(No Model.)

# J. E. GREINER.

## TRUSS FOR BRIDGES, ROOFS, &c.

No. 535,695. Patented Mar. 12, 1895.

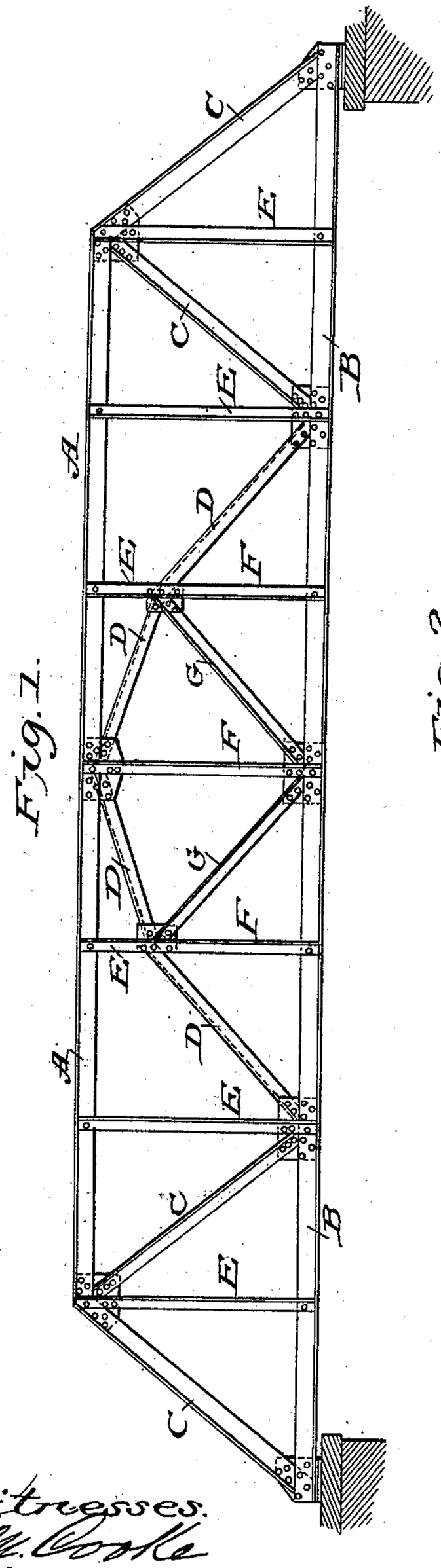


Fig. 1.

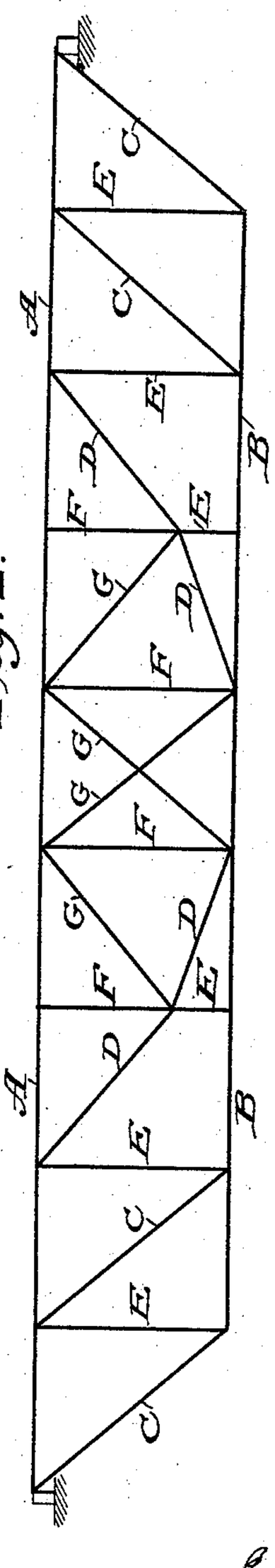


Fig. 2.

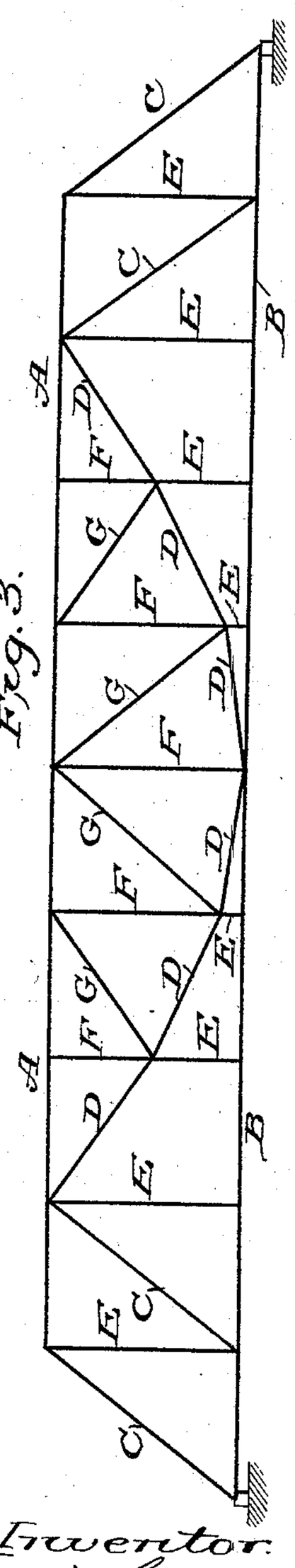


Fig. 3.

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# UNITED STATES PATENT OFFICE.

JOHN EDWIN GREINER, OF BALTIMORE, MARYLAND.

## TRUSS FOR BRIDGES, ROOFS, &c.

SPECIFICATION forming part of Letters Patent No. 535,695, dated March 12, 1895.

Application filed September 10, 1894. Serial No. 522,582. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN EDWIN GREINER, of Baltimore, Maryland, have invented certain new and useful Improvements in Bridges, Roofs, or other Structural Work; and I do hereby declare the following to be a clear, full, and exact description thereof, reference being had to the accompanying drawings and to the letters of reference marked thereon.

My invention relates to a new form of subdivided quadrangular or triangular bridge or roof truss having but one support on each pier and having some of the main inclined web members which pass from chord to chord, and are connected directly thereto, intersect two or more panels, but instead of being in a straight line between the chords as is the case in ordinary subdivided trusses, these inclined members have their points of intersection with the upper chord, lower chord and verticals, on the line of a curve, as can be seen by the accompanying drawings, in which—

Figure 1 represents a detailed elevation of the improved truss having eight panels. The inclined web members starting from the center panel point of upper chord intersect two panels. This is designed as a truss for a through bridge the bearings on masonry being directly under the ends of the bottom chord. Fig. 2 represents a skeleton elevation of a truss having an odd number of panels, in which the inclined members intersecting two panels, start from the joints on the bottom chord nearest the center of the bridge. It is designed as a truss for a deck bridge, the bearings on masonry being directly under ends of upper chord. Fig. 3 represents a skeleton elevation of a truss in which the inclined web members beginning with the center joint of the lower chord, intersect three panels designed for a through bridge.

Viewing Fig. 1, it will be observed that the improved truss as there shown, is composed of an upper chord A, a lower chord B, inclined web members C intersecting one panel, inclined web members D which join one chord at the center joint and intersect two panels before joining the other chord at an intermediate panel point free from the abutments, hangers or verticals E outside of the bow formed by inclined members D, counter braces G, and verticals F included within the bow of the inclined members D. The counter braces G, which are joined at one end to the lower chord, are secured to the inclined web members D at their intersection with the verticals F, and their object is to take up the strains due to a moving load and to hold the inclined web members firmly in position. They are not strained under a uniformly distributed load.

In Fig. 2 is seen the improved truss when there is an odd number of panels. In this case, the main inclined diagonals D, start from the panel point on lower chord nearest the center of the bridge, intersect two panels, then join the upper chord at an intermediate panel point, all points of intersection being on a curved line. Similar letters apply to members similar to those in Fig. 1. The center panel has two cross counter braces G.

In Fig. 3 is seen another adaptation of the improved truss to a long span. Here the main diagonals D beginning with the center joint of lower chord intersect three panels before they join the upper chord at an intermediate panel point, all intersections being on a curved line. The main inclined braces D in this case, are held in position by the counter braces G at intersection with verticals as described in Fig. 1. This truss may be made of iron, steel or a combination of wood with iron or steel and is applicable for bridges used for highways or railroads for spans of any length to which truss bridges are usually adapted, except that the number of panels must not be less than six.

The truss is not a combination of an arched rib or suspension catenary with a quadrangular or triangular truss as might be presumed from its general appearance, but is strictly a legitimate quadrangular or triangular truss having some of its long panels subdivided into shorter panels, the stress in each member being capable of accurate determination as in any regularly framed structure. The inclined members D, which intersect two or more panels and have their connection joints with the verticals or chords on a curved line, are merely main braces or ties as in the case of a subdivided Pratt truss, but by being arranged in the broken manner shown, they are capable of relieving the chords of a part of their stresses and tend toward economy of

material. The truss however, may be considered as a combination of a bowstring truss with a quadrangular or triagular truss frame, in which the diagonals D forming the bow and the members included between this bow make a complete short span bowstring truss, the ends of which are connected directly to intermediate panel points of a truss frame. The prolongations of the chord of the bow at each end are trussed by the members C, E, and these members being joined to the chord member which intersects the crown of the bow will form a quadrangular trussed frame.

The superiority of my invention over trusses used in bridges as usually constructed, is as follows:—First, it will give a substantial structure, each member of which has determinate strains; second, the stresses in the chords have less variation than usual, being in some cases uniform from end to end; third, a saving in material.

Having now practically described the nature of this my invention, and its application, I would here state that in setting out the nature of the invention, I have shown certain special arrangements and adaptations to a different number of panels. I wish it to be understood however, that although these forms, modes and arrangements illustrated, may be used to advantage, yet I do not limit my invention to the special cases shown, as the improvement may be carried out in other forms without departing from its spirit or scope, and that it is susceptible of many modified forms, and will necessarily have to be varied to suit the varying conditions in actual practice, and

I declare what I claim in respect of the herein-described invention is—

1. In the construction of triangular or quadrangular trusses for bridges or other structures, the herein described trusses having but one point of bearing on each pier the main braces or ties of which begin at and take direct hold of one chord at the center joint or joints nearest the center, intersect two or more panels, and end at and connect directly to the other chord at intermediate panel points, the intersecting points of said braces or ties with the chords and vertical members of the truss being points on a curved line.

2. In the construction of quadrangular or triangular trusses for bridges or other structures, the herein described main braces or ties D which end at their intersections with the upper and lower chords at intermediate panel points, and which in joining the two chords together form a segmental curve.

3. In the construction of quadrangular or triangular trusses for bridges or other structures, the braces or ties D extending from chord to chord but not beyond and which incline at an angle with each other and with the chords which they intersect at intermediate panel points, in combination with the counter braces G.

4. In the construction of quadrangular or triangular trusses for bridges or other structures, the combination of double or triple intersection braces or ties D, which begin directly at a joint in one chord and end at an intermediate panel point in another chord whose intersections with chords and verticals, are points on a curve, with upper chord A, lower chord B, inclined members C, verticals E and F, and counter braces G, all as shown and described.

5. In the construction of trusses for bridges or other structures, the combination of a bowstring truss with a quadrangular or triangular truss frame in which the apex or crown of the bow is directly connected to one chord of the triangular or quadrangular truss frame and the string of the bow forms when prolonged a part of the other chord of the quadrangular or triangular truss frame.

6. In the construction of quadrangular or triangular trusses for bridges roofs or other structures, the herein described truss composed of a bowstring truss of four or more panels in combination with the extended chord of the bow for one or more panels at each end, the said extensions being trussed by the frames formed by the members C and E, and these frames being held in position by the chord or straining beam which connects directly to the crown of the bowstring truss as well as to the frames thereby forming a complete truss of a longer span than the bowstring truss and having but one support on each pier.

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