TRUSS STRUCTURE FOR BEAMS

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FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

HARVEY B. VAN RADER
INVENTOR

BY
BUCKHORN, BLORE, KLAQUIST & SPARKMAN
ATTORNEYS
TRUSS STRUCTURE FOR BEAMS

Harvey B. Van Raden, Rte. 3, Box 246, Hillsboro, Oreg. 97123

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ABSTRACT OF THE DISCLOSURE

A beam or pair of rafters have brackets mounted on their opposite ends connected by a tie rod, the brackets having portions to bear against the beam or rafters when a load is applied to supply a reverse movement thereby to relieve to some extent the tension resulting from the load.

The present invention relates to a truss structure for use with load bearing rafters or beams and to apparatus for pretensioning such structures and for applying reaction forces to such structures as to increase their load carrying capabilities.

A particular object of the present invention is to provide an arrangement wherein the force of a load upon a beam or rafter is caused to apply a reverse moment to the portion of the beam which would otherwise be placed in tension thereby increasing the load carrying capabilities of such beam or rafter.

Another object of the invention is to provide new and improved brackets for use with beams or rafters so as to apply a reverse movement to them upon the occasion of loading of the beam or rafter.

Other objects and advantages of the invention will become more apparent hereinafter.

In accordance with an illustrated embodiment of the present invention, mounted to the opposite ends of a load carrying structure adapted to span an area and having portions placed in tension by reason of a load imposed on such structure are a pair of brackets mounted one adjacent each end of the structure. Means are provided for pivotally mounting said brackets on said structure and the brackets are pivotally connected by a tie rod which is placed in tension. The brackets are provided with means to engage the structure and to apply to said structure, by reason of the tension of the tie rod, a moment opposite to that resulting from a load imposed on the structure.

For more details of the invention reference is made to the accompanying drawings wherein:

FIG. 1 illustrates a roof truss constructed in accordance with the invention;

FIG. 2 is an end view of a bracket utilized in such roof truss made in accordance with the invention;

FIG. 3 is a side elevation of the bracket;

FIG. 4 is an elevation of a beam construction made in accordance with the invention; and

FIG. 5 is still another roof truss constructed in accordance with the invention.

Referring first to FIGURE 1, there is therein shown the application of the invention to a roof truss comprising a pair of opposed rafters 10 abutting each other at their upper ends at which they may be joined by any suitable means. The lower ends of the rafters may be suitably supported on posts or uprights 12 which may comprise the sidewalls of a building. Mounted one on each of the rafters near the lower end thereof is a pair of brackets

14, details of the construction of which are better shown in FIGURES 2 and 3. Each of the brackets 14 comprises a pair of side plates 16 that are disposed one on each of the opposite sides of a rafter 10. The side plates 16 are more or less triangular in shape and are joined at one of their apices by a tie bar 18 which is adapted to fit within a notch 20 formed in the corresponding rafter. The cooperative engagement of the notches 20 and tie bars 18 anchor the brackets against movement longitudinally of the rafters and define, as will become more apparent, a pivot point about which the brackets may rotate. Between a forwardly extending pair of apices of the plates 16 extends a second tie bar or pressure plate 22 which engages the underside of the corresponding rafters 10.

Each pair of side plates is joined at the third apices thereof by a third plate 24 having an opening to receive the end of a tie rod 26 that extends between the brackets, the ends of the tie rod being threaded to receive nuts 28 that may be threaded onto the tie rod 26 to apply tension thereto. When the tie rod 26 is under tension, the brackets 14 rotate relatively about their tie bars 18 to cause the pressure plates 22 to be forced against the underside of the rafters thereby applying a "reversed movement" against the rafters and in effect pretensioning the same and causing the same to camber. The underside of each of the rafters 10 is thus placed in compression rather than tension, as would be its normal condition, whereby, as will be readily apparent, the load bearing capacity of the rafters 10 is materially increased. Computation will show that the load-bearing capacity of a member will increase by an amount of from 60 to 75 percent by reason of the tension applied by means of the brackets 14 and tie rod 26.

As will be apparent the brackets 14 may assume various configurations and the brackets may be pivotally secured to rafters and beams by many suitable means. For example, if the rafters 10 are of steel the tie bars 18 may be welded to the upper surface of the rafters or the brackets may be secured by bolts extending through the corresponding rafters as shown in FIGS. 4 and 5.

The application of the principles of the invention to a single beam 30 is shown in FIGURE 4. The beam 30 is shown as a simple beam supported at its opposite ends by any suitable supports indicated at 32. Mounted one adjacent each of the opposite ends of the beam 30 is a pair of brackets 34, each comprising a pair of side plates 36 pivotally secured to the beam by a bolt 38 extending through the beam and the side plates. Each of the brackets 34 includes a pressure plate 39 extending between the side plates 36 beneath the under surface of the beam 30. Extending between each of the brackets 34 is a tie rod 42 which may comprise a pair of clevises 44 suitably secured to the brackets 36 beneath the beam 30 whereby the tie rod 42 is displaced from the axis of the beam and from the plane extending through the axes of the pivot points 38. The tie rod 42 is provided with a turn buckle 46 whereby the tie rod may be tensioned to cause the pressure plates 39 to be forced upwardly against the lower surface of the beam 30 thereby causing the lower portion of the beam to be placed in compression. This again will effectively increase the load bearing capacity of the beam 30.

Referring now to FIGURE 5 the combination of the application of the principles of the preceding embodiments to a truss structure is therein shown. The embodiment of FIGURE 5 comprises a pair of rafters 40 supported near their opposite ends on posts or walls 42. The upper ends of
the rafters 40 oppose one another and are held against one another by any suitable means. Mounted on each of these rafters adjacent the opposite ends thereof are brackets 49, 50, each of which comprises a pair of side plates embracing the opposite sides of the corresponding rafter 40. The brackets 49, 50 are each held in place for pivotal movement about a horizontal axis by a bolt 52 extending through the corresponding rafter. The brackets 49, 50 of each rafter are joined by a tensioning tie rod 54, which upon tensioning is adapted to force a pressure plate 56 of each bracket against the underside of the corresponding rafter, thereby placing the lower portion of each of the rafters in compression. In addition, the lower brackets 50 on the opposed rafters are joined by a tensioning tie rod 58 that is adapted to apply additional pressure to the beams through the pressure plates 56 of the lower brackets, particularly when a load is applied to the rafters 40. The load carrying capacity of the rafters 40 is thereby increased.

Having illustrated and described a preferred embodiment of the invention it should become apparent to those skilled in the art that the invention permits of modification in arrangement and detail. I claim all such modifications as come within the spirit and scope of the appended claims.

I claim:

1. A truss structure comprising:
   a pair of opposed rafters having abutting upper ends,
   a pair of brackets mounted on each of said rafters adjacent the lower ends thereof,
   means pivotally securing said brackets to said rafters for pivotal movement of each of said brackets about a horizontal axis extending at right angles to the longitudinal axis of the rafter on which it is mounted and restraining said brackets from movement longitudinally of said rafters,
   a tie rod extending between said brackets, and
   pressure plates on each of said brackets engaging the underside of the rafter on which the bracket is mounted, said tie rod being in tension whereby said pressure plate means are forcibly thrust against the corresponding rafter.

2. A truss structure comprising:
   a pair of opposed rafters having abutting upper ends,
   a pair of brackets mounted on each of said rafters adjacent the lower ends thereof,
   said brackets each comprising a pair of generally triangular side plates disposed on each of the opposite sides of the corresponding rafters,
   means pivotally mounting said brackets adjacent one corner thereof to said rafters for rotation about an axis normal to the longitudinal axis of the rafters and restraining the brackets against movement longitudinally of the rafters, each of said brackets having a pressure plate fixed to and extending between said side plates thereof at a second apex of said plates,
   each said pressure plate extending beneath the corresponding rafter and being positioned relativley between said first tie bar and the upper end of such rafter,
   the third apices of said side plates extending beneath said rafters and a tie rod extending between and engaging said brackets at the third apices thereof,
   said tie rod being in tension whereby said brackets are caused to pivot about said axes of said pressure plates are forcibly pressed against the lower surfaces of said rafters to camber the same.

3. A truss structure comprising:
   a pair of opposed inclined rafters having abutting upper ends,
   a pair of brackets mounted on each said rafter adjacent the lower ends thereof,
   said brackets each comprising a pair of generally triangular side plates disposed on each of the opposite sides of the corresponding rafters,
   means securing said first tie bars to the upper surface of said rafters and restraining the brackets against movement longitudinally of the rafters, each of said brackets having a second tie bar fixed to and extending between said side plates thereof at a second apex of said plate,
   each said second tie bar extending beneath the corresponding rafter and being positioned relatively between said first tie bar and the upper end of such rafter,
   the third apices of said plates extending beneath said rafters and being positioned between the second tie bars and the lower ends of said rafters, and
   a tie rod extending between and engaging said brackets at the third apices thereof,
   said tie rod being in tension whereby said brackets are caused to pivot about said second tie bars thereof and the second tie bars thereof are forcefully pressed against the lower surfaces of said rafters to camber the same.

4. A truss structure comprising:
   a pair of opposed inclined rafters having abutting upper ends,
   a pair of brackets mounted on each of said rafters adjacent the lower ends thereof,
   said brackets each comprising a pair of generally triangular side plates disposed on each of the opposite sides of the corresponding rafters,
   each of said brackets having a first tie bar fixed to and extending between said side plates thereof at an apex of said plates,
   said rafters each having a notch in the upper surface thereof cooperatively receiving said first tie bar and restraining the brackets against movement longitudinally of the rafters, each of said brackets having a second tie bar fixed to and extending between said side plates thereof at a second apex of said plates,
   each said second tie bar extending beneath the corresponding rafter and being positioned relativley between said first tie bar and the upper end of such rafter,
   the third apices of said side plates extending beneath said rafters and being positioned between the second tie bars and the lower ends of said rafters, and
   a tie rod extending between and engaging said brackets at the third apices thereof,
   said tie rod being in tension whereby said brackets are caused to pivot about said first tie bars thereof and the second tie bars thereof are forcefully pressed against the lower surfaces of said rafters to camber the same.

5. A truss structure comprising:
   a pair of opposed rafters having abutting upper ends,
   a pair of brackets mounted on each of said rafters one adjacent each of the opposite ends thereof,
   means for securing said brackets to said rafters to allow pivotal movement of each of said brackets about a given horizontal axis extending at right angles to the longitudinal axis of the rafter on which it is mounted and restraining said brackets from movement longitudinally of said rafters,
   a tie rod connected to and extending between each of said pairs of brackets,
   pressure plate means on each of said brackets engaging the under side of the rafter on which the bracket is mounted, said tie rods being in tension whereby said pressure plate means are forcibly thrust against the corresponding rafter, and
   a further tie rod connected to and extending between the lowermost bracket on each of said rafters, and
   means for placing said further tie rod in tension
further to urge said pressure plate means against said rafters.

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JOHN E. MURTAGH, Primary Examiner.