May 24, 1938. R. H. MADDOCK 2,118,257

CROSS FRAME MEMBER

Original Filed March 2, 1931 3 Sheets-Sheet 1

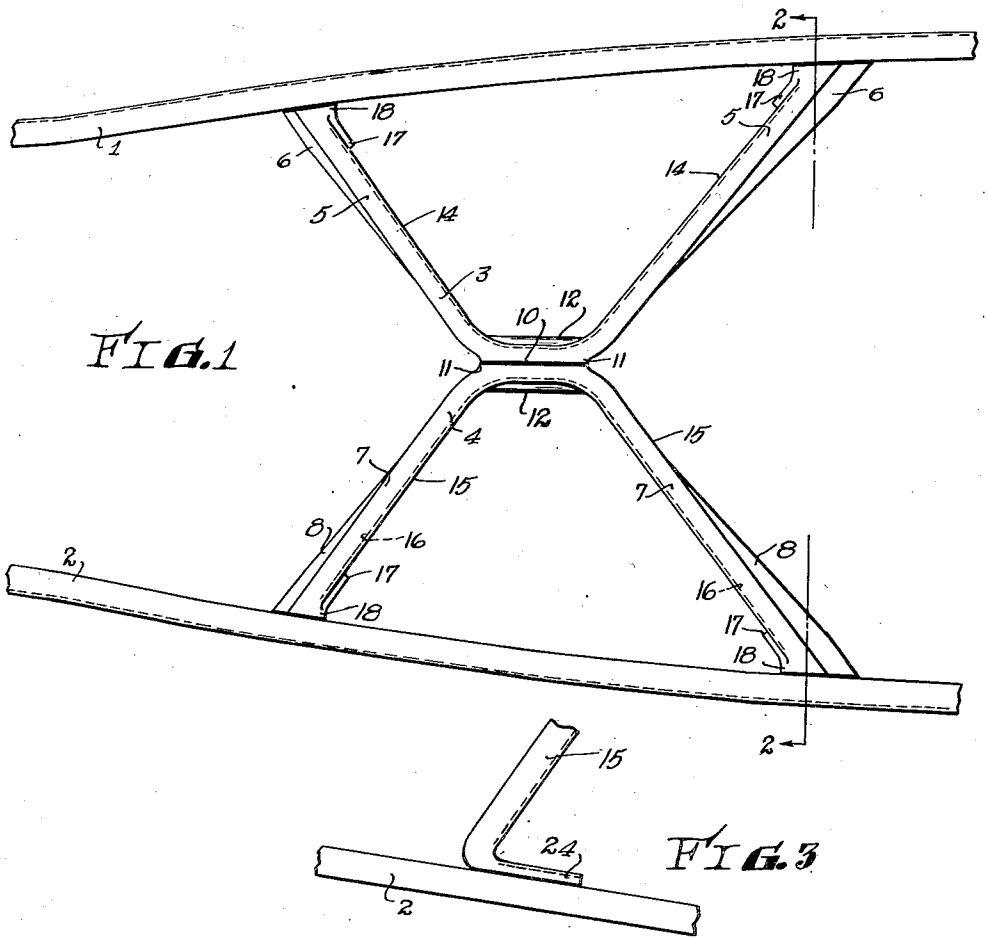


FIG. 1

FIG. 3

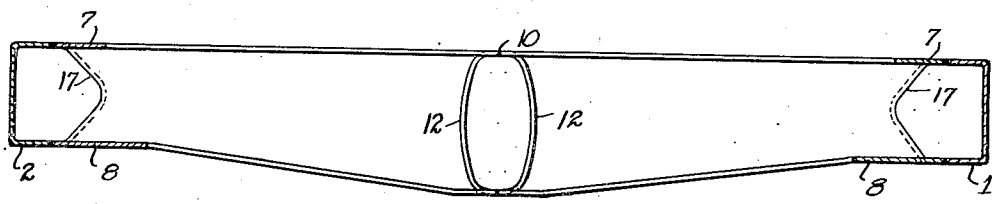


FIG. 2

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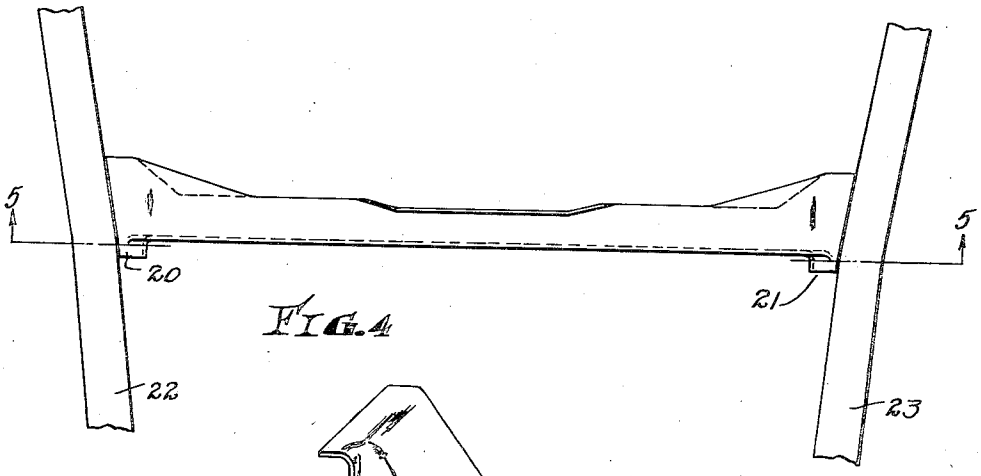


FIG. 4

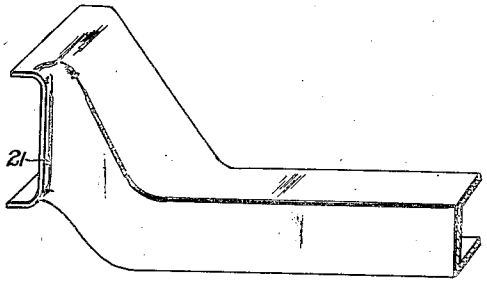


FIG. 11

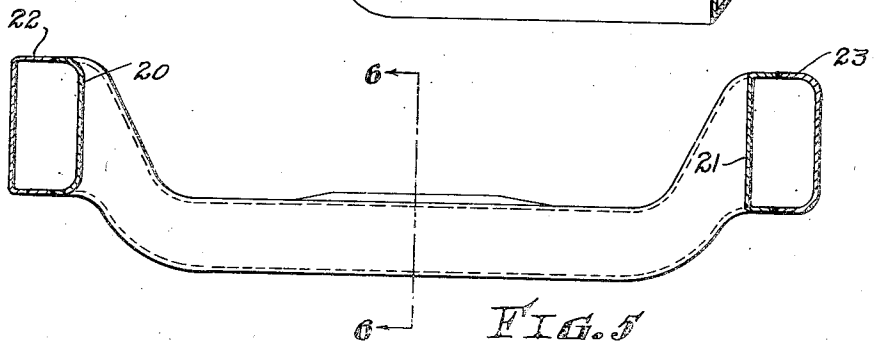


FIG. 5

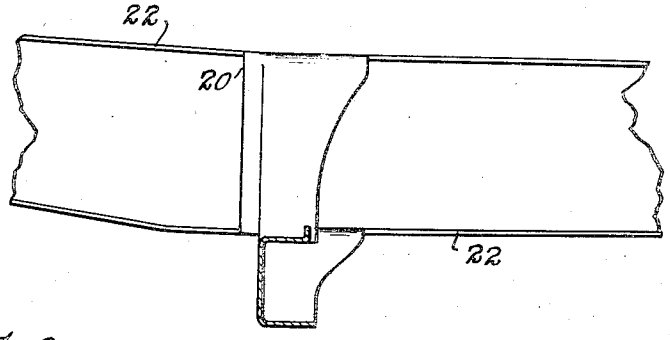


FIG. 6

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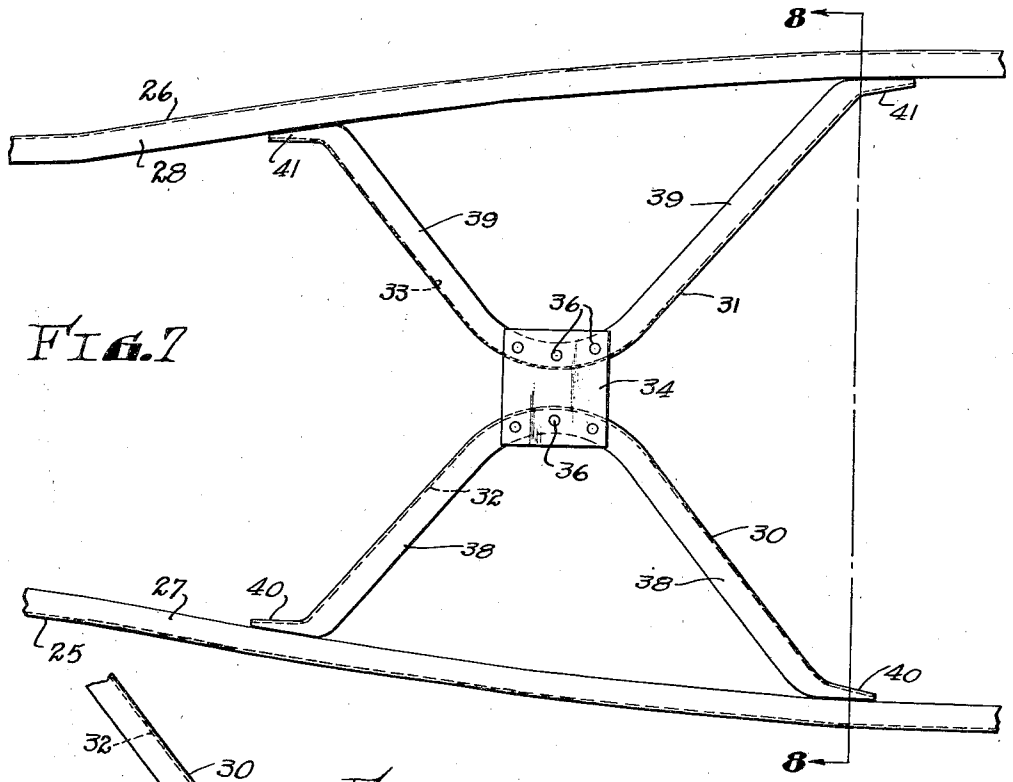


FIG. 7

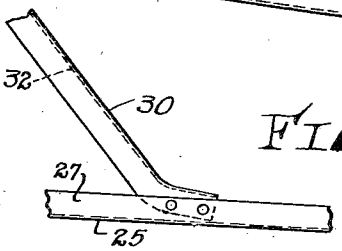


FIG. 10

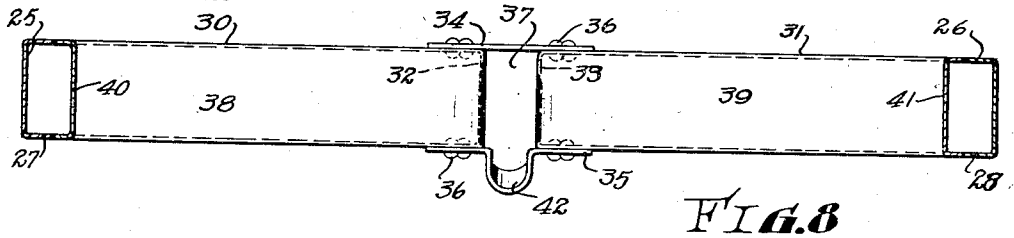


FIG. 8

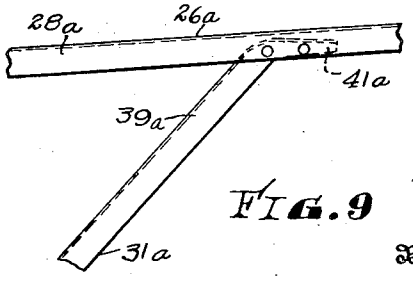


FIG. 9

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UNITED STATES PATENT OFFICE

2,118,257

CROSS FRAME MEMBER

Robert H. Maddock, Cleveland, Ohio, assignor to The Midland Steel Products Company, Cleveland, Ohio, a corporation of Ohio

Application March 2, 1931, Serial No. 519,385
Renewed October 24, 1935

8 Claims. (Cl. 280—106)

This invention relates to vehicle frames and particularly to an improved cross member for connecting the side rails.

An important feature of my invention is a cross member which braces the vehicle frame both laterally and longitudinally to a greater degree than cross members heretofore used, forming with the side rails a vehicle frame which in plan is substantially a truss construction.

Another important feature of my invention resides in the formation of the ends of the cross member so that it may be easily and economically secured to the side rails and can withstand severe torsional and shearing stresses without damage to the cross member or side rails.

The principles of my invention will become apparent from the following specification in which preferred forms of my cross member and the manner of connecting the ends to the side rails are described by reference to drawings wherein:—

Fig. 1 is a plan view of the cross member connected between the side rails of a vehicle frame.

Fig. 2 is a partial sectional view taken on a plane indicated by the line 2—2 of Fig. 1.

Fig. 3 is a partial plan view of an end of the cross member illustrating another connection with the side rails. It is to be particularly noted that the elements 3 and 4 of the X-member are of greater depth adjacent their intersections and gradually taper down to lesser depth throughout their entire lengths. In this arrangement, the outer ends of the elements or arms are of substantially the same depth as the side rails to facilitate attachment of the arms thereto. The taper throughout the length of the arms is obtained by making the lower longitudinal edge alone, taper into the greater depth at the intersection so that the upper longitudinal portion of the arms or elements do not project above the horizontal plane of the top of the side rails to interfere with the body or the attachment thereof to the chassis.

Fig. 4 is a plan view of a drop channel cross member secured to the side rails of a vehicle frame.

Fig. 5 is a view taken on a plane indicated by the line 5—5 of Fig. 4.

Fig. 6 is a cross sectional view taken on a plane indicated by the line 6—6 of Fig. 5.

Fig. 7 is a plan view of a modified form of the cross member illustrated in Fig. 1.

Fig. 8 is a cross sectional view of the member and side rails of the vehicle frame taken on a plane indicated by the line 8—8 of Fig. 7.

Fig. 9 is a partial plan view of one of the ends of the cross member illustrating another manner in which it may be connected to the vehicle frame and side rails.

Fig. 10 is a partial plan view of a cross rail and end of a cross member such as shown in Fig. 7 and illustrates a riveted connection between the two.

Fig. 11 is a perspective view of the end of the member illustrated in Fig. 4.

Referring first to Figs. 1 and 2, my cross frame member is shown connected to side rails 1 and 2 of a vehicle frame and comprises two channelled elements 3 and 4, disposed intermediate the side rails 1 and 2, with the upper flange 5 and lower flange 6 of one toward the corresponding flanges 7 and 8 of the other.

The elements 3 and 4 may be secured to each other intermediate the ends, preferably near the center, by butt welding the flanges 5 and 6 of one to the edges of the corresponding flanges 7 and 8 of the other along a portion 10 of their lengths. Welding fins 11 are provided to facilitate the welding operation. In order to permit passage of the propeller shaft and for other structural reasons, the webs of the members may be bent so as to be concave toward the flanges along the connected portion, as indicated at 12. In this manner the connected portion of the elements 3 and 4 is somewhat box-shaped in cross section as better illustrated in Fig. 2, the unwelded or bifurcated ends forming forks 14 and 15 on each side of the welded portion.

The forks 14 of the element 3 and the corresponding forks 15 of the element 4 are bent or flared outwardly from the axis of the welded portion toward the side rails 1 and 2 respectively, forming a cross member which is substantially X-shaped in plan.

The ends of the forks 14 of the member 3 are connected to the same side rail 1 at widely separated points, the ends of the upper flanges 5 engaging the upper flange of the side rail and the ends of the lower flange 6 engaging the lower flanges of the side rail. The lower flanges 6 and 8 of the elements 3 and 4 respectively may be wider than the outer portion, as better illustrated in Fig. 1.

In order to provide a greater length of welding connection between the flanges of the cross member and the corresponding flanges of the side rails, the web 16 of the cross member is turned and deformed, beginning a short distance from the end, to form a flange 17 thereon. This flange extends from the web in a direction away from

the flanges of the cross member and approximately normal to the web. The flange 17 defines a surface concave toward its ends into the planes of the upper and lower flanges of the cross member, thus strengthening the webs against buckling and disposing part of the web material in the flanges, as at 18, better illustrated in Fig. 11. In this manner additional flange width is provided for connecting with the side rails. The ends of the flanges of the cross members thus widened are butt welded or otherwise secured to the corresponding flanges of the side rails.

Another advantage of turning part of the web 16 into the flange 17 is that it gives a full depth of welding material along the entire bend. If a channel member were butt welded to the flanges without turning such a flange on the member due to the radius of curvature between the web and flange of the cross member, the effective welding edge of the flange adjacent to the web of the cross member would gradually drop off along the upper surface and, near to the web, would present only a point or line against the edges of the side rail flanges. Thus at the point of greater stress, when a load is applied to the cross member longitudinally of the frame, the weld would be only a point or at least of much less area than elsewhere. This small area would be in effect a line of weakness and the welded joint would tend to split open at such small area, and once having split the welded seam would tend to tear apart.

In the form of cross member illustrated in Fig. 1, the points of connection with the side rails define substantially a square or a rectangle of slightly greater dimension transversely of the frame than longitudinally thereof. I have found this dimensioning very effective and desirable. However, I do not intend to limit my invention to such dimensions.

The cross member and side rails thus form substantially a box section transversely of the connection, as illustrated in Fig. 2.

Another manner of securing the ends of the parts to the side rail when the webs of the cross member are disposed toward the respective side rails is illustrated in Fig. 3. In such case the ends may be bent inwardly toward the transverse axis of the cross member so as to present the flanges of the cross member toward the side rail flanges.

In order to provide a greater length of welding edge and at the same time eliminate the large radius of bend for the outer edge of the flange of the cross member, a portion of the cross member flange may be removed, thus forming flanges of much less width, as indicated at 24. As illustrated in Fig. 3, this greatly reduces the radius of bend of the cross member flanges and provides a very long welding edge.

In Figs. 4, 5, 6, and 11 is illustrated a drop cross member, the ends of the flanges of which are also widened by turning and spreading a portion of the web, as indicated at 20 and 21, for the purposes above described, whereby each end may be secured more effectively to the flanges of the side rails 22 and 23 respectively, with which the member is associated. This throws metal from the web into the flanges to increase the effective weld area between the cross member and side rails.

In Figs. 7 and 8 is illustrated a form of cross member embodying many of the principles of the X-shaped cross member previously described. This cross member is connected to the vehicle frame side rails 25 and 26, which have inwardly disposed flanges 27 and 28 respectively, and comprises two channel shaped elements 30 and 31. The elements 30 and 31 are positioned with their webs 32 and 33 respectively toward each other and their flanges toward the side rails 25 and 26 respectively.

The elements are secured intermediate the ends and preferably near the center between clamping plates 34 and 35. In the form illustrated the plates 34 and 35 lie respectively on the outer faces of the upper and lower flanges of both channel elements, and are secured to the flanges thereof by rivets 36 or welding.

The webs 32 and 33 are in spaced relation to each other and with the plates 34 and 35 define a passage 37 through the member which permits the positioning of the propeller shaft therethrough. The lower plate 35 may have a central longitudinal depression 42, concave upwardly and properly sloped for better effecting the positioning of the shaft.

The unsecured portions of each of the members 30 and 31 are bent away from the axis of the secured portions and toward the side rails, the unsecured portions or forks 38 of the member 30 engaging the same side rail 25 and the unsecured portions or forks 39 of the member 31 both engaging the side rail 26. Thus each of the members 30 and 31 are substantially U-shaped in plan and form in combination with each other an X cross member.

The ends 40 and 41 of the members 30 and 31 respectively are flared farther outwardly from the longitudinal axis of the members so as to present the edges, instead of the ends of the flanges of the members toward the side rail members. The ends of the first described member may be similarly formed.

The upper and lower flanges of the cross member may lie in the same planes respectively as the corresponding flanges of the side rails with which associated so that they may be butt welded thereto. On the other hand the side cross member flanges may overlap or underlap the corresponding flanges of the side rails to permit securing the flanges together by rivets, as illustrated in Fig. 10.

If it is desired to dispose the U members 30 and 31 of the form illustrated in Fig. 7 with the flanges toward each other so as to permit securing together at the center by butt welding the flanges, as in the case of the form shown in Fig. 1, then the ends may be turned as illustrated in Fig. 9. For example, the end of the member 31*a* of the fork 39*a* may be turned, as indicated at 41*a*, to present the flanges thereof in overlapping relation to the corresponding flanges 28*a* of the side rail 26*a*.

Various changes may be made in the forms of my invention illustrated in various combinations or subcombinations of the feature described in each form and may be combined with or substituted for corresponding parts of the other forms. In the forms described, however, it will be apparent that I have provided a cross member which effectively connects the side rails, forming a truss construction, and which engages the side rails at widely separated points with an increased length of connection between each end of the cross member and the side rail with which associated.

I claim:

1. In a vehicle frame comprising two side rail members with inwardly disposed flanges, a cross member adapted to be connected at its ends to said side rail members, the ends of said cross member being substantially channel shaped in

cross section with the web disposed vertically of the frame, a portion of the end of the web of said member being spread and deflected out of its normal plane to dispose part of the material thereof into the plane of and contiguous with the flanges of said channel whereby the length of the end of said channel is increased for providing a longer connection to the side rail with which the end is associated, said member being connected to the side rail by butt welding the end of the flanges thereof to the corresponding flanges of the side rail with which associated.

2. In a vehicle frame including two spaced side rail members, a cross member comprising two channel shaped elements disposed with the flanges of one toward the flanges of the other and secured together intermediate the ends by butt welding the flanges of one to the corresponding flanges of the other along a portion of the length thereof, the unconnected forks of each one of said elements being deflected outwardly away from the point of connection obliquely toward one of the side rails and the forks of the other element being similarly deflected toward the other side rail, and the ends of the forks of each of said elements being deflected inwardly toward the transverse axis of the cross member to dispose the flanges thereof toward the side rail with which they are associated, and to engage the side rail at widely spread points and being secured thereto by attaching the flanges of the elements to the corresponding flanges of the side rails.

3. In a vehicle frame including two spaced side rail members, a cross member comprising two channel shaped elements disposed with the flanges thereof toward each other and connected edge to edge intermediate their ends, the webs of said intermediate portions being bowed outwardly toward the side rail members, the unfastened portions of said elements being turned away from the fastened portions and toward their respective side rail members, the terminals of said unfastened portions being deflected to present the edges of the flanges thereof to the side rail members, one of said flanges of each element being wider than the other flange of said element, and said element being secured to the side rails by butt welding the edges of said flanges of the cross member to the corresponding flanges of the side rail with which they are associated.

4. In a vehicle frame including two spaced side rail members with inwardly disposed upper and lower flanges, a cross member comprising two channel-shaped elements bent to substantially U form with their intermediate portions of their flanges butt-welded together, the unsecured forks of each element being deflected outwardly from the connected portion and away from the other element, the ends of the forks of one element engaging one of said side rails and the ends of the forks of the other element engaging the other side rail, the ends of the webs of said ends being deflected and spread to dispose part of the material thereof into the plane of and contiguous with the flanges of said channel-shaped elements, said ends being connected to the respective side rails by welding the flanges of said elements to the flanges of the side rails.

5. In a vehicle frame comprising side rails, a cross member connecting said side rails, said cross member having ends of substantially channel cross section and being disposed between the side rails with the webs vertical, said member being connected at its ends to the side rails, the webs at the ends of said members being deformed and turned to form flanges normal to the web and extending laterally therefrom to dispose the upper and lower portions of said webs in the same planes with the upper and lower flanges of the cross member whereby additional flange width is provided at the ends of the cross member for connecting it to the side rail, and said cross member being secured to the side rails by securing the upper and lower flanges thereof to corresponding flanges of the side rails.

6. In a vehicle frame including a channel shaped member, a second member, said second member being of channel shaped cross section and disposed with its end toward the flanges of the first member, and being connected at its end to the first member through its flanges, a portion of the web at the end of the said second member being deformed out of its normal plane and turned to form a flange normal to the web thereof and to dispose part of the material thereof into the plane of and contiguous with the normal flanges of said second member, whereby additional flange width is provided on the second member for connection to the first member.

7. In a vehicle frame including two spaced side rails, a cross member comprising two channel shaped elements disposed with the flanges thereof toward each other and connected edge to edge intermediate their ends, the webs of said intermediate portions being bowed outwardly toward the side rails to increase the cross section of said member, the unconnected forks of one of said elements being bent away from the point of connection and obliquely toward one of the side rails, the unconnected forks of the other element being similarly bent toward the other side rail, the ends of the forks of each of said members being bent to present the flanges thereof toward the side rail member with which they are associated, and the cross member so formed being secured to the side rail by connecting the flanges of said ends to the corresponding flanges of the side rails.

8. In a vehicle frame including a member comprising two channel shaped elements disposed with their intermediate portions connected, the webs of said intermediate portions being bowed outwardly to increase the cross section of the connected intermediate portions, and the unsecured ends of the channel-shaped elements being arranged in outwardly diverging relation.

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