July 8, 1941. A. V. PEDERSEN 2,248,380

ROOF TRUSS

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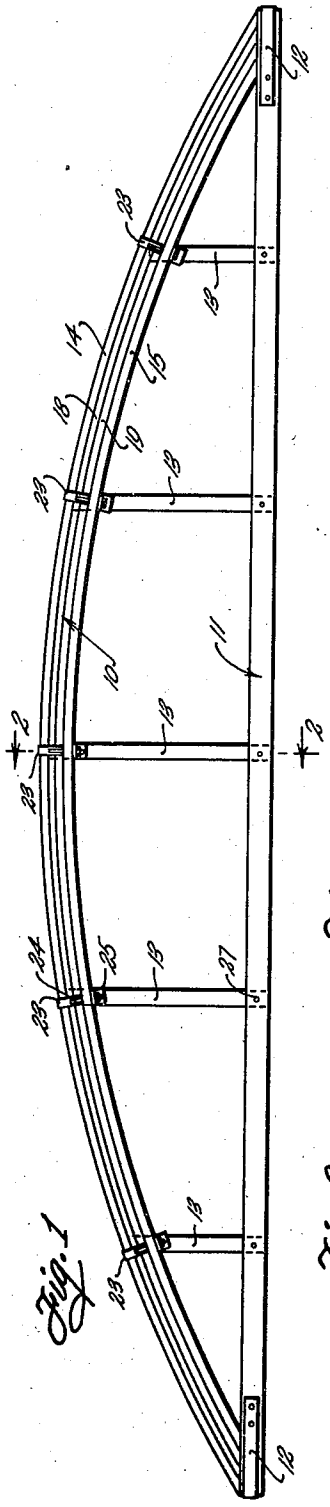


Fig. 1

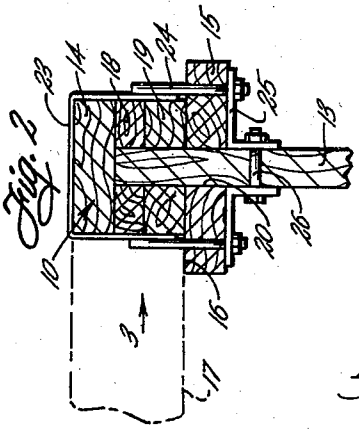


Fig. 2

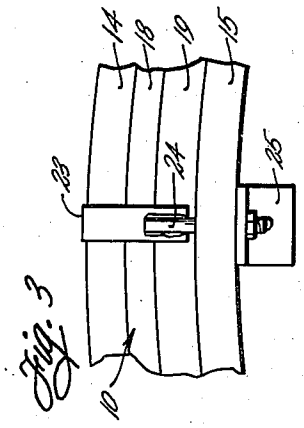


Fig. 3

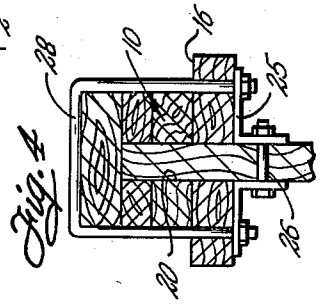


Fig. 4

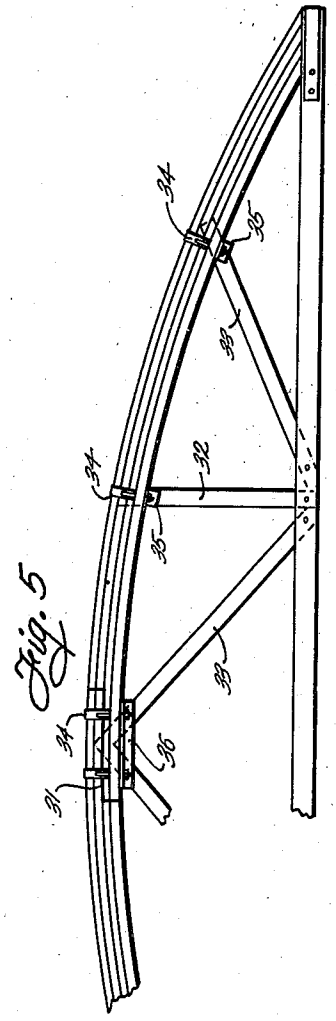


Fig. 5

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Fig. 6

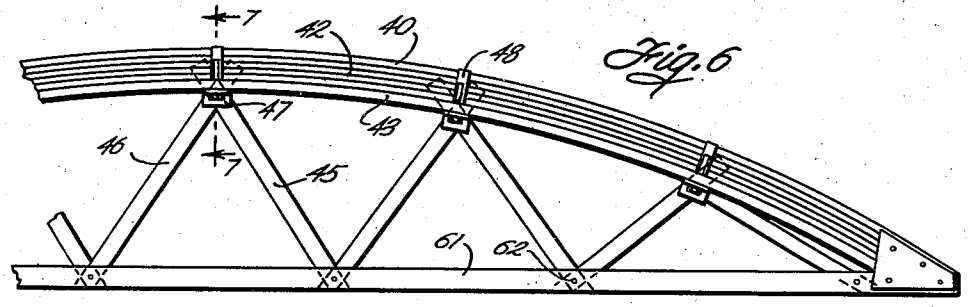


Fig. 7

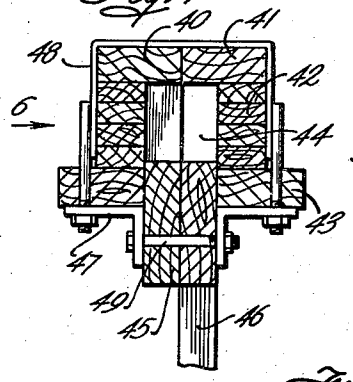


Fig. 8

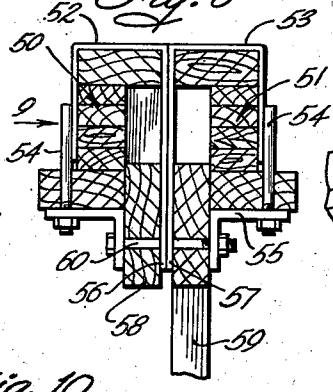


Fig. 9

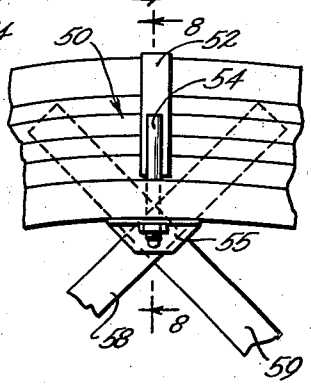


Fig. 10

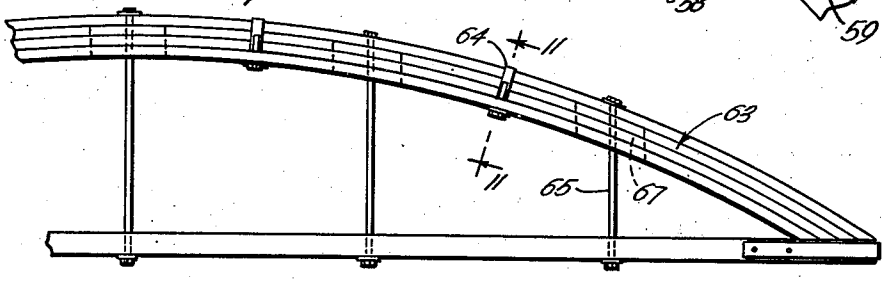


Fig. 12

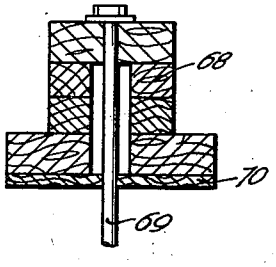
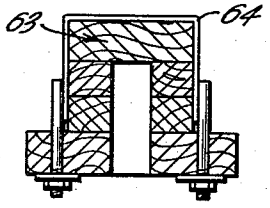


Fig. 11



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2,248,380

ROOF TRUSS

Axel V. Pedersen, Los Angeles, Calif.

Application April 30, 1940, Serial No. 332,447

14 Claims. (Cl. 108—23)

This invention relates to improvements in roof trusses, and the like.

It is an object of the present invention to provide an improved roof truss comprising a curved upper chord and a horizontal lower chord, the upper chord being formed of bent or preformed laminations glued together or otherwise fastened in the shape of the desired curvature of the upper chord, the chord being so designed as to facilitate the attachment of web members thereto in a manner to adequately carry the required loads yet requiring a minimum of fitting so that the truss can be easily and quickly erected and installed in its desired position.

Heretofore a large number of roof trusses have been designed having curved upper chords wherein the elements or pieces which make up the upper chord are to be fitted and assembled together at the location where the truss is erected. Such constructions are disadvantageous in that skilled labor is required to properly fit and assemble the various elements that make up the upper chord. In many instances the elements that connect the various parts of the upper chord are subsequently concealed so that frequent visits of building inspectors are required to make proper inspection of the chord during its erection.

Roof trusses have also been designed wherein the upper chord has been made up of laminations which are bent or curved to the curvature of the chord and glued together. However, in such constructions the bent laminated upper chord is usually in the form of one or more bent laminated elements having substantially rectangular cross section.

An object of the present invention is to provide a roof truss wherein the upper chord is in the form of bent laminations glued together and shaped to conform to the curvature of the upper chord wherein the cross sectional shape, instead of being rectangular will be of inverted U-shape. In this manner the top lamination or laminations constituting the cap of the upper chord may be formed of a good grade of lumber capable of withstanding the comparatively heavy stresses that may be imposed upon it and the bottom lamination or laminations may likewise be formed of a better grade of material to carry their stresses. The intermediate or web laminations which are not required to carry such severe stresses may be formed of an inferior grade of material for purposes of economy. The arrangement of the parts is such that web members may have their upper ends extended into the groove or a recess that extends longitudinally along the underside of the upper chord with a minimum amount of fitting being required to connect the web members to the upper and lower chords. The cap of the upper chord contributes materially to the stiffness of the chord and the insertion of the upper ends of the web members into the upper chord also contributes to the stiffness of the truss. By the improved construction the upper chord may be entirely fabricated and shaped at the manufacturing plant where there is usually adequate equipment to properly shape and fasten together the laminations of the upper chord. It may then be delivered as a unit or in sections capable of being readily assembled together at the locale of erection. Where the span of the truss is known in advance, all of the parts requiring fitting may be fitted at the manufacturing plant and readily assembled without the employment of skilled labor at the point of erection. In most instances, however, the exact span length is unknown at the time that the upper chord is formed but with the present invention the span may be delivered to the point of erection and cut to the required length following which the various parts that require assembly may be assembled together without employing skilled labor for this purpose.

With the foregoing and other objects in view, which will be made manifest in the following detailed description and specifically pointed out in the appended claims, reference is had to the accompanying drawings for an illustrative embodiment of the invention, wherein:

Figure 1 is a view in side elevation of one form of truss embodying the present invention;

Fig. 2 is a sectional view taken substantially upon the line 2—2 in the direction indicated;

Fig. 3 is a partial view in side elevation taken in the direction of the arrow 3 upon Fig. 2;

Fig. 4 is a partial view in vertical section similar to the upper portion of Fig. 2, illustrating a slightly modified form of construction that may be employed;

Fig. 5 is a partial view in side elevation illustrating an alternative form of web member arrangement that may be employed in the improved truss;

Fig. 6 is a view similar to Fig. 5 illustrating an alternative form of construction embodying the present invention;

Fig. 7 is a sectional view taken upon the line 7—7 upon Fig. 6;

Fig. 8 is a view similar to Fig. 7 illustrating a slightly modified form of construction and may

be considered as having been taken upon the line 8—8 upon Fig. 9;

Fig. 9 is a partial view in side elevation taken in the direction of the arrow 9 upon Fig. 8;

Fig. 10 is a partial view in side elevation illustrating a further alternative form of construction that may be employed embodying the present invention;

Fig. 11 is a sectional view taken substantially upon the line 11—11 upon Fig. 10; and

Fig. 12 is a view similar to Fig. 11 illustrating a slightly modified construction.

Referring to the accompanying drawings wherein similar reference characters designate similar parts throughout, the improved truss such as is illustrated in Figs. 1 to 3, inclusive, comprises a curved top chord generally designated at 10 and a straight or horizontal bottom chord indicated at 11, the two chords being suitably connected at their ends by any conventional or preferred type of shoe indicated at 12. The chords are also connected intermediate their ends by means of web members indicated at 13.

The invention primarily concerns the construction of the top chord 10 which is made up of laminations as shown in Fig. 2. These laminations are in the form of suitable lengths of wood with the uppermost lamination 14 forming or constituting the cap of the chord. This lamination as well as the bottom lamination indicated at 15 are both formed of an excellent grade of wood inasmuch as the top and bottom of the chord have the greatest stresses imposed thereon. The top lamination or cap extends the complete width across the top of the chord whereas the bottom lamination preferably, but not necessarily, projects outwardly therebeyond forming ledges 16 which may be advantageously used to support rafters one of which is indicated at 17. The intermediate or web laminations 18 and 19 may, if desired, be formed of an inferior grade of lumber as these laminations are not required to withstand as great stresses as the top and bottom laminations.

It will be noted that the intermediate laminations 18 and 19 and the bottom lamination 15 are longitudinally divided into sections which are spaced apart, thus forming a groove 20 running lengthwise of the top chord on its underside. In the construction of the top chord the various lengths of lumber used to form the laminations are coated with glue or an equivalent adhesive and are bent on a form, not shown, into the curvature of the upper chord. They are allowed to remain fastened on this form until the glue has set so that the top chord, when removed from the form, will have the desired curvature of the upper chord. The bottom or horizontal chord 11 may be formed of a single timber but in the preferred form of construction it is composed of two spaced timbers 21 and 22.

When it is desired to erect the truss at any location the curved upper chord is shipped as a curved unit to the location and if the exact length of the span is unknown prior to the time of shipment, the ends of the upper chord are cut off to the desired length at the location and the shoes 12 applied and connected as by bolts to the ends of the lower chord. The web members 13 are then ready for application. Strap devices are applied to the upper chord which consist as illustrated in Fig. 2, of inverted U-shaped sections of strap iron 23 to the legs of which bolts 24 are welded. The threaded ends of the bolts are extended through holes bored in the projecting portions or ledge-forming portions of the bottom lamination 15. Angle irons 25 are attached to the underside of the lowermost lamination by means of these bolts. The web members 13 have a thickness substantially equal to the width of the groove 20 and have their upper ends inserted into the groove. Holes are bored in the web members for the reception of bolts 26 which pass through the web members and through the angle irons 25. An important feature of the construction resides in the fact that it is unnecessary to fit the tops of the web members against the underside of the cap 14. All stresses are transmitted through the angle irons 25 and the bolts 26 so that it is unnecessary to have any fit present or in fact any engagement whatsoever between the tops of the web members and the bottom of the cap. In this way the use of skilled labor to make an accurate fit between the web members and the top chord at the location of installation is avoided and furthermore, inspection of the joint between the tops of the web members and the cap is unnecessary in that it is immaterial whether the tops of the web members bear against the bottom of the cap or not all stresses being transmitted by means of the angle irons.

When the tops of the web members have thus been inserted and fastened to the top chord the bottoms of the web members may be connected to the bottom chord such as by bolts 27. If it is desired to provide the bottom chord with camber this can be easily accomplished by elevating the bottom chord sufficiently to impart the camber while holes are being drilled through the bottom chord and through the bottoms of the web members for the insertion of the bolts 27.

By means of this construction it will be appreciated that the elements of the top chord can be bent or formed into the desired shape at the factory or place of fabrication and shipped as a unit to the place of erection where the top and bottom chords can be assembled and the web members installed without requiring skilled labor nor an undue amount of inspection. Those parts of the truss which require inspection are externally located so as to be readily visible. As the cap is formed by one of the laminations of the truss extending across the top of the recess or groove 20 it not only serves to adequately carry compression loadings but in addition, it imparts to the truss a desired stiffness against side sways or lateral movement. This stiffness is also contributed to by the bottom lamination sections. As the tops of the web members extend into the recess or groove 20 with a reasonable close fit between the sides of the web members and the walls of the groove these web members also contribute by reason of this arrangement to the stiffness of the truss.

In shipping spans the top chord is made up and glued together so as to form a single unit. In long spans, however, it may be necessary to make the top chord in sections which can be spliced together readily at the time of erection.

In Fig. 4, I have illustrated a slightly modified form of construction wherein the strap means 23 and bolts 24 are substituted is by a U-bolt 28 which encircles the major portion of the top chord the same as previously described with the ends of the U-bolt extending through the projecting portions of the bottom lamination and attached to the angle irons 25. This form of construction may be employed in certain instances although the use of a wide strap as at 23 is preferred because of the fact that the danger of

its being tightened into the wood fibers is reduced on account of its width.

In Fig. 5 an alternative form of truss is disclosed wherein the top chord 30 is made up of laminations the same as that previously described. A suitable splice is indicated at 31 which may be employed where long spans are to be bridged by the truss. In this form of construction the web members 32 and 33 are vertical and inclined respectively but have their upper ends extending into the groove 20 of the upper chord without necessarily fitting them against the underside of the cap. They are fastened to the upper chord by means of straps 34 and angle irons 35 as previously described.

In the center of the upper chord where the tops of inclined web members 33 meet they may be connected to the top chord by means of angle irons 36 of such a length as to be common to two adjoining inclined web members. The advantages of this form of construction are substantially the same as that previously described.

In Figs. 6 and 7, an alternative form of construction is disclosed wherein the top chord is made up of laminations all of which are longitudinally divided. The top lamination is made up of two sections 40 and 41 contiguously arranged. The intermediate laminations or web laminations are indicated at 42 and the bottom lamination at 43. In this form of construction the top chord is in reality formed of two opposed Z-shaped sections made up of laminations bent to the curvature of the chord and glued together. In erecting the truss these sections of the top chord are arranged side by side with the cap laminations 40 and 41 contacting each other. This leaves a recess or groove 44 extending along through the truss and open on its underside which is of such width as to receive the upper ends of web or lacing members 45 and 46. Angle irons 47 are fastened against the underside of the lowermost lamination 43 by means of the strap means 48. The web members 45 and 46 have their upper ends positioned in the recess or groove 44 and a single hole bored therethrough for the reception of a single bolt 49. In this form of construction it is likewise unnecessary to fit the ends of the web members to the underside of the cap. The strap means serves to hold the sections of the upper chord together in side by side relationship and together with the angle irons 47 and the bolt 49 to transmit the stresses between the upper chord and the web members.

The advantages of this form of construction are substantially the same as that previously described. This form of construction may be advantageously employed where the loads imposed on the truss are quite heavy and consequently it is desirable to divide the upper chord into sections that can be readily assembled together at the point of erection.

If the span is such as to require that each section of the upper chord be divided the splicing in the sections is preferably arranged so as to be staggered. That is, the splices in one section will be staggered with relation to the splices in the opposite section.

In Fig. 8, a slightly modified form of construction is illustrated wherein the top chord is made up of Z-shaped sections of laminated timbers, the two sections being indicated generally at 50 and 51. In this form of construction, however the strap means, instead of extending across the top of the cap is divided into two sections one section of the strap means being indicated at 52 and the other at 53. Each strap means has a bolt 54 welded thereto which is projected through the projecting portion of the lowermost lamination and fastened to the angle iron 55. That portion of the strap which extends inwardly from the side of the upper chord is then bent downwardly between the two sections of the upper chord, the downwardly bent portions being indicated at 56 and 57. These downwardly bent portions extend between the upper ends of the web members 58 and 59 and have apertures therein through which the bolt 60 extends. In this way, as previously described, it is unnecessary to fit the ends of the web members against the bottom of the cap as all stresses are transmitted through the medium of bolts 60 and angle irons.

After the web members illustrated in Figs. 6 and 8 are connected to the top chord they have their lower ends fastened to the bottom chord 61 as by bolts 62. Bottom chord may, if desired, have camber applied thereto.

In Figs. 10 and 11 a modified form of construction is disclosed wherein the top chord indicated at 63, is made substantially the same as that previously described in connection with Figs. 1, 2, and 3. The strap means for the top chord is indicated at 64. In this form of construction one or more hangers or rods 65 are dropped through holes drilled in the cap and attached to the bottom chord 66. Filler blocks or filler pieces indicated at 67 may be positioned in the recess or groove in the top chord where these hanger rods are located.

In the construction shown in Fig. 12, the top chord indicated at 68 is of substantially the same construction previously described in connection with Figs. 1 to 3. The hanger rod or rods 69 that are dropped through the cap are also dropped through a bottom cover lamination 70 which may be fastened to the bottom of the top chord by means of the strap means. This cover lamination serves to cover the bottom of the recess or groove formed in the top chord and to present a neat and attractive appearance around and between the hanger rod 69.

From the above-described constructions it will be appreciated that an improved roof truss is provided wherein the top chord is made up of glued laminated timbers of such cross sectional shape as to impart or develop desired structural stiffness in the top chord itself. The arrangement also is such as to permit of assembly in the field or at the point of erection with a minimum amount of fitting and consequently virtually no skilled labor. All parts of the construction that are assembled in the field and which are structurally important are open and available for inspection at all times. The construction is such that the top chord may be economically manufactured in suitable lengths at the factory or place of fabrication where adequate equipment is present to assure proper construction and proper assembly of the elements of the top cord.

Various changes may be made in the details of construction without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. A truss comprising a curved top chord and a horizontal bottom chord, the top chord being formed of a cap, web laminations, and a bottom lamination bent to the curvature of the top chord and fastened together prior to the assembly of the truss, the web and bottom laminations being divided forming a groove extending length-

wise of the top chord beneath the cap, and one or more web members connecting the top and bottom chords having portions positioned in the groove.

2. A truss comprising a curved top chord and a horizontal bottom chord, the top chord being formed of a cap, web laminations, and a bottom lamination bent to the curvature of the top chord and fastened together prior to the assembly of the truss, the web and bottom laminations being divided forming a groove extending lengthwise of the top chord beneath the cap, and one or more web members connecting the top and bottom chords, said web members having their upper ends extending into the groove, and means encircling the major portion of the top chord and fastened to the web members.

3. A truss comprising a curved top chord and a horizontal bottom chord, the top chord being formed of a cap, web laminations, and a bottom lamination bent to the curvature of the top chord and fastened together prior to the assembly of the truss, the web and bottom laminations being divided forming a groove extending lengthwise of the top chord beneath the cap, the bottom lamination having its outer edges projecting outwardly beyond the web laminations, straps encircling the caps and web lamination of the top chord and extending through the projecting portions of the bottom chord, web members connecting the top and bottom chords having their upper ends extending into the groove, and means fastened to the web members immediately beneath the top chord for connecting them to the straps.

4. A truss comprising a curved top chord and a horizontal bottom chord, the top chord being formed of a cap, web laminations, and a bottom lamination bent to the curvature of the top chord and fastened together prior to the assembly of the truss, the web and bottom laminations being divided forming a groove extending lengthwise of the top chord beneath the cap, strap means extending from over the cap down the sides of the upper chord, web members connecting the bottom chord to the top chord having their upper ends extended into the groove, angle irons fastened to the sides of the web members beneath the top chord, and means fastening the angle irons to the strap means.

5. A curved top chord of a truss made up of laminations bent to conform to the curvature of the chord, the laminations being glued together with the top and bottom laminations being wider than the web laminations.

6. A curved top chord of a truss made up of laminations bent to conform to the curvature of the chord, the laminations being glued together with the top and bottom laminations being wider than the web laminations, the web and bottom laminations being divided into spaced sections providing a groove on the underside of the chord extending lengthwise thereof beneath the top lamination.

7. A curved top chord of a truss made up of laminations bent to conform to the curvature of the chord and glued together, the top lamination constituting a cap, there being web and bottom laminations therebelow formed of divided spaced sections providing a groove on the underside of the chord extending lengthwise thereof.

8. A curved top chord of a truss made up of laminations bent to conform to the curvature of the chord and glued together, the top lamination constituting a cap, there being web and bottom laminations therebelow formed of divided spaced sections providing a groove on the underside of the chord extending lengthwise thereof, the cap being formed of divided but contiguously arranged sections.

9. A truss comprising a curved top chord and a horizontal bottom chord, the top chord being formed of two Z-shaped laminated sections each of which has its laminations fastened together independently of any connection with other elements of the truss, said sections being contiguously arranged with the top laminations contacting each other and laminations therebelow disposed in spaced relationship forming a groove extending lengthwise of the top chord on its underside, and web members connecting the top and bottom chords having their upper ends extending into the groove.

10. A truss comprising a curved top chord and a horizontal bottom chord, the top chord being formed of two Z-shaped laminated sections each of which has its laminations fastened together independently of any connection with other elements of the truss, said sections being contiguously arranged with the top laminations contacting each other and laminations therebelow disposed in spaced relationship forming a groove extending lengthwise of the top chord on its underside, and web members connecting the top and bottom chords having their upper ends extending into the groove, angle irons secured to the sides of the web members and strap means encircling both Z-shaped sections and secured to the angle irons.

11. A truss comprising a curved top chord and a horizontal bottom chord, the top chord being formed of two Z-shaped laminated sections each of which has its laminations fastened together independently of any connection with other elements of the truss, said sections being contiguously arranged with the top laminations contacting each other and laminations therebelow disposed in spaced relationship forming a groove extending lengthwise of the top chord on its underside and web members connecting the top and bottom chords having their upper ends extending into the groove, angle irons secured to the sides of the web members and strap means encircling each Z-shaped section and secured to the angle irons and against the inner faces of the web members respectively.

12. A truss comprising a curved top chord and a horizontal bottom chord, the top chord being formed of laminations bent to the curvature of the top chord, and fastened together in such curved condition independently of any connection with any other members of the truss so that the laminations collectively act as a unit, there being a groove on the underside of the top chord and web members connected to the bottom chord and extending into the groove, and means encircling the top chord and fastened to the web members for connecting the web members to the top chord.

13. A truss comprising a curved top chord and a horizontal bottom chord, the top chord being formed of laminations bent to the curvature of the top chord and glued together in such curved condition independently of any connection with any other members of the truss so that the laminations collectively act as a unit, there being a groove on the underside of the top chord and web members connected to the bottom chord and extending into the groove, and means encircling

the top chord and fastened to the web members for connecting the web members to the top chord.

14. The method of construction a truss having a curved laminated top chord, a bottom chord and connecting webs, which method includes curving or bending the laminations of the top chord and fastening them together to form a curved laminated unitary top chord prior to the assembly of the top chord with the bottom chord and web members.

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