central part of the second end sill **19**, will not give way under a compression load with the coupler at an angle as it was experienced in similar constructions consisting mainly of sheet metal.

Finally, the new construction is stronger than previous structures on account of the integral casting **18** at the end of the sheet metal structure, which casting combines the buffer bar, a coupler carrier **111** and the attachment **112** for the collision posts (not shown) so as to make use of the full strength of these members.

The modified embodiment illustrated in Figures 15, 16 and 17 has a center sill substantially

identical with the center sill of the first embodiment, yet this center sill extends without change in cross section through the intersection with the bolster beam 113, and requires therefore no further description. The same reference numerals are supplied for corresponding parts of both embodiments.

The bolster beam 113 has on each side of the center sill a pair of longitudinally spaced vertical walls 114 provided with outwardly directed flanges 115 and 116. The bottom wall or web 117 is connected to the flanges 116 and extends uninterruptedly across the underside of the center sill. Each side wall 114 is also provided along its inner vertical margins with a flange 118. The top chord of the bolster beam is constituted by an upwardly facing hat section 119 bridging by its web 120 the space between the side walls 114, having its side walls 121 secured to the side walls 114 and its top flanges 122 secured to and extended longitudinally beyond the flanges 115. This member 119 extends uninterruptedly across the center sill and has its web 120 secured to the top flanges 7 thereof.

The inner ends of the side walls 114 are interconnected by generally U-section members 123 which have their side arms 124 secured, preferably by spot welding, to the side walls 114. The bottom walls or webs 125 of the members 123 and the flanges 118 of the side walls are secured to the upstanding arm 126 of an angle plate or bracket 127, the lower arm 128 of which is welded to the flanges 116. The plates 127 nest in the angles formed by the webs 6 and the bottom flanges 8 of the center sill on each side and are secured to the lateral marginal portions of the center sill and to the bottom web 117 of the beam by a number of rivets 129 which will also hold the center bearing (not shown).

Inserted between the side walls of the center sill and arranged in the planes of the bolster beam side walls 114 are a pair of bulkheads 130 provided with marginal flanges 131, 132. The vertical flanges 131, arms 126 of the plates 127, the center sill side walls 6 and the flanges 118 of the bolster beam side walls are secured together by bolts 133 or similar connecting means such as rivets. Also the bottom flange 132 of each bulkhead 130 is secured to the bottom members 4 and 5 of the center sill and the bottom plate 117 of the bolster beam by bolts one of which is visible in part at 134 in Figure 15. It will be noted that the bulkheads 130 have the middle portions of their marginal flanges 131, 132 inwardly arched so as to pass around the grooves 9 and 12, 13 of the center sill walls. The bulkheads 130 are also secured to the side walls 121 of the top chord member 119.

The bolster beam side walls 114 and their lower flanges 116 are reinforced by angle brackets 135 stiffened by ribs 136 which serve for the transmission of the stresses from the side bearing 137.

Instead of the deposit weld of the first embodiment between the side walls and the bottom wall of the bolster beam, in this embodiment angle section strips 138 are inserted and spot welded by their arms to the vertical walls 114 and the bottom walls 117, Figure 17.

Also in this embodiment the walls of the bolster beam extend in effect uninterruptedly across the center sill and the connection between bolster beam and center sill is of great strength.

The invention is not restricted to the illustrated embodiment but its basic features can be applied to other structures and can be modified without departing from the spirit of the invention and the coverage afforded by the attached claims.

What is claimed is:

1. In a vehicle body underframe, a hollow section center sill having transversely spaced side walls, a transverse beam having portions extending laterally on both sides of the center sill, a bulkhead interconnecting the lateral portions of the transverse beam in the interior of the center sill, a longitudinal reinforcing corrugation formed in the side walls of said sill, said corrugation being cut away at the location of the bulkhead whereas the portions of the side walls above and below said corrugation are continued across the location of the bulkhead.

2. In a vehicle body underframe, a hollow section center sill having transversely spaced side walls, a transverse beam having portions extending laterally on both sides of the center sill, a bulkhead interconnecting the lateral portions of the transverse beam in the interior of the center sill, a longitudinal reinforcing corrugation formed in each of the side walls of the sill, said corrugation being cut away at the location of the bulkhead whereas the portions of said walls above and below said corrugation are continued across the location of the bulkhead, said side walls being reinforced by added means in and adjacent the region of the bulkhead and the cut-out of the reinforcing corrugations.

3. In a center sill for vehicles such as railway cars: transversely spaced longitudinally extending vertical walls interconnected by transverse webs and walls, and a casting structure having side portions inserted between the side walls of the center sill and secured thereto, said structure being adapted for the passage of and provided with abutments for a draft and buffing gear and having a bridge interconnecting the upper parts of the side portions, a cover plate, connecting means between the cover plate and the lower marginal portions of the side walls of the center sill and the side portions of said structure so as render the cover plate a main stress transmitting element and so that the structure and plate together result in a closed frame for the passage of said gear.

4. In a center sill for railway cars and the like vehicles, comprising: a hollow section sheet metal structure composed of vertically and longitudinally extending walls and of a top wall inter-connecting the side walls and extending from the outboard end of the structure for some distance inboard, in combination with a buffer casting having a vertical portion secured to the end margins of the side walls of the center sill and having an inboard extending arm overlapping the top surface of and connected with said top wall.

5. In an underframe for railway cars and the like vehicles, a center sill and a bolster beam secured together at their intersection, said center sill having transversely spaced side wall members interconnected by a horizontal wall structure along one of the top and underside of the sill, longitudinal reinforcing grooves formed in said side wall members inboard of and terminating at said bolster beam, said side wall members and said horizontal wall structure extending across the intersection with the bolster beam to a region between the bolster beam and the end of the underframe, a second set of side wall members extending from a region inboard of said bolster beam to about the end of the underframe and being secured in overlapping relation to said first named side wall members, a second horizontal

wall structure interconnecting the side walls along the other one of said top and underside of the sill and extending from a region inboard of the end of said first named horizontal wall structure to about the outboard end of the center sill, so that said center sill includes a number of longitudinal members and structures ending in different regions and overlapping one another thereby avoiding stress concentrations, and so that at least several of the longitudinal center sill members and structures extend across the intersection with the bolster beam.

6. Center sill for railway and the like vehicles comprising a hollow section middle portion having transversely spaced side walls interconnected by a generally horizontal bottom wall, said side walls and said bottom wall ending short of the end of the center sill but the side walls extending in outboard direction beyond the bottom wall, additional side wall members overlapping said first named side walls from a region inboard of the end of the bottom wall and extending to about the end of the center sill, and a top wall structure interconnecting the side walls and extending from a region inboard of the end of the bottom wall to about the end of the center sill.

7. In an underframe for railway and the like vehicles, a hollow section sheet metal center sill and a hollow section sheet metal bolster beam, said center sill having a middle portion including U-section side wall members facing outwardly and each provided with at least one longitudinal reinforcing groove in its vertical arranged web, said grooves terminating on the inboard side of the bolster beam but the web portions above and below the groove extending outboard across the bolster beam location toward the end of the underframe, a second pair of outwardly facing U-section side wall members having a plane web and being nested in said first named U-section members, said second U-section members extending from a point inboard of the bolster beam beyond the end of said first named U-section members and having their webs longitudinally split in the end region, the lower portions of said split webs and the attached lower arms of the U-sections diverging toward the end of the underframe, a triangular structure inserted between and secured to the upper and lower sections of the webs, and transverse bulkheads arranged in line with the side walls of the bolster beam arranged in the interior of the center sill and secured by marginal flanges to the side wall members of the sill immediately outboard of the end of said reinforcing grooves.

8. A hollow section transverse beam for vehicles such as railways cars, comprising: longitudinally spaced vertical walls, a bottom wall and reinforcements secured to the upper margins of the side walls and arranged on the outsides thereof, a longitudinally extending angle section member connected with the outer ends of said side walls and said reinforcements and adapted for connection with a longitudinal side sill structure so as to transmit the stresses from the beam into the side sill structure over a wide area.

9. In an underframe structure for vehicles such as railway cars: a center sill and a hollow-section transverse beam, the latter comprising longitudinally spaced vertical walls, the upper portions of said vertical walls extending uninterruptedly across the top of said center sill, angle-section profiles having one of their arms secured to the outside of the upper portions of said vertical walls while the other one of their arms extends generally horizontally away from the center of the transverse beam, said angle-section profiles extending likewise uninterruptedly across the center sill and having their said other arms secured to the top of the center sill.

10. In an underframe structure for vehicles such as railway cars: a center sill and a hollow-section transverse beam, the latter comprising longitudinally spaced vertical walls, angle-section profiles having one of their arms secured to the outside of the upper portions of said vertical walls while the other one of their arms extends generally horizontally away from the center of the transverse beam, said angle-section profiles extending uninterruptedly across the center sill and having their said other arms secured to the top of the center sill, said second-named arms of the angle-section profiles constituting part of a floor panel structure, having its adjoining parts secured to the margins of said second-named arms.

11. End underframe structure for railway cars comprising a bolster beam and a hollow-section center sill portion extending between said bolster beam and the outboard end of the structure, said center sill portion having transversely spaced vertical walls interconnected by vertically spaced top and bottom webs, said top web extending from the outboard end of the sill portion to a point spaced in outboard direction from the bolster beam, and said bottom web extending from the bolster beam to a point spaced from the outboard end of the sill portion but beyond the inboard end of the top web, the arrangement of said webs serving for directing at least a large part of the stresses exerted by buffing and draft gear on the outboard end of the center sill downwardly in inboard direction into the lower part of the center sill portion.

12. End underframe structure for railway cars comprising a bolster and a hollow-section center sill portion extending between said bolster and the outboard end of the structure, said center sill portion having transversely spaced vertical walls interconnected by vertically spaced top and bottom webs, a draft and buffing gear abutment arranged between the bolster and the outboard end of said sill portion in the interior of the latter, said top web extending from the outboard end of the sill portion to a point between said abutment and said bolster, and said bottom web extending from the bolster to said abutment, the arrangement of said webs serving for directing at least a large part of the stresses exerted by buffing and draft gear on the outboard end of the center sill downwardly in inboard direction into the lower part of the center sill portion.

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