Sept. 10, 1940.

M. FALK

2,214,049

ROOF TRUSS

Filed April 18, 1939

Fig. 1

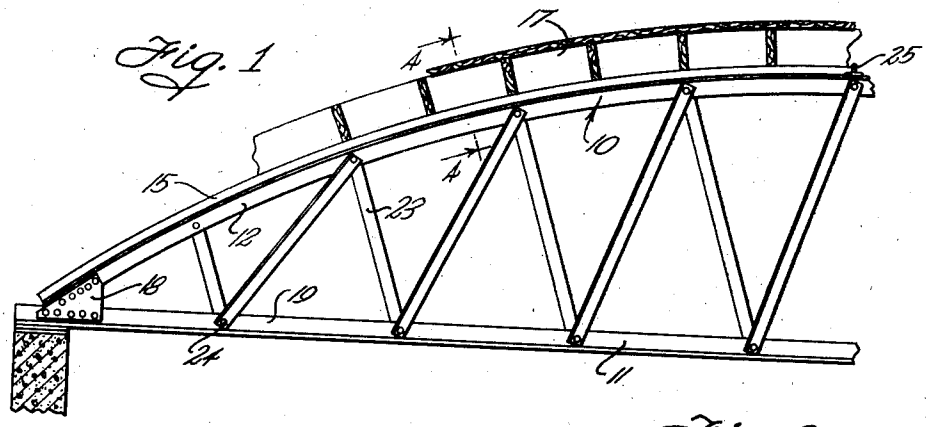


Fig. 2

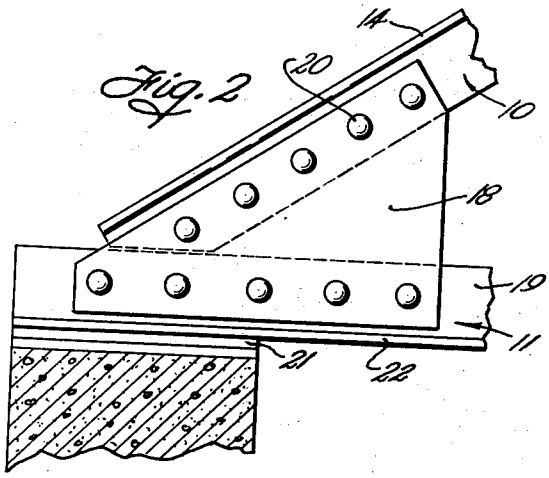


Fig. 3

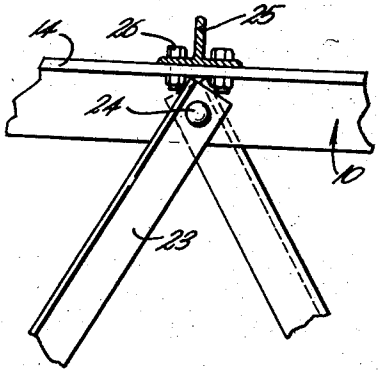
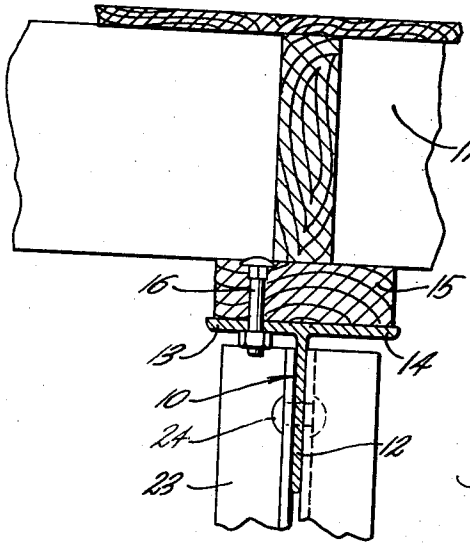


Fig. 4



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ROOF TRUSS

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Application April 18, 1939, Serial No. 268,507

1 Claim. (Cl. 108—23)

This invention relates to improvements in trusses and particularly to that type of truss designed to support roofs or other like relatively light loads. An object of the invention is to provide an improved form of truss construction in which the stress carrying members are formed of steel which is of such design as to enable the members of the truss to be easily manufactured and assembled and installed with a minimum labor expense.

Heretofore it has been proposed to design roof trusses formed of steel wherein there is a curved upper chord and a lower horizontal chord. The conventional construction has been to form the chords of the truss from angle irons arranged back to back. Interposed between the vertical legs of the angle irons at the panel points are gusset plates with rivets extending through the vertical legs of the angle irons and through the gusset plates. The lacing members are in turn riveted to the gusset plates.

A serious detriment to such a construction is the calculation, marking and punching of the numerous holes in the separate pieces which must be matched at each panel point to provide means for connecting the several members that are assembled to form the completed truss. These difficulties entail a great increase of labor with the result that the conventional steel roof truss can hardly compete commercially with the price of wooden roof trusses.

It is an object of the present invention to provide a steel roof truss which will eliminate the use of gusset plates and enable the assembly and installation of the members of the steel roof truss with a minimum amount of labor, eliminating largely the difficulty heretofore experienced in calculating, marking, punching and lining up the rivet holes in the various members that are to be riveted together. By means of the present invention the number of pieces to be handled and assembled to construct a steel roof truss is reduced by approximately one-half and the number of rivets and rivet holes is reduced by approximately three-fourths.

Another object of the invention is to provide a steel roof truss which is of such design that the length of members and the spacing of the rivet holes that are required can be readily determined for trusses of various lengths or spans. By means of the present invention the location of rivet holes and the lengths of members can be readily determined with reference to the length of span when the radius of the curved upper chord is made equal to the length of the span.

A further object of the invention is to provide a steel roof truss wherein the lower chord is divided by panel points into segments of substantially equal length and the upper chord is likewise divided by panel points into segments of equal length, there being one more panel in the upper chord than in the lower chord and lacing members connecting the chords at the panel points. Heretofore in the design of roof trusses there are usually vertical lacing members arranged between the chords and diagonal lacing members connecting the tops and bottoms of adjacent vertical lacing members, these diagonal and vertical lacing members being connected to the chords at the panel points. With this arrangement the diagonal lacing members are unnecessarily long and when an unbalanced load is imposed on the truss there are conditions wherein the diagonal lacing members are subjected to compressive stresses. Due to their unnecessary length these diagonal members must be made sufficiently heavy to carry the loads that may be imposed upon them. In some forms of trusses those lacing members above referred to as being vertical instead of being vertically arranged are arranged upon radii of the curved upper chord. But even in this arrangement the diagonal lacing members are longer than necessary. By virtue of the arrangement of the present invention the lacing members can be made as short as practicable more closely approaching in length the length of the vertical lacing members. Consequently, as the lacing members in the present truss are comparatively short as compared with the length of diagonal lacing members in the trusses above described, none of the lacing members need be made extremely heavy to be able to carry compressive stresses even when the truss is subjected to unbalanced or shifting loads.

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 claim, reference is had to the accompanying drawing for an illustrative embodiment of the invention, wherein:

Fig. 1 is a partial view in side elevation illustrating approximately one-half of a roof truss embodying the present invention.

Fig. 2 is a fragmentary view in elevation illustrating the connection at the ends of the upper and lower chords.

Fig. 3 is a fragmentary view illustrating the

connection between lacing members and the upper chord.

Fig. 4 is a sectional view taken substantially upon the line 4—4 upon Fig. 1.

Referring to the accompanying drawing wherein similar reference characters designate similar parts throughout, the truss comprises an upper chord 10 curved in conformity to the the curvature of the roof and a lower chord 11 which constitutes a horizontal chord. These chords are mainly formed of steel but instead of being formed of angle irons arranged back to back, the upper chord is formed of a split I-beam, split longitudinally of its web so that the cross section of the upper chord is in the form of an integral T. It is now customary for steel concerns supplying rolled steel shapes to roll the steel in the form of an I-beam and should the customer desire a structural member, T-shaped in cross-section, I-beams are split to supply the desired T-shape. Should conditions change so that steel concerns should undertake to roll the T-shapes rather than split I-beams in order to obtain them, the present invention contemplates the use of such rolled T-shapes.

The essential characteristic is that the T-shape cross section as shown in Fig. 4 is an integral piece of steel rather than two opposed angle irons arranged back to back. The T-shape or upper half of the split I-beam is suitably rolled to give it the desired curvature and in long spans the upper curved chord 10 may be formed by two abutting curved steel T-shapes suitably fastened together by angles and straps riveted, bolted, welded or otherwise secured to the abutting ends of the chord forming members.

On the upper flanges 13 and 14 there may be applied a wooden nailer strip 15 which may be bolted in place as by carriage bolts 16 providing for the attachment of the roof 17.

The lower horizontal chord 11 is likewise formed of a split I-beam positioned so as to be of inverted T-shape. This lower horizontal chord may likewise be formed of two or more sections suitably fastened together intermediate the ends of the truss. The ends of the chords are connected together by means of plates 18 of general triangular shape. There are preferably two plates at each end of the truss which plates fit against opposite sides of the vertical web 12 of the upper chord and the vertical web 19 of the lower chord. The end of the vertical web 12 is preferably beveled off so as to fit against the top edge of the vertical web 19 of the lower chord. Plates 18 may be riveted, bolted, welded or otherwise secured together through the webs. The construction illustrated shows these plates being fastened by rivets 20. Bearing plates 21 are attached to the horizontal flanges 22 of the lower chord such as by welding or otherwise. Lacing members 23 in the form of angle irons or T-irons connect the vertical web 19 of the lower chord with the vertical web 12 of the upper chord. These lacing members are merely positioned against the sides of the webs and preferably have single rivet or bolt holes in their ends so that at each end of a lacing member a single rivet or bolt 24 may extend through the ends of two lacing members and through the intervening web. Struts 25 may extend across the top of adjacent upper chords and are bolted or otherwise secured to the top flanges 13 and 14 such as by bolts 26. Similar strut members may be provided for the bottom chords.

It will be noted that with the improved construction the use of gusset plates for attachment of the lacing members is entirely eliminated. Heretofore when the chords were formed of angle irons arranged back to back, on assembling the truss considerable difficulty was encountered in aligning all of the rivet or bolt holes which occur around each panel point. By means of the present design this is eliminated. The aligning of the rivet holes in the lacing members with each other and with the rivet holes in the vertical webs is comparatively easily accomplished, inasmuch as single rivets or bolts are used at the ends of the lacing members as illustrated.

If the upper chord is curved in accordance with a parabolic curve there is virtually no stress on the lacing members under ordinary conditions, however, in order to simplify construction, I prefer to dispense with the use of a parabolically curved upper chord and instead to curve the upper chord in accordance with the arc of a circle. Thus, if the curvature of the upper chord has a radius equal to the length of span, it is possible to readily compute the length of the lacing members and the positions of the rivet holes for the rivets 24, thus by determining upon one design of roof truss, the lengths of the lacing members and the distance between rivet holes for rivets 24 can be determined as a certain fraction of the length of the span. In applying the same design to a roof truss of greater span or smaller span, the proper location of the rivet holes and the length of the lacing members can be easily and quickly computed as a function of the length of span.

It is of course true that when the upper chord is shaped on a curve that is a portion of a circle, that the lacing members under such circumstances will be caused to assume portions of the load which would not be true in the case of a true parabolic arch, however as the stress imposed on the lacing members under these circumstances is relatively small, single rivets can be used at the ends of the lacing members and the advantages of readily modifying or adapting the design to different spans are accomplished. In this manner by using upper and lower chords formed of integral T-shapes which may be rolled shapes or obtained from split I-beams, it is possible to not only manufacture but to install a roof truss that will compete with wooden roof trusses that are now frequently used.

It will be noted that the points of attachment of the upper ends of the lacing members 23 are arranged at substantially equally spaced panel points along the upper chord. Similarly, the lower points of attachment of the lacing members 23 are arranged at substantially equally spaced panel points along the lower chord, there being one more panel in the upper chord than in the lower chord. The length of each lacing member is but slightly in excess of a vertical lacing member dropped from the corresponding upper panel point. In other words, the length of the lacing members in the present truss design is but slightly in excess of a vertical lacing member used at the same point and considerably less than the length of diagonal lacing members used in trusses having vertical lacing members. If the truss has imposed thereon unbalanced loads certain of the lacing members may be placed in compression and if the lacing members are very long they must be made sufficiently heavy to prevent buckling under these compressive stresses. By keeping them relatively short as in the present design and more closely approaching the length of vertical lacing members it is unnecessary to have the

lacing members made of unusually heavy material in order to be capable of withstanding any compressive stresses imposed by unbalanced loads on the truss.

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 claim.

I claim:

A roof truss comprising a curved steel upper chord T-shaped in cross section, a horizontal lower chord of inverted T-shape in cross section, plates positioned against the webs of the upper and lower chords adjacent the ends thereof, rivets connecting the plates through the webs of the chords, and lacing members positioned against the sides of the webs of the upper and lower chords intermediate the ends of the upper and lower chords, at oblique angles to the lower chord and single rivets connecting the lacing members together through the intervening webs of the upper and lower chords, the load of the truss being applied to the upper chord between panel points defined by the connection of the lacing members thereto as well as at the panel points.

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