Nov. 19, 1929. G. S. CHILES 1,736,251

SIDE FRAME

Filed April 16, 1926 2 Sheets-Sheet 1

Fig. 1.

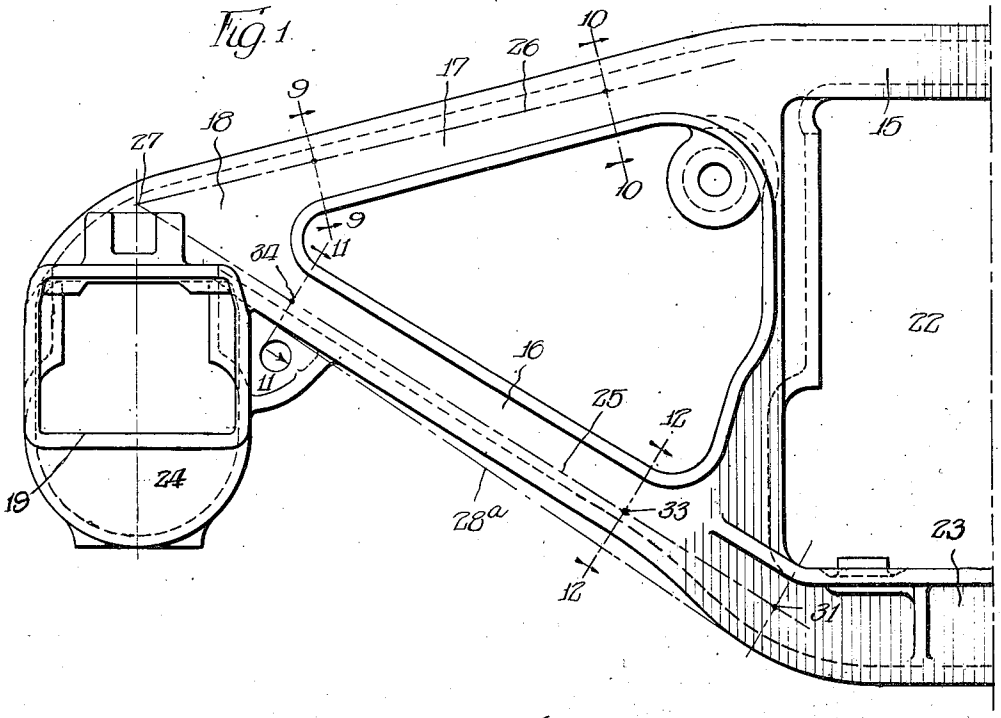


Fig. 2.

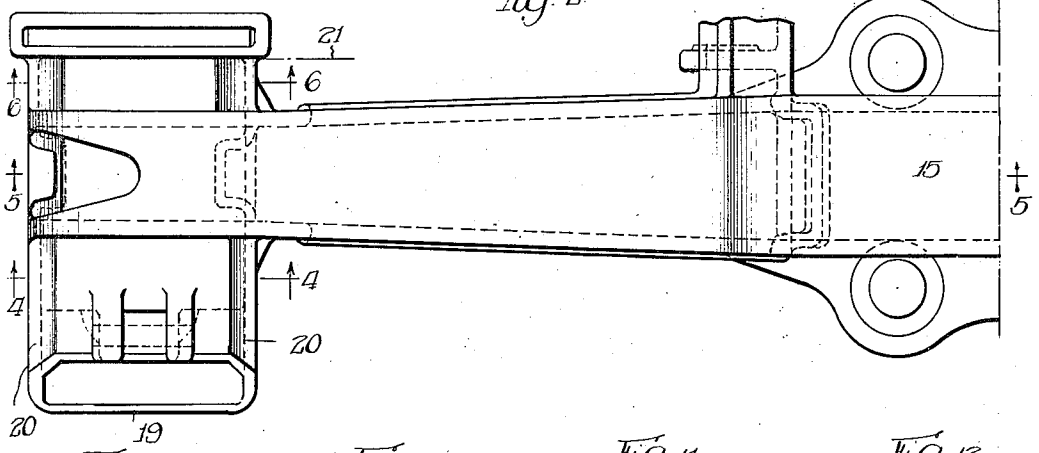


Fig. 9.

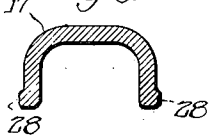


Fig. 10.

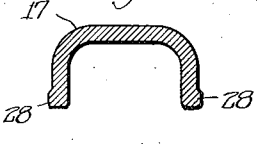


Fig. 11.

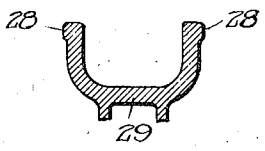
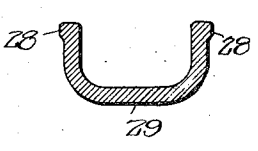


Fig. 12.



Witness:
R. Burkhardt.

Inventor:
George S. Chiles,
By Wilkinson, Huxley, Byron & Knight
attys.

Nov. 19, 1929. G. S. CHILES 1,736,251

SIDE FRAME

Filed April 16, 1926 2 Sheets-Sheet 2

Fig. 5.

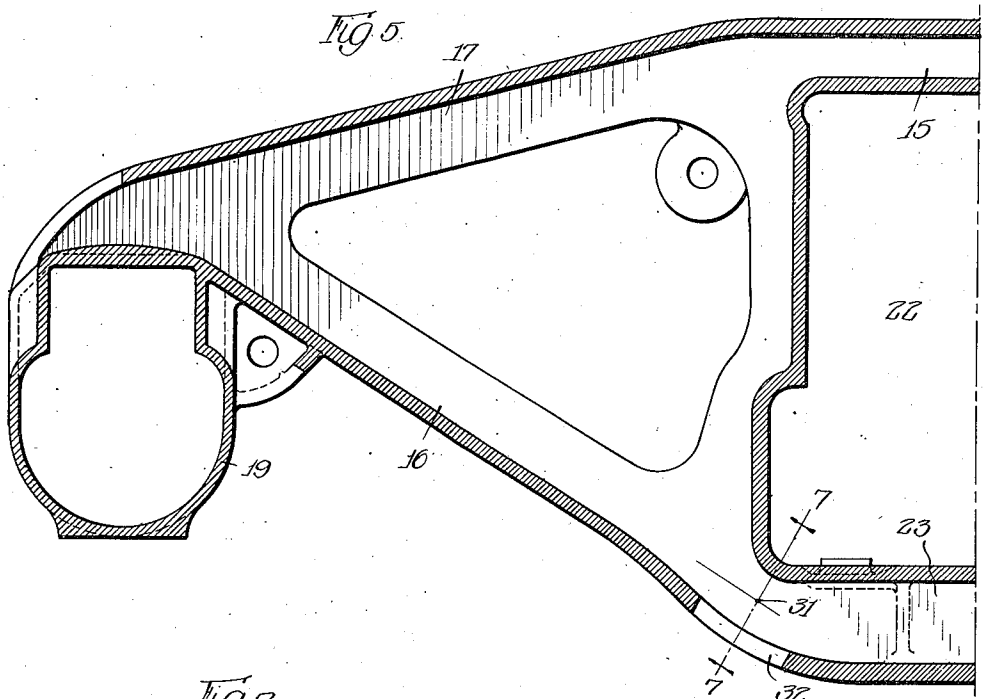


Fig. 7.

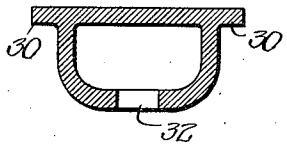


Fig. 8.

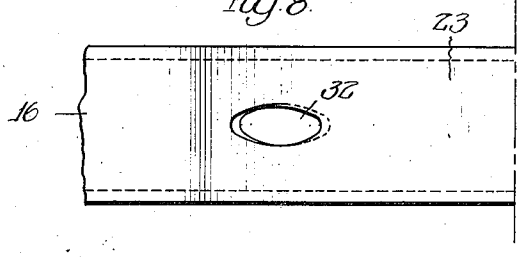


Fig. 3.

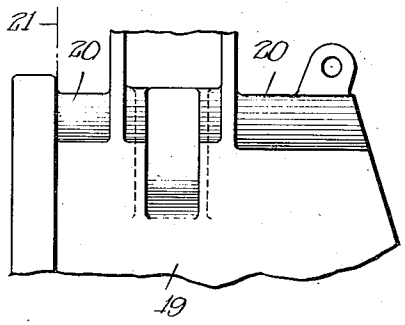


Fig. 6.

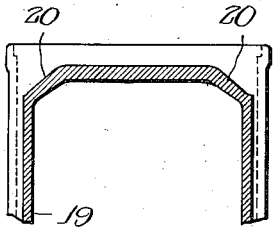
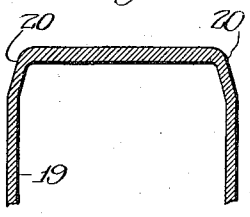


Fig. 4.



Inventor:
George S Chiles,
By Wilkinson, Huxley, Byron & Knight
Attys.

Witness:
R. Burkhardt.

Patented Nov. 19, 1929 1,736,251

UNITED STATES PATENT OFFICE

GEORGE S. CHILES, OF ST. LOUIS, MISSOURI, ASSIGNOR, BY MESNE ASSIGNMENTS, TO SCULLIN STEEL CO., OF ST. LOUIS, MISSOURI, A CORPORATION OF DELAWARE

SIDE FRAME

Application filed April 16, 1926. Serial No. 102,386.

The present invention relates to side frames.

More particularly the present invention relates to the construction of side frames such as are used in railway car trucks, and an object of the present invention is to provide a side frame of reduced weight and of increased strength over prior practice.

A further object is to provide a side frame which under load will have the parts thereof so disposed that the force lines will coincide with the regions of greatest strength.

A further object is to provide a side frame which will reduce to a minimum the regions of lesser mechanical strength.

Further objects will appear as the description proceeds.

Referring to the drawings—

Figure 1 is a view in side elevation of one-half of a side frame embodying the principles of the present invention, the showing of Figure 1 being taken under loaded conditions;

Figure 2 is a top plan view of the structure shown in Figure 1;

Figure 3 is an end view of the structure shown in Figures 1 and 2;

Figure 4 is a sectional view taken along the plane indicated by the arrows 4—4 of Figure 2;

Figure 5 is a sectional view taken along the plane indicated by the arrows 5—5 of Figure 2;

Figure 6 is a sectional view taken along the plane indicated by the arrows 6—6 of Figure 2;

Figure 7 is a sectional view taken along the plane indicated by the arrows 7—7 of Figure 5;

Figure 8 is a bottom plan view of a portion of the bottom tie member and the tension member shown in Figure 5;

Figure 9 is a sectional view taken along the plane indicated by the arrows 9—9 of Figure 1;

Figure 10 is a sectional view taken along the plane indicated by the arrows 10—10 of Figure 1;

Figure 11 is a sectional view taken along the plane indicated by the arrows 11—11 of Figure 1; and

Figure 12 is a sectional view taken along the plane indicated by the arrows 12—12 of Figure 1.

The numeral 15 indicates a side frame, each end of which side frame includes a tension member 16 and a compression member 17. Said tension and compression members 16 and 17 are connected together at the corresponding end portion 18 of the side frame, which end portion in the illustrated embodiment of the present invention has formed integral therewith the journal box 19, though the invention is not limited to side frames having integral journal boxes.

The journal box 19 is bevelled at its two upper side portions, as clearly indicated in the drawings, the bevelled portions being indicated by the numerals 20—20, said bevelled portions preferably extending entirely across the journal box from the plane 21 to substantially the other extremity of the journal box, as indicated by shading in Figures 2 and 3. By reason of the bevelled construction referred to, not only are sharp corners avoided and the amount of metal reduced, but, furthermore, the beam action of the journal box is shortened, and a more rigid and stronger design, with a more uniform section of metal, is provided.

The bevelled structure at the two sides of the journal box, as shown, for example, in Figures 2 and 3, has the further advantage that in casting it is not necessary to provide right and left-hand cores. Inasmuch as the upper outer corner is made the same as the upper inner corner, identical cores may be used in casting, thereby simplifying the casting operation. The bevelled construction at the two sides of the journal box has the further decided advantage of improved rigidity, a truncated gable construction being provided having improved stiffness over a journal box having a flat top from side to side. Accompanying this advantage is, of course, the saving of metal.

According to the present invention, the cross sectional areas of the members forming the side frame are so disposed that when the

side frame is under load, the centers of area of the stress communicating members lie substantially along the force lines. It is within the objects of the present invention to provide a construction in which the stress communicating members are so proportioned that a line through the centers of area of the various cross sections of said member coincides with the force line in said member when the side frame is under load. In addition to locating the centers of area as outlined immediately above, the present invention contemplates a structure which avoids sudden or abrupt changes in the disposition of the metal.

The numeral 22 indicates the bolster space of the side frame, and the numeral 23 indicates the tie member below said bolster space, which tie member 23 forms a tie between the tension members 16 at the two ends of the side frame.

The vertical medial plane of the journal box 19 is indicated by the line 24. It is decidedly advantageous to have the force lines of the tension and compression members 16 and 17 intersect substantially within the medial plane 24 at as low a level as practicable. In order to explain the advantages of the present invention, reference may be had particularly to Figures 1, 5, 7, 9, 10, 11 and 12. The force line within the tension member 16 is indicated by the numeral 25, and the force line within the compression member 17 is indicated by the numeral 26. Said lines 25 and 26 intersect at the point 27, which is located approximately within the plane defined by the numeral 24. As indicated above, the cross sectional centers of areas of the tension and compression members should lie along the force lines 25 and 26.

Figures 9 and 10 indicate two cross sectional views of the compression member 17. As indicated in said figures, said compression member 17 is a channel section having its web portion uppermost. The outer extremities of the channel section comprising the compression member 17 may have outwardly extending flanges 28 for strengthening purposes.

Figures 11 and 12 illustrate cross sections taken at or near the extremities of the tension member 16. As indicated in said figures, said tension member 16 is a channel section having its web portion lowermost. The web portion of the tension member 16 is indicated by the numeral 29, and, as shown in Figure 1, by reference to the straight line 28^a, is preferably continuous but slightly curved upwardly along the length of the tension member 16. Said web portion 29 of the tension member 16 lies in substantial alignment with the inner upper edge 20 of the corresponding journal box 19. The channel section comprising the compression member 16 may also be provided with the flanges 28—28 similar to those referred to in connection with the channel section of the tension member 17.

The juncture between the tension member 16 and the tie member 23 preferably takes the form of a box section, as indicated in Figure 7, which box section may have the flanges 30—30 in substantial alignment with the flanges 28—28 of the tension member 16. The center of area of the medial plane marking the juncture of the tension member 16 and the tie member 23 should lie in the force line 25. Tests have indicated that the region of least stress under vertical load is at the bottom of the web connecting the tension member 16 and the tie member 23. Accordingly, the present invention contemplates the provision of a drainage hole 32 at this region. The weakening effect of the usual drainage hole is thereby minimized, and the advantage is attained that the center of area of the medial plane representing the juncture of the tension member 16 and the tie member 23 is raised. By reason of the fact that the hole 32 is located at a point where stress under vertical load is a minimum, said hole 32 may be larger than has heretofore been considered permissible, facilitating the use of cores in the casting operation and facilitating the removal of core sand after casting has been accomplished, and furthermore facilitating the removal of water or lading which may find its way into the tie member 23. The raising of the center of area 31 is also promoted by reason of the flanges 30—30 (Figure 7), which may have considerable width and thickness. It will be understood, of course, that the functions of the flanges 30—30 in raising the center of area 31 will be present whether the drainage hole 32 is provided or not.

As the parts are shown in Figure 1, the center of area of the cross section shown in Figure 12, which center of area is indicated by the numeral 33, lies substantially in a straight line connecting the center of area 31 of the juncture between the tension member 16 and tie member 23 and the center of area 34 taken along the plane indicated by the arrows 11—11 of Figure 1. Figure 1 represents conditions under load. Under no load or light load conditions, the center of area 33 at the cross section indicated by the arrows 12—12 will lie slightly above the straight line connecting the centers of area 31 and 34. The line connecting the centers of area 31, 33 and 34 under unloaded or light load conditions will therefore not coincide precisely with the force line 25, but will be a smooth line without abrupt changes in direction, having its limits transversely of the tension member 16 defined by the force line 25; that is to say, the line connecting the centers of area of the tension member under unloaded or light load conditions will be a curved line. The force line 25 under no load

or light load conditions is a chord of the curve which defines the centers of area of the corresponding tension member. By reason of this construction, when the frame is loaded and the tie member 23 tends to deflect downward, the resulting bending in the adjacent tension members will cause the line connecting the centers of area, that is, the neutral axis to move into substantial coincidence with the force line 25. The straightening of the tension members has a leverage action tending to set up secondary forces in the bottom tie 23, tending to move said bottom tie upward, thereby better adapting the side frame to carry the load impressed upon it.

By reason of the coordination of the journal box having the bevelled edges referred to and the tension and compression members as described, the necessary height of the frame is reduced, and at the same time the metal of the journal box is located in line with the forces, producing the most direct action possible. Beam action over the journal box is minimized, accomplishing improved sturdiness over prior practice with a reduction in metal and a reduction of the tendency to crack.

Though a perferred embodiment of the present invention has been described in detail, it will be clear that many modifications will occur to those skilled in the art. It is intended to cover all such modifications that fall within the scope of the appended claims.

What is claimed is:—

1. A side frame comprising a tension member and a compression member arranged in angular relation with each other, said members being joined in a common region and having a journal box disposed at said common region, the cross sectional areas of said members having their centers of area disposed along smooth lines intersecting substantially in a medial vertical plane of said journal box, the smooth line representing the centers of area of said tension member under no load condition being a curve having as a chord a straight line connecting the limits of said centers of area in said tension member, said curve being disposed above said straight line.

2. A side frame comprising a tension member and a compression member arranged in angular relationship with one another, said members being joined in a common region, and a journal box operatively associated with said members at said common region, said journal box having its upper edge portion adjacent to said tension member bevelled off, said tension member having its centers of area, under load, arranged in a substantially straight line passing above said bevelled edge portion of said box.

3. A side frame comprising a tension member and a compression member arranged in angular relationship with one another said members being joined in a common region, a journal box cooperatively associated with said members at said common region, said tension and compression members having their cross sectional centers of area disposed along the force lines of said members when said side frame is under load.

4. A side frame comprising a tension member and a compression member arranged in angular relationship with one another, said members being joined in a common region, a journal box cooperatively associated with said members at said common region, said tension and compression members having their cross sectional centers of area disposed along the force lines of said members when said side frame is under load, the lines representing said cross sectional centers of area intersecting in substantially the medial plane of said journal box.

5. In a side frame, a tension member, a compression member, which members are connected together at an extremity of said side frame, a journal box connected to said members at said extremity, the upper side edges of said journal box being bevelled whereby said side frame may be disposed at a relatively low level with reference to said journal box, said compression and tension members comprising channels having their neutral axes disposed at relatively low positions in said members, said neutral axes being substantially coincident with the load lines of said members when said frame is under load.

6. A side frame including a tension member and a compression member joined together at an extremity of said side frame, a journal box at said extremity, said tension and compression members comprising channel sections having their extremities provided with strengthening flanges, the web of the channel section of said tension member being lowermost, the neutral axes of said tension and compression members being disposed at relatively low levels in said tension and compression members, said neutral axes being substantially coincident with the load lines of said members when said frame is under load.

7. In a side frame, in combination, a tension member, a compression member, said members being connected together at an extremity of said side frame, a journal box connected to said side frame at said extremity of said side frame, said journal box having its inner upper edge bevelled, said tension and compression members being shaped to have their neutral axes at relatively low levels, said tension member being a channel section, the web of said tension member being in substantial alignment with said bevelled edge, said neutral axes being substantially coincident with the load lines of said members when said frame is under load.

8. A side frame comprising a bolster re-

ceiving portion, a compression member connected to the upper part of said bolster receiving portion, a tension member connected to the lower part of said bolster receiving portion, said tension and compression members being disposed in angular relationship with each other and being connected together at their outer ends, a journal box joined to said tension and compression members adjacent to the point of junction of said members, said tension and compression members comprising channel sections having their neutral axes disposed at a relatively low level which neutral axes intersect substantially at the vertical central plane of said journal box, said neutral axes being substantially coincident with the load lines of said members when said frame is under load.

9. In a side frame, in combination, a tension member, a compression member, which members are connected together at an extremity of said side frame, a journal box connected to said members at said extremity, the upper side edges of said journal box being bevelled, said tension member having a web portion in substantial alignment with the bevelled portion of said box, the neutral axes of said members being substantially coincident with the load lines of said members when said frame is under load.

10. In a side frame, in combination, a tension member, a compression member, which members are connected together at an extremity of said side frame, a journal box connected to said members at said extremity, the upper side edges of said journal box being bevelled in planes transverse to the plane of said side frame, said tension member comprising a channel having the web thereof lowermost, the neutral axes of said members being substantially coincident with the load lines of said members when said frame is under load.

11. In a side frame, in combination, a tension member, a compression member, which members are connected together at an extremity of said frame, a journal box connected to said members at said extremity, the upper side edges of said journal box being bevelled, said tension member comprising a section having a continuous web portion substantially in alignment with one of said bevelled edges, the neutral axes of said members being substantially coincident with the load lines of said members when said frame is under load.

12. A side frame comprising a bolster receiving portion, a compression member connected to the upper part of said bolster receiving portion, a tension member connected to the lower part of said bolster receiving portion, said tension and compression members being disposed in angular relationship with each other and being connected together at their outer ends, a journal box joined to said tension and compression members adjacent to the point of junction of said members, said tension and compression members comprising channel sections having their neutral axes disposed at relatively low levels, which neutral axes intersect substantially at the vertical central plane of said journal box, the inner upper edge of said journal box being bevelled, the web of the channel section of said tension member being disposed in substantial alignment with said bevelled edge, said neutral axes being substantially coincident with the load lines of said members when said frame is under load.

13. A side frame including a tension member and a compression member joined together at an extremity of said side frame, a journal box at said extremity, said tension and compression members comprising channel sections having their extremities provided with strengthening flanges, the neutral axes of said tension and compression members being disposed at relatively low levels in said tension and compression members, said neutral axes being disposed in positions to intersect substantially in the vertical central plane of said journal box, said journal box having its upper inner edge portion bevelled, said tension member having the web portion of its channel section disposed in substantial alignment with said bevelled portion of said journal box, said neutral axes being substantially coincident with the load lines of said members when said frame is under load.

14. In a side frame, in combination, a tension member, a compression member, and a tie member for the bottom of the bolster opening, said tension and compression members being connected together at their outer extremities and having a journal box operatively associated therewith, the centers of area of said tension member and the cross sectional center of area of the junction between said tension member and said tie lying substantially in a straight line when said side frame is under load.

15. In a side frame, in combination, a tension member, a compression member, and a tie member for the bottom of the bolster opening, said tension and compression members being connected together at their outer extremities and having a journal box operatively associated therewith, the centers of area of said tension member and the cross sectional center of area of the junction between said tension member and said tie lying substantially in a straight line when said side frame is under load, said tension member comprising a channel section having its web portion lowermost.

16. In a side frame, in combination, a tension member, a compression member, and a tie member for the bottom of the bolster opening, said tension and compression members

being connected together at their outer extremities and having a journal box operatively associated therewith, the centers of area of said tension member and the cross sectional center of area of the junction between said tension member and said tie lying substantially in a straight line when said side frame is under load, said tension member comprising a channel section having its web portion lowermost, said journal box having a bevelled inner edge portion disposed in substantial alignment with the web portion of said channel section.

17. In a side frame, a tension member, a compression member, and a tie member disposed at the bottom of the usual bolster opening, said compression member and tension member being connected together at their outer extremities, the cross sectional centers of area of said tension member and the cross sectional center of area of the juncture between said tension member and said tie lying substantially in a straight line when said side frame is under load, said tension member and said tie member having a continuous web portion lying lowermost of said tension member and tie, said web portion being disposed in an upwardly extending curve between said juncture and the outer extremity of said tension member.

18. A side frame comprising a tension member and a compression member joined together at their outer extremities, a tie member disposed below the usual bolster opening, the cross sectional centers of area of said tension member and the cross sectional center of area of the juncture between said tie member and said tension member being disposed, when said frame is under load, in substantially a straight line, said tension member and tie member being provided with a web lying lowermost of said tension member and tie member, said web at the juncture between said members being provided with an opening for drainage purposes and for raising the cross sectional center of area of said juncture.

19. A side frame comprising a pair of tension members and a pair of compression members at the two extremities of said said frame, said tension members being connected by a tie member, each of said tension members having its cross sectional centers of area under load arranged substantially in a straight line intersecting the cross sectional center of area of the juncture between said tie member and the corresponding tension member.

20. A side frame comprising a tension member and a compression member arranged in angular relationship with one another, said members having a common region forming the junction of said members, said tension member comprising a member the center of area line of which is curved upwardly intermediate of its length relative to the force line of said member.

21. A side frame comprising a pair of tension members and a pair of compression members, a tie member connecting the lower extremities of said tension members, each of said tension members having its cross sectional centers of area arranged along a smooth line passing substantially through the center of area of the medial plane defining the juncture of said tension member and said tie member.

22. A side frame comprising a pair of tension members, a pair of compression members, a tie member connecting the lower extremities of said tension members, each of said tension members having its cross sectional centers of area arranged along a smooth line passing substantially through the center of area of the medial plane defining the juncture of said tension member and said tie member, said tension member being curved upwardly intermediate of its length.

23. A side frame comprising a pair of tension members, a pair of compression members, a tie member connecting the lower extremities of said tension members, each of said tension members having its cross sectional centers of area arranged along a smooth line passing substantially through the center of area of the medial plane defining the juncture of said tension member and said tie member, the line marking the centers of area of said tension member being curved upwardly intermediate of its length under no load conditions, said smooth line being intersected by a chord, the intersections of said chord and curve being located substantially at the center of area of said medial plane and the center of area at the other extremity of said tension member.

24. A side frame comprising a pair of tension members and a pair of compression members, a tie member connecting the lower extremities of said tension members, each of said tension members having its cross sectional centers of area arranged along a smooth line passing substantially through the center of area of the medial plane defining the juncture of said tension member and said tie member, said tension member comprising a channel section having its web portion lowermost.

25. A side frame comprising a pair of tension members, a pair of compression members, a tie member connecting the lower extremities of said tension members, each of said tension members having its cross sectional centers of area arranged along a smooth line passing substantially through the center of area of the medial plane defining the juncture of said tension member and said tie member, said tension member being curved upwardly intermediate of its length, said tension member comprising a channel section having its web portion lowermost.

26. A side frame comprising a pair of

tension members, a pair of compression members, a tie member connecting the lower extremities of said tension members, each of said tension members having its cross sectional centers of area arranged along a smooth line passing substantially through the center of area of the medial plane defining the juncture of said tension member and said tie member, the line marking the center of area of said tension member being curved upwardly intermediate of its length under no load conditions, said smooth line being intersected by a chord, the intersections of said chord and curve being located substantially at the center of area of said medial plane and the center of area at the other extremity of said tension member, said tension member comprising a channel section having its web portion lowermost.

27. A side frame comprising a tension member and a compression member arranged in angular relationship with one another, said members being joined in a common region, and a journal box cooperatively associated with said members at said common region, said journal box having its upper edge portion adjacent to said tension member bevelled off, said tension member having its centers of area under load arranged in a substantially straight line, said compression member having its centers of area disposed in a substantially straight line, which straight lines intersect substantially in a medial vertical plane of said journal box.

Signed at St. Louis, Missouri, this 13th day of April, 1926.

GEORGE S. CHILES.