March 15, 1927. 1,621,299

W. E. WHITE

BUILT-UP STRUCTURAL ELEMENT

Filed Sept. 19, 1924

Fig. 1

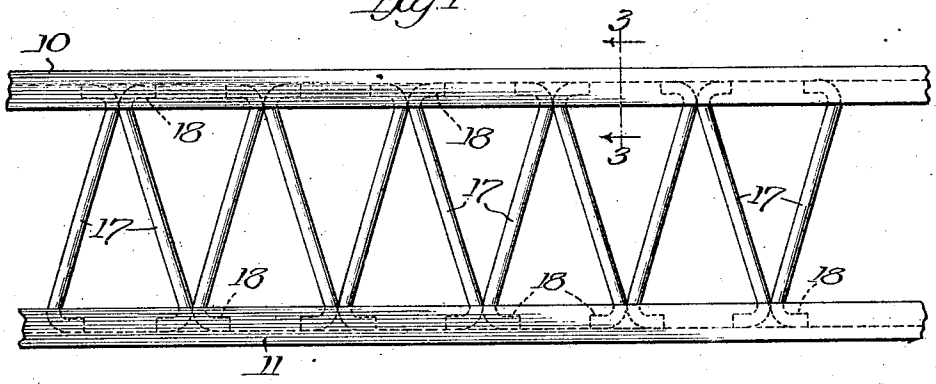


Fig. 2

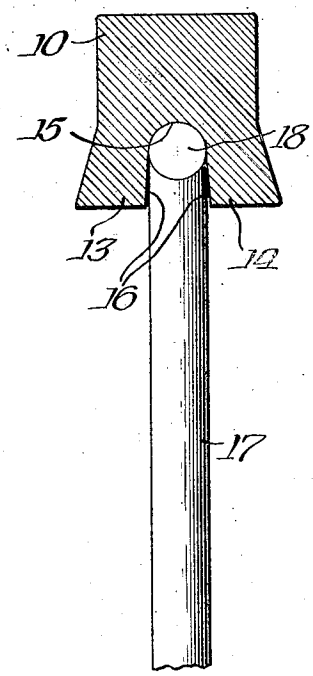


Fig. 3

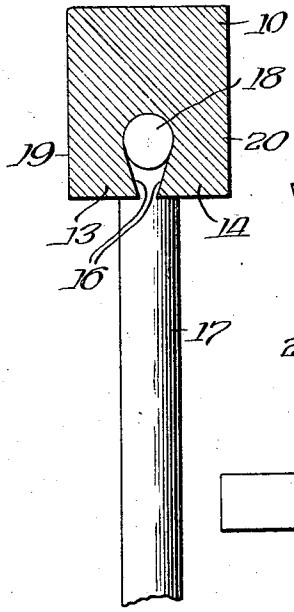
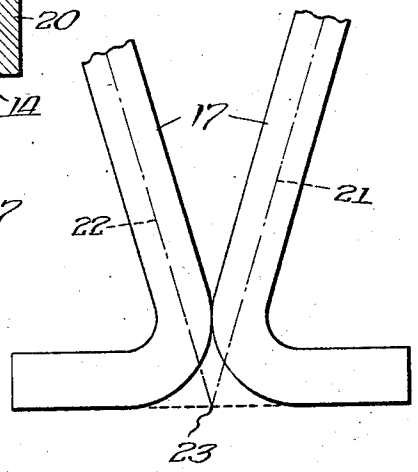


Fig. 4



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UNITED STATES PATENT OFFICE.

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BUILT-UP STRUCTURAL ELEMENT.

Application filed September 19, 1924. Serial No. 738,623.

My invention relates to structural elements and particularly to an improvement on the structure shown in my co-pending application, Serial No. 730,825, filed Aug. 8, 1924.

An object of my invention is to provide a truss structure composed of chords, and individual struts interlocked with the chords by displacing the metal thereof.

The chord elements of my invention are of peculiar cross sectional shape and are designed to facilitate production in an ordinary rolling mill. When so produced, the cost is no greater than that of any standard steel shape. The bars or chord elements are provided with a continuous longitudinal groove slightly tapered inwardly from the mouth to the inner end, the body of metal at each side of the groove being likewise tapered.

An ideal arrangement of the members comprising an articulate structure is to so arrange the members comprising it that their centers of gravity shall be joined to intersect in a point. This is practically accomplished in the structure herein disclosed.

The struts which I prefer to employ are diagonally disposed and each end of a strut member is re-bent at an acute angle to the longitudinal axis of the strut. When these strut members are so placed that one end of each strut is in contact with or closely contiguous to the end of an adjacent strut, the centers of gravity of the two struts intersect at a point within the lateral width of the chord and at substantially the center of gravity of the chord. This eliminates secondary stresses, and the desired result is accomplished by the rebending of the ends of the struts at an acute angle.

The invention will be more readily understood by reference to the accompanying drawing, in which:—

Fig. 1 is a side elevation of a portion of a built-up lattice truss constructed in accordance with my invention.

Fig. 2 is a section view showing the form of the chord element prior to the act of compressing the sides.

Fig. 3 is a sectional view on the line 3—3 of Fig. 1 showing the shape of the parts in their completed condition, and

Fig. 4 is an enlarged view of a pair of struts in their assembled position, the view being provided in order to illustrate the fact that the center lines of the struts intersect at a point within the confines of the structure.

In the drawings, it will be seen that the truss structure comprises two chord elements, 10, 11 of duplicate shape. The cross sectional contour of the chords is shown in Fig. 2. The upper portion of the chord consists of a solid body or head, 12, provided with marginal flanges 13, 14. The space or groove between the flanges is preferably arcuate at its inner end as indicated at 15, and the sides 16 are slightly tapered outwardly. This is necessary to facilitate rolling. The flanges are, however, thicker at their extremities than at their inner portions, that is to say, the metal constituting the flanges is gradually thickened from the inner end to the margin thereof. Thus both faces of the flanges are angularly disposed relative to a vertical plane, but the angle of the outer face is greater than that of the inner surface. The desirability of this configuration is shown by examining the finished structure, as in Fig. 3. Following the assembly therewith of a strut 17, the rebent end 18 of which is seated within the groove, the structure is caused to pass between pairs of plain rolls or between suitable dies whereby the sides of the chords are flattened. Both sides 19, 20 now constitute plane surfaces. However, as the body of metal within the side flanges 13, 14 is thicker at the marginal extremities than at the inner end, the groove has been partly closed, the metal having been caused to flow around the strut 17, and around the rebent end 18. The pressure applied has the effect also of slightly flattening the terminal portion 18 of the strut as best shown in Fig. 3. The flow of metal has resulted in such disposition thereof that a substantial quantity has entered the space at the inside angle of the bent end of the strut, that is, at a point closely adjacent to the longitudinal axis of the strut. Therefore, a force tending to pull the strut longitudinally out of its position is resisted by a substantial body of metal. By properly designing the chord elements, the force necessary to displace the strut element is greater than the tensile strength of the strut.

In a lattice truss of the form shown, the strut element with the ends bent at an acute angle and placed in contact as shown in Fig. 4, provides for maximum efficiency. The center of gravity lines 21—22 of the struts

intersect at the point 23, which is at substantially the center of gravity of the chord, and not outside of the structure as in similar trusses heretofore proposed. Since the center of gravity lines of the members 17 intersect substantially at the center of gravity of the members 10 and 11, no bending stress is set up in the joint due to the eccentricity of the stresses, and there is no tendency to rotate the members 17 in their mountings. While I believe this to be an important advantage, I do not consider the invention to be so limited.

I claim:

1. In a structure of the class described, the combination of a pair of chords each having a longitudinal groove, and strut elements connecting said chords, said strut elements being relatively diagonally disposed, both ends of each strut being rebent at an acute angle, the metal of the chords being caused to flow into the angle of the bent ends of the struts seated in the grooves in said chords.

2. A truss structure comprising chords having a longitudinal groove therein, and struts oppositely diagonally disposed and connecting said chords, both ends of each strut being oppositely bent at an acute angle, the rebent portion being received within the groove within the chord and extending parallel to said chord.

3. A truss structure comprising in combination, channel shaped chords and separate, oppositely diagonally disposed struts the ends of each strut being rebent at an acute angle and being received within the channel in said chords, the longitudinal axes of adjacent diagonally disposed struts intersecting within the body of the chords, the metal of the chord being caused to flow into the angle of the bent ends of said struts.

4. A truss structure comprising in combination, channel shaped chords and relatively diagonally disposed struts, the ends of the struts being bent at an acute angle and received within the channel of said chords, the longitudinal axes of adjacent struts intersecting within the body of the chords, the metal of the chords being caused to flow into the angle of the bent ends of the struts.

Signed at Chicago, Illinois, this 15th day of September, 1924.

WILLIAM E. WHITE.