July 31, 1928. 1,678,738

S. MACOMBER

STRUCTURAL ELEMENT

Filed Jan. 6, 1926

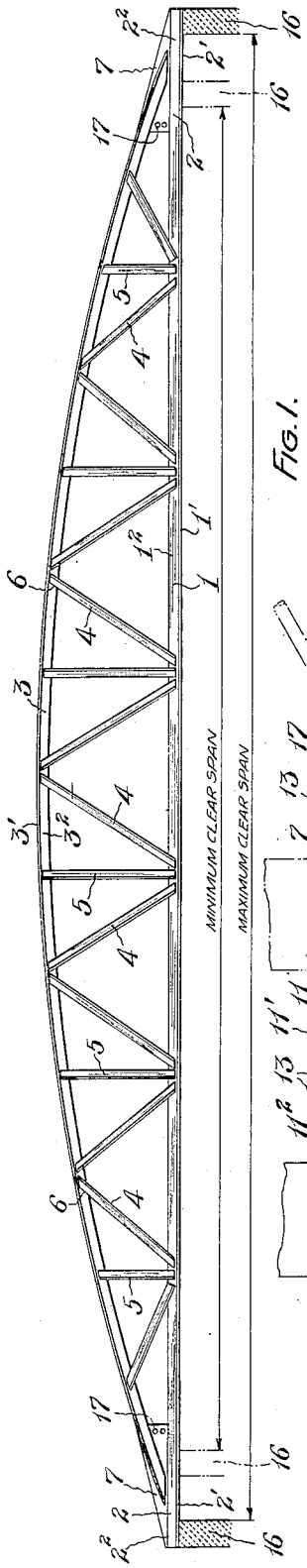


FIG. 1.

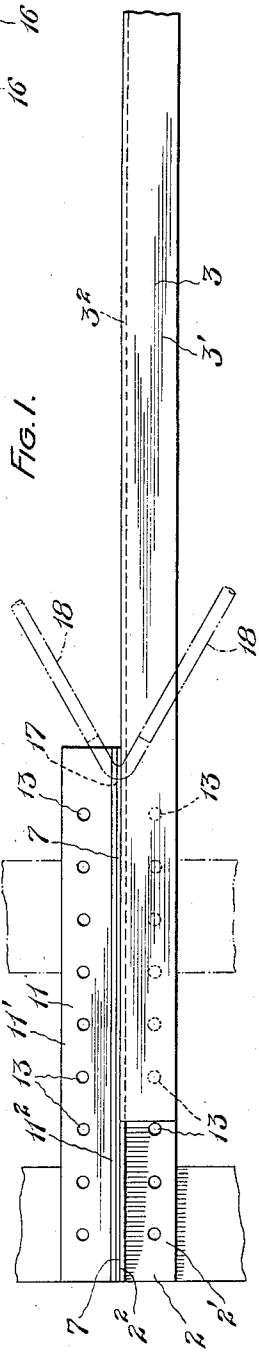


FIG. 3.

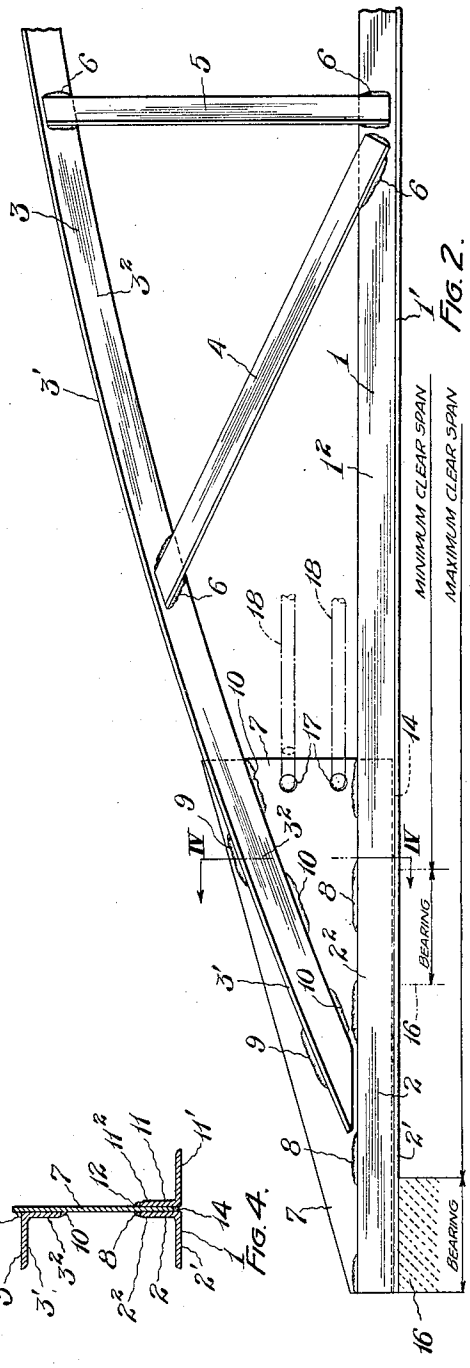


FIG. 2.

FIG. 4.

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UNITED STATES PATENT OFFICE.

STANLEY MACOMBER, OF MASSILLON, OHIO, ASSIGNOR TO THE MACOMBER STEEL COMPANY, OF CANTON, OHIO, A CORPORATION OF OHIO.

STRUCTURAL ELEMENT.

Application filed January 6, 1926. Serial No. 79,531.

My invention relates to structural elements and particularly to a product adaptable for use as a roof support. The invention particularly relates to a specially formed element particularly adaptable for use for spans of varying lengths within a given maximum and minimum, whereby a relatively small series of elements each adjustable for a given spread of spans, will provide for a total spread of spans covering any practicable adjustability.

The annexed drawing and the following description set forth in detail certain means embodying my invention, such means constituting, however, but one of the various forms in which the principle of the invention may be illustrated.

In said annexed drawing:

Figure 1 is a side elevation of a complete roof support embodying my invention;

Figure 2 is a side elevation of one of the element ends, upon an enlarged scale;

Figure 3 is a plan view of the elements shown in Figure 2; and

Figure 4 is a vertical, transverse section, taken in the plane indicated by the line IV—IV, Figure 2.

Referring to the annexed drawing in which the same elements are indicated by the same respective ordinals in the several views, I denote a base chord of the element by the ordinal 1, the same being an angle bar having a horizontal flange 1′ and a vertical flange 1^2. In the form of invention illustrated, this base chord 1 is of a sufficient length for the maximum length of span for which the particular element is adapted. However, this main chord 1 might be of a shorter length and supplemented by end members integrated therewith to complete the maximum length of the element, as will appear more fully hereinafter. The end sections of the base chord 1 are indicated by the ordinal 2 and disposed adjacently the top of the vertical flanges 2^2 of these end sections 2 are the ends of the horizontal flanges 3′ of a curved top chord 3, consisting of an angle bar having, in addition to the horizontal flange 3′, a vertical flange 3^2. The areas within which the ends of the curved top chord 3 lie are adjacent to the end sections 2 of the base chord 1 but are removed a substantial distance from the extreme ends of the base chord 1, as plainly shown in Figures 1, 2 and 3. I complete a truss portion of the element by integrally uniting the body portions of the chords 1 and 3 through the medium of angle iron diagonals and verticals 4 and 5 secured to the vertical flanges 1^2 and 3^2 of the base and top chords 1 and 3, respectively. The several adjacent web bars 4 are arranged alternatively diagonally, as fully appears in Figure 1, so that a series of alternately arranged upright and reverse V-sectors are formed, the adjacent angles at the top and bottom, respectively, of which are quite widely spaced, and the element is further reinforced by the vertical web members 5 which bisect the angle of the upright V-sections. The connection between the ends of the web members 4 and 5 and the chord members 1 and 3 is preferably effected by arc-welding the areas 6. I further connect the base chord 1 and the top chord 3 by integrating the ends thereof through the medium of triangular-shaped vertical gusset plates 7, which, in combination with the ends 2 of the chord 1, or with other end members connected to the base chord 1, if desired, and with special complementary end bars, hereinafter fully described, form end supports for the element and preferably form end beams which furnish adjustable supports for varying spans, as hereinafter fully described. The triangular end tie plates 7 respectively extend inwardly substantially beyond the areas in which the ends of the chord 3 lie, and substantially within the lines denoting the limits of the minimum span for which the element is adapted, as plainly shown in Figures 1 and 2. The complementary angle member for finishing the supporting base of the element is an angle bar 11 having a horizontal flange 11′ and a vertical flange 11^2. Referring to the inner edge of the tie plate 7, it will be noted that the bottom of the same lies slightly above the bottom of the horizontal flanges 2′ and 11′ of the ends 2 and angle bar 11, respectively, and that the top of said inner edge of the tie plate 7 extends slightly above the horizontal flange 3′ of the top chord 3. From these bottom and top positions the tie plates 7 extend, respectively, in a horizontal line and in a downwardly sloping line outwardly to the extreme ends of the base chord 1 so as to lie somewhat above the bottom and top, respectively, of the outer ends of the vertical flange 2^2, as shown at the extreme left-hand

end of Figure 2. The integrating of the ends of the base and top chords 1 and 3, respectively, with the tie plates 7 is preferably effected by arc-welding the areas formed by the space immediately below the longitudinal edge of the tie plates 7 and between the opposed faces of the flanges 2^2 and 11^2, as denoted by the ordinal 14, Figure 4, and by arc-welding the angles formed by the faces of the tie plates 7 and the tops of the flanges 2^2 and 11^2 and the bottom of the flanges 3^2, as denoted by the ordinals 8, 12 and 10, respectively, Figure 4, and the angle formed by the vertically-extending edges of the tie plates 7 and the inner edges of the horizontal flanges 3′, as denoted by the ordinal 9. Thus, I form an integral roof element having the central truss portion proper and the beam end extensions formed by the ends of the chords 1 and 3 and the tie plates 7 and angle bars 11 integrated therewith. This roof element is designed to be supported upon concrete columns 16 or other suitable supports and I indicate, by the ordinal 13, holes for anchor bolts or other column connections. I also provide holes 17 in the tie plates 7 for receiving lateral bracing members 18, if and as desired. The top chords 3 are punched to take wood nailing strips or steel purlins, as desired.

Thus, in addition to the particular combination of elements forming a roof element, I may provide means whereby the concrete or other column supports 16 may be disposed varying distances apart within certain limits and still the roof element will perform the required duty. In the element illustrated in the accompanying drawing, the limits are indicated by the minimum clear span and the maximum clear span, Figures 1 and 2. These spans are the clear distances between the supports 16. I indicate in Figure 3 by full lines and dot-and-dash lines, respectively, supports 16 for the maximum and minimum spans and I also indicate by the plurality of holes 13 for anchor bolts the possibility of the support columns 16 lying anywhere within the limits indicated. If desired, the element may be cut within the limits to the desired length and the truss feature of the same is not disturbed, the beam end supporting extensions formed by the flanges 2′ and 11′ and reinforced by the tie plates 7 and the ends of the top chord 3 being suitable for supports anywhere within the maximum and minimum limits stated. The broad idea of central truss sections and end beam extensions in a structural unit, for use in varying lengths and preserving both the beam and truss effects, forms the subject-matter of other patent applications filed by me and the same broadly is not claimed in this application but only the adaptation of the same to the particular form of curved chord roof element hereinbefore described in detail, shown in the accompanying drawing, and hereinafter claimed; as well as the particular combination of elements for a roof element suitable for use in one length only.

What I claim is:

1. A structural element comprising an angle bar forming a base chord, a curved second angle bar forming a top chord, web members secured to the vertical flanges of said bars, the ends of the horizontal flanges of the top chord being disposed adjacent the edges of the vertical flanges of the base chord and a substantial distance from the respective ends of the latter, vertical longitudinal tie plates secured to the vertical flanges of said chords and extending inwardly substantially beyond the ends of the top chord, and complementary flanged bars welded to the bottom of the opposite faces of said tie plates to complete a plain balanced base for the element, whereby the element may be adjusted to varying distances between supports within the maximum limit of the length of the base chord and the minimum limit of somewhat more than the distance between the inner edges of the tie plates.

2. A structural element comprising an angle bar forming a base chord, a curved second angle bar forming a top chord, web members welded to the vertical flanges of said bars, the ends of the top chord being disposed a substantial distance from the respective ends of the base chord longitudinal triangular-shaped tie plates extending inwardly in a regularly increasing height from the ends of said base chord to points substantially beyond the ends of the top chord, the inner vertical edges of said tie plates extending flush with said vertical flanges from a point slightly above the bottom of the horizontal flange of the base chord to a point above the top of the horizontal flange of the top chord, said chords and tie plates being welded together at the junction lines formed by the upper and lower edges of said vertical flanges and said tie plates, and complementary flanged bars welded to the bottom of the opposite faces of said tie plates to complete a plain balanced base for the element, whereby the element may be adjusted to varying distances between supports within the maximum limit of the length of the base chord and the minimum limit of somewhat more than the distance between the inner edges of the tie plates, the integrated ends of the chords and tie plates forming beams affording a multiplicity of points of support for the adjustable use of the element.

3. A structural element comprising an angle member having a vertical flange and forming a base chord, a curved top chord, web members secured to said chords, vertical end tie plates secured to said chords, and extension angle members having vertical

flanges secured upon one side of said tie plates and adjacent the bottom edge thereof, said tie plates being disposed between the vertical flanges of said base chord and said extension members, said base chord, extension members and said tie plates affording end supports.

4. A structural element comprising an angle bar forming a base chord, a curved second angle bar forming a top chord, web members secured to the vertical flanges of said bars, vertical longitudinal triangular shaped end tie plates extending inwardly in a regularly increasing height from the ends of said base chord, the inner vertical edges of said tie plates extending flush with said vertical flanges from a point slightly above the bottom of the horizontal flange of the base chord to a point above the top of the horizontal flange of the top chord, said chords and tie plates being welded together at the junction lines formed by the upper and lower edges of said vertical flanges and said tie plates, and complementary angle bars welded to the bottom of the opposite faces of said tie plates to complete a plane balanced base for the element, the integrated ends of the chords, complementary bars, and tie plates forming beams affording end supports for the element.

5. A structural element comprising a base chord having a vertical flange, a top chord having a vertical flange, web members secured to said chords, vertical tie plates extended inwardly from the ends of said chords and secured to the respective vertical flanges of the latter, and complementary base members having vertical flanges secured to the bottom of the tie plate faces opposite to those to which the base chord flanges are secured, to complete balanced supporting ends for the element.

Signed by me this 1st day of December, 1925.

STANLEY MACOMBER.