Dec. 27, 1927. 1,654,151

H. G. TREGILLUS

TRUSSED STRUCTURE

Filed June 23, 1920 2 Sheets-Sheet 1

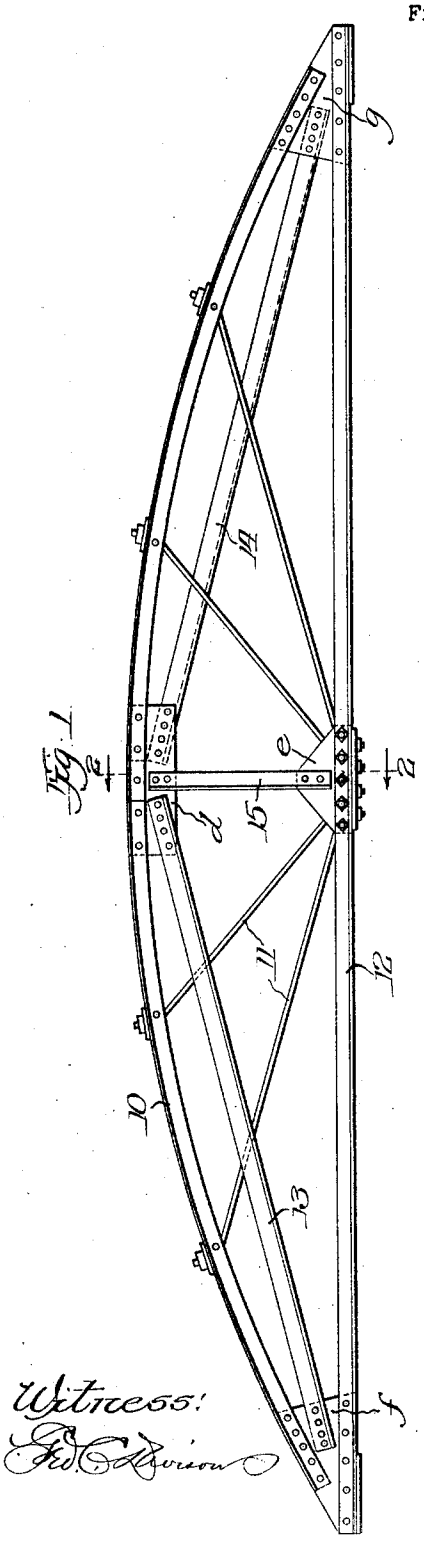


Fig. 1

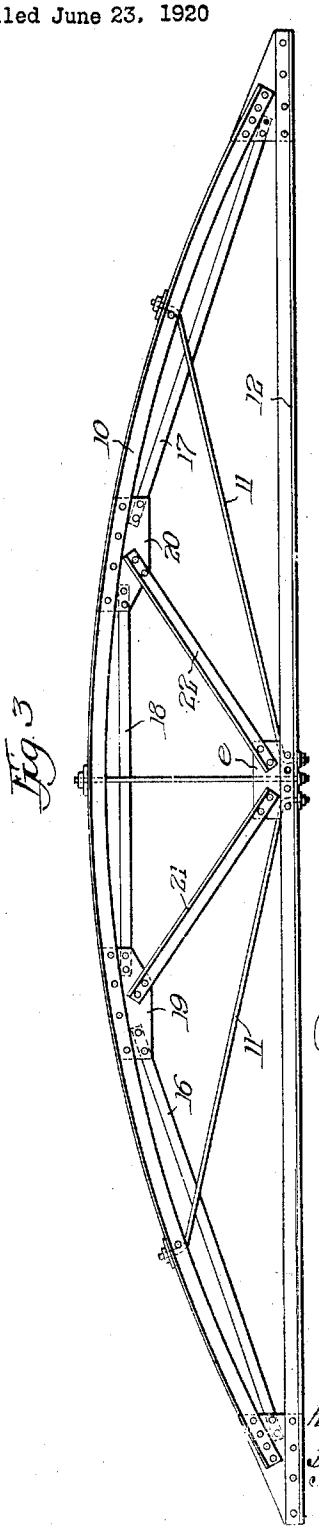


Fig. 3

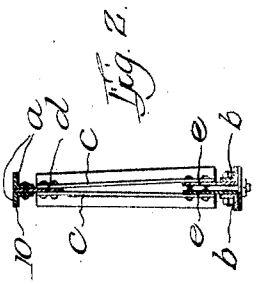


Fig. 2.

Witness:

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2 Sheets-Sheet 2

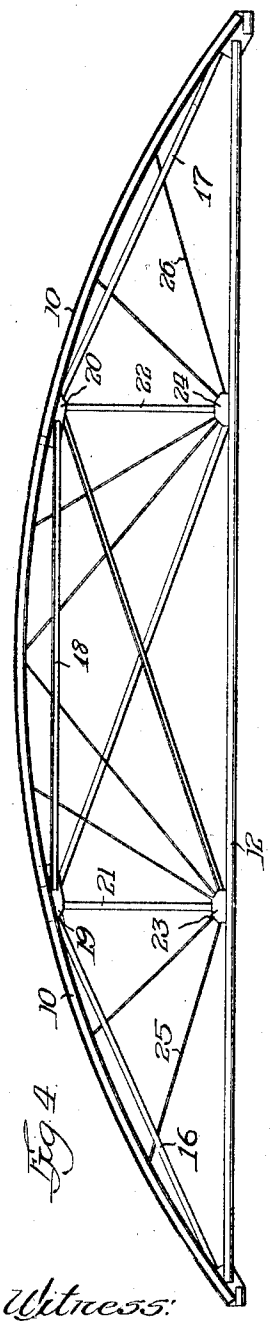


Fig. 4.

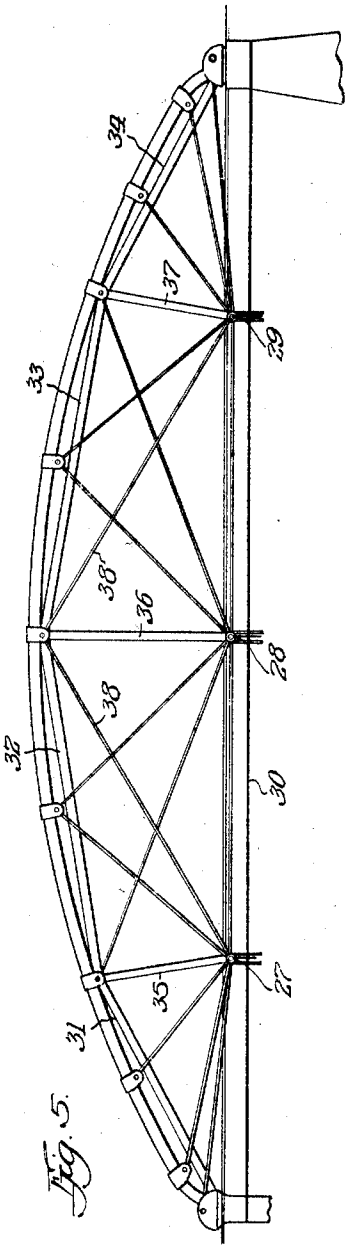


Fig. 5.

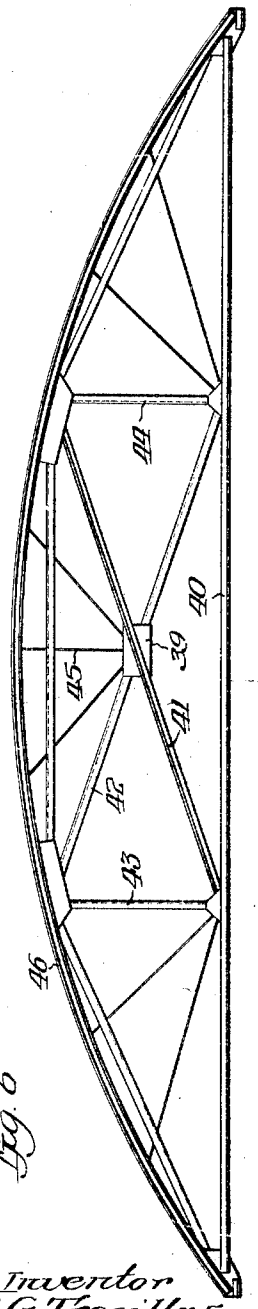


Fig. 6.

Witness:

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Patented Dec. 27, 1927. 1,654,151

UNITED STATES PATENT OFFICE.

HAROLD G. TREGILLUS, OF BARRINGTON, ILLINOIS.

TRUSSED STRUCTURE.

Application filed June 23, 1920. Serial No. 391,035.

My invention refers to trussed structures of the class disclosed in my Patent No. 1,330,771 of February 10th, 1920, the object of the invention being to provide modified truss formation which will better adapt the trussed structures to varying conditions encountered in actual practice, while at the same time increasing the efficiency and permitting the structures to be built with greater economy.

In the form shown in the patent referred to, the anchoring or tension members extend from the ends of the arch member to intermediate points thereof, that is, the ends of the arch form the anchorage points for the anchoring members. Under certain conditions it may be desirable to change the location of the anchoring point or points. For example, where the span is so long that the stock material for the anchoring members would not be long enough, it would be desirable to shift the anchorage points to permit the use of shorter anchoring members. Under other conditions, it might also be desirable to shift the anchoring points away from the ends of the arch or truss. In the structure of my patent above referred to, we have an inverted Bollman truss structure associated with an arch member and with this arrangement the anchorage points are at the arch ends. By changing the form of the inverted truss structure, the anchorage point or points, i. e. the point or points of application of the arch retaining tension members, can be shifted from the arch ends to some intermediate point or points on the truss structure and such shifting of the anchorage points will permit the use of shorter tension members for connecting the point or points of anchorage with the arch.

The structure of which the shifted anchorage points form a part, I call the inverted truss structure or formation, and the combination of this inverted truss formation with the arch member and the tension members I call the trussed structure.

In operation, then, the inverted truss formation is anchored to the arch ends, and intermediate points on the arch are anchored to a predetermined anchorage point, or predetermined anchorage points on the chord member of the inverted truss formation by means of tension members.

On the accompanying drawings, my invention is incorporated and illustrated in a number of trussed structures showing modified inverted truss formations. In these drawings,

Fig. 1 is a side elevational view of one form of structure,

Fig. 2 is a sectional view on line 2—2, Fig. 1.

Fig. 3 is a side elevational view of a modified form of structure and

Figs. 4, 5 and 6 show other modifications.

Referring to Fig. 1 the trussed structure shown comprises the arch member 10, tension members 11 and an inverted truss formation to which the arch member is anchored by the tension members. The inverted truss formation or structure shown comprises the chord member 12, the inverted truss tension members 13 and 14 and the strut member in the form of a king-post 15 connecting between the juncture of the truss tension members and the chord member 12. As shown in Fig. 2 the arch member may be composed of two angle bars a, and the chord member 12 may be composed of two angle bars b, while the strut member may be composed of two angle pieces c secured at their upper ends to plate d and at their lower ends to plates e, the plate d being secured to the arch member bars a and the plates e being riveted to the chord member bars b. The chord and arch members are connected together at their ends by web plates f and g to which the truss tension members 13 and 14 are also secured, the inner ends of these members being secured to the plate d. The truss structure is thus connected directly to the arch member at the ends and center thereof. The plates e form an anchorage for the tension members 11 which radiate therefrom and connect with the arch member at intermediate points thereof. The principle of operation of this trussed structure is the same as that disclosed in my patent referred to, the tension members together with the truss formation preventing bulging of the arch member during application of irregular load thereto, and consequently preventing flattening of the arch member at other points.

Primarily the anchorage points are at the ends of the arch which are held properly spaced by the chord member 12 which becomes the tension chord of the trussed structure when under load. By means of the truss formation or structure extending between the arch ends, the anchorage points can be shifted to any desired location on the

truss structure. In Fig. 1, the shift has been made to the center of the chord member 12, and owing to the rigid truss formation the point of anchorage represented by the plates *e* is positive. By thus shifting the anchorage much shorter tension members 11 can be used, and there are many advantages in the use of such shorter tension members.

In Fig. 3 a modified truss formation is shown. Instead of only the two truss tension members of the structure of Fig. 1, three such members 16, 17 and 18 are used, the member 18 being interposed between the inner ends of the members 16 and 17, the members being fastened to the plates 19 and 20 secured to the arch member 10. With this arrangement of truss tension members two strut members 21 and 22 are provided and secured at their upper ends to the plates 19 and 20 and at their lower ends to the anchorage plates *e*. The arch member 10 is thus connected directly to the truss formation at four points instead of at three points as shown in the structure of Fig. 1. The tension members 11 radiate from the anchorage point *e* to the arch member at intermediate points thereof, one of the tension members extending vertically upwardly to connect with the arch member at the center thereof as clearly shown. The principle of operation of the structure of Fig. 3 is exactly the same as that of Fig. 1 and of the structure disclosed in my patent referred to.

Fig. 4 shows another modified arrangement of truss formation by means of which two anchorage points are provided intermediate the arch ends, from which anchorage points the arch retaining tension members radiate. The strut members 21 and 22 extend vertically downwardly from the plates 19 and 20 and are fastened to the anchorage plates 23 and 24 which are secured to the chord member 12. The tension members 25 and 26 radiate from the plates 23 and 24 respectively to desired points on the arch member 10. If the strut members 21 and 22 of the structure of Fig. 4 were swung inwardly to bring their lower ends together to a common anchorage point, we would have the structure of Fig. 3. By modifying the truss formation a single intermediate anchorage point may be provided as in the structure of Fig. 3, or two anchorage points as in the structure of Fig. 4, or any desired number of intermediate anchorage points could be provided and situated either in the line of the chord 12 or above or below such line. By properly designing the truss formation these anchorage points can be made practically as rigid and positive as they would be if they were at the ends of the arch as in the arrangement shown in my patent referred to.

Fig. 5 shows an arrangement involving three intermediate anchorage points 27, 28 and 29 which are on the truss structure comprising the chord 30, the truss tension members 31, 32, 33 and 34, the strut members 35, 36 and 37 and the diagonals 38. This Fig. 5 represents the conversion of the structure shown in Horton Patent No. 595,629 of December 14th, 1897, into a trussed structure of my invention.

Fig. 6 represents a trussed structure involving an anchorage point 39 above the line of the chord 40, the anchorage point being at the crossing of the diagonals 41 and 42 extending between the struts 43 and 44, tension members 45 radiating from the anchorage point to the arch member 46.

In the structure shown on the drawings of my patent, the arch retaining members form necessary parts of the inverted Bollman truss structure, while in the arrangement of this application the inverted truss is a structure complete in itself, arch retaining members radiating to the arch member from selected points of anchorage on the truss. In the structure shown on the drawings of the patent, the inverted Bollman truss formation comprises only tension members, while in the arrangement disclosed in this application the truss formations comprise both tension and compression members.

In order that the term "inverted" as applied to the truss formation shall be clearly understood, it is pointed out that any truss for supporting loads, that is, to resist downward forces, is not inverted, and has the main tension member at the bottom. The truss formation of my invention is for resisting upward forces and has its main tension member at the top. It is, therefore, an inverted truss.

Having described my invention, I claim as follows:—

1. The combination of an arch member and an inverted truss structure directly attached one to the other at not less than two points, and tension members connecting said truss structure with said arch member at various points thereof, said truss structure being composed of tension and compression members.

2. A trussed structure comprising an arch member and an inverted truss structure whose ends are directly attached thereto, said trussed structure being composed of compression and tension members.

3. A trussed structure comprising an arch member, an inverted truss structure directly attached to the arch member ends and tension members radiating from a point on said truss structure intermediate the arch ends and connecting with the arch member at various points thereof.

4. In a structure of the class described, the combination of an arch member, positive anchorage means directly attached to the ends of said arch member and comprising ten-

sion and compression members, and tension members connecting one point of said anchorage means with said arch member at various points throughout its length.

5. A trussed structure comprising an arch member, a polygon of tension members having all its corners directly attached to said arch, strut means connecting said arch with the side of the polygon opposite the arch, said polygon and strut means forming a truss structure, and tension means connecting said truss structure with said arch member at various points thereof.

6. In a trussed structure of the class described, the combination of an arch member, a truss structure directly attached to the arch member ends and forming positive anchorage between the arch ends, and arch retaining members extending from said truss structure to said arch member at various points of said arch member.

7. In a structure of the class described, the combination of an arch member, a chord member connecting the ends of said arch member, tension sub-chord members directly attached to the ends and to various points of said arch member, strut means joining said arch member at various points to said chord member, said chord member, tension sub-chord members and strut means forming a truss structure, and arch retaining tension members radiating from a point of said truss structure to said arch member at various points throughout its length.

8. In a trussed structure of the class described, the combination of an arch member, a chord member connecting the ends of said arch member, truss rods extending from the ends of said chord member to said arch member and sub-tending less than one-half of said arch member, a center truss rod extending between the inner ends of the afore-mentioned truss rods, strut members extending from the junctures of said truss rods to the chord member at the center thereof, and arch retaining tension members radiating to the arch member from the juncture of said strut members and chord member.

9. In a structure of the class described, the combination of an arch member, a polygon of tension members having its lower member extending between the arch member ends and said polygon being directly attached at its corners to the arch member, strut means extending from the polygon corners to said lower tension member, and arch retaining tension members radiating to said arch member from the juncture of said strut means and lower tension member.

10. A truss structure comprising an arch, a main chord for the arch, secondary chords for three separate portions of the arch, struts connecting the center of the main chord with the junctures of the secondary chords, and tension members connecting the center of the main chord respectively with intermediate points of the said arch portions.

11. A truss structure comprising an arch, a bottom chord for the same, a tension member connecting the centers of the arch and the bottom chord; a pair of struts connecting the center of the bottom chord with the arch, the said struts being symmetrically disposed with respect to the tension member; a tension member connecting the upper ends of the struts, and a pair of tension members forming chords of the arch and leading respectively from the ends of the bottom chord.

12. A truss structure comprising an arch, a bottom chord for the same, an odd number of secondary chords disposed symmetrically with respect to the axis of the arch and respectively forming chords for consecutive portions of the complete arch, symmetrically disposed compression members connecting the ends of the medial secondary chord with the bottom chord, and tension members connecting the lower ends of the compression members respectively with arch portions opposite intermediate points of non-medial secondary chords.

13. In an arched truss or girder, an arch, separate means for stiffening separate portions of the arch, a main chord for the arch, struts connecting the center of the main chord with the junctures of the said separate arch portions, and tension members connecting the center of the main chord with the arch at points intermediate of the said portions.

In witness whereof, I hereunto subscribe my name this 18th day of June, A. D. 1920.

HAROLD G. TREGILLUS.