

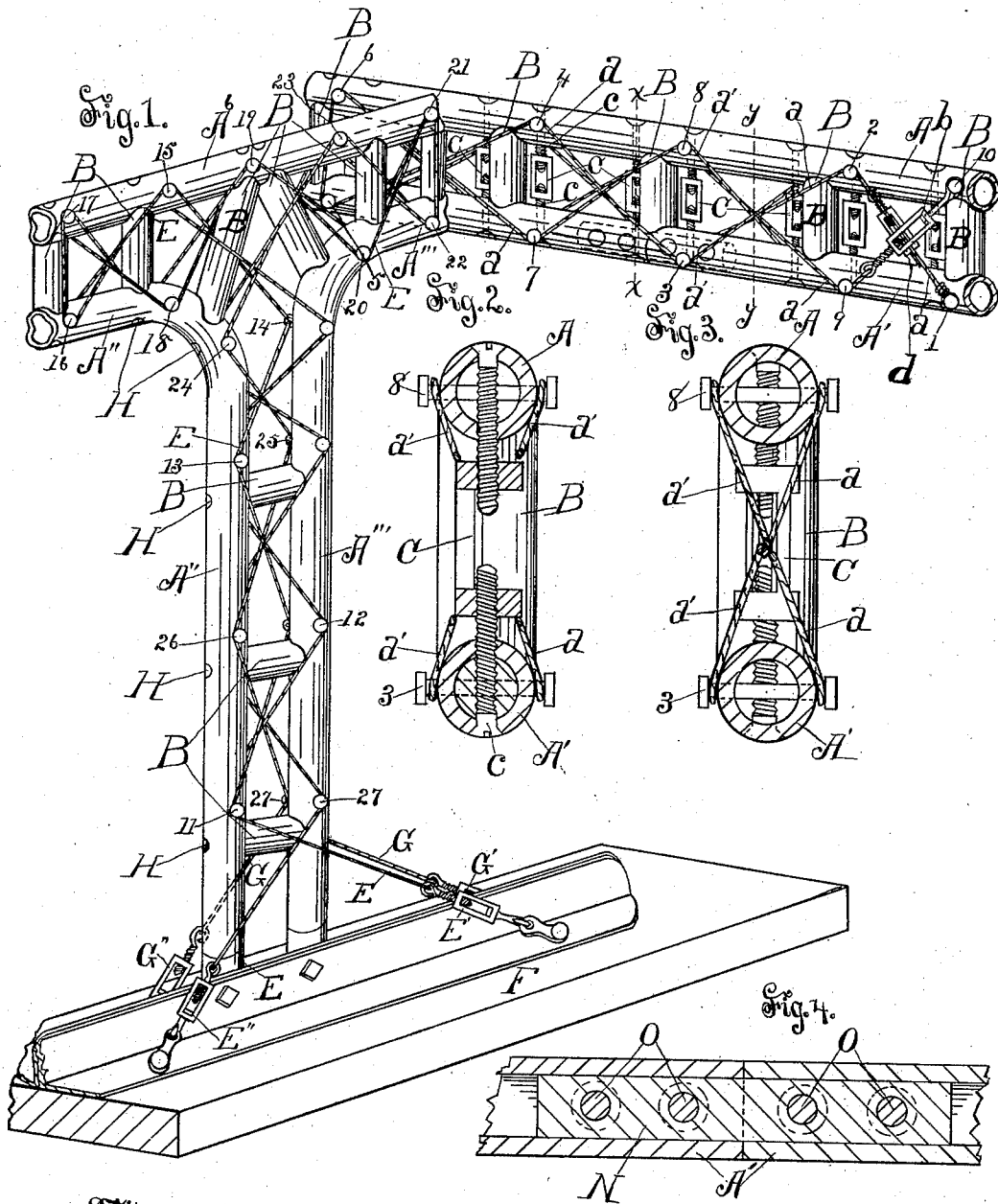
(No Model.)

2 Sheets—Sheet I.

G. A. STEPHENSON.
ELEVATED RAILWAY STRUCTURE.

No. 468,841.

Patented Feb. 16, 1892.



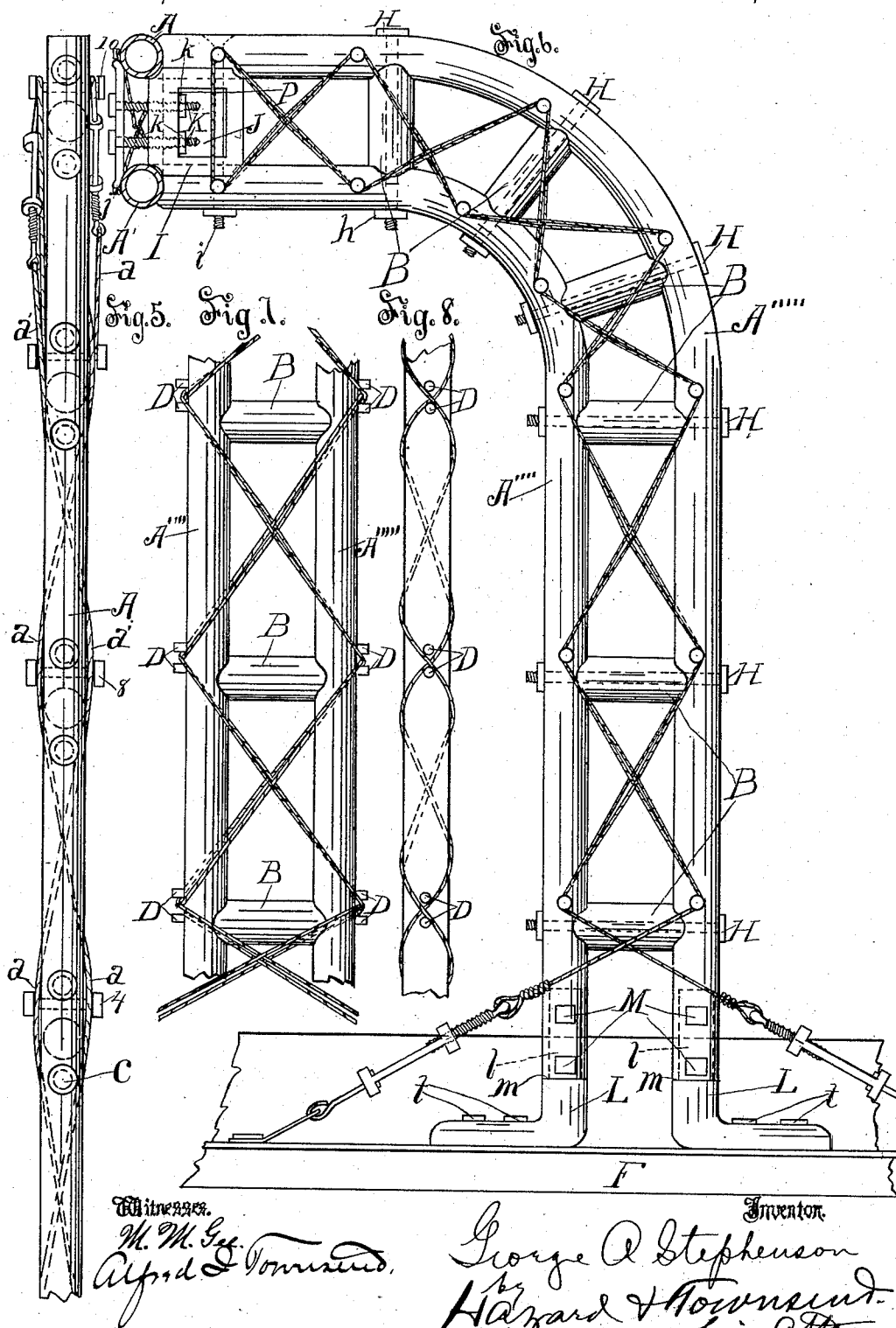
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UNITED STATES PATENT OFFICE.

GEORGE A. STEPHENSON, OF LOS ANGELES, CALIFORNIA, ASSIGNOR OF
ONE-HALF TO JOHN F. BUTLER, OF SAME PLACE.

ELEVATED-RAILWAY STRUCTURE.

SPECIFICATION forming part of Letters Patent No. 468,841, dated February 16, 1892.

Application filed July 23, 1891. Serial No. 400,393. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. STEPHENSON, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Cable-Truss and Double-Traction Rail and Support for Elevated Railways, of which the following is a specification.

My invention primarily consists of an improved track for elevated railways; but it also comprises certain features which are applicable to general use in structures which require combined strength and lightness.

The primary object of my invention is to provide a rail suitable for use in an improved railway system invented by me employing pendent cars, which system is more fully described in my application, Serial No. 400,394, for Letters Patent filed in the United States Patent Office at the date of filing this application, and in which the traction-wheels are arranged in a vertical plane. In order to provide a rail suitable for this purpose, it becomes desirable to construct a light, rigid, and strong truss, and such truss is herein described and claimed as a part of my invention.

The object of this part of my invention is to produce a truss which shall possess the greatest possible rigidity and strength with the least possible weight of material.

A further object of such invention is to produce a truss in which lateral vibration is absolutely prevented, and one which may be quickly and conveniently tightened if the truss should from any cause become slack.

My improved track for elevated railways is provided with two bearing or traction surfaces arranged in a vertical plane; and it consists, essentially, of a cable-truss double-traction rail comprising two parallel tubes secured to each other in a vertical plane by intermediate means, as shown in the accompanying drawings, which illustrate my invention as applied in several forms.

Figure 1 is a perspective view of my invention as applied to an elevated-railroad double track and support, the nearest track-truss being removed to disclose the other parts. Fig. 2 is a cross-section of the track on line $x x$, Fig. 1, looking toward the right. Fig. 3 is a

cross-section of the track on line $y y$, Fig. 1, looking toward the left. Fig. 4 illustrates the improved joint which is to be used in connecting the members of a long girder or elevated track. Fig. 5 is a plan view of the track shown in Fig. 1. Fig. 6 is an elevation of a single-track support or pillar embodying my invention. Fig. 7 is a fragmentary side view of a pillar or support embodying my invention and showing the cables passing around on the outside of the side members $A A'$, which in this view are lettered A''' and A'''' , thus dispensing with the side-retaining pins, which are shown in Fig. 1, and are respectively numbered from 1 to 27. Fig. 8 is an edge view of Fig. 7.

In practice I propose to make the parallel side members and the interposed brace-blocks of steel tubing.

My invention, broadly stated, consists of the combination of two edge or side members a series of brace-blocks interposed between such edge members, and one or more tension-cables attached alternately at a series of points along such side members to the opposite sides thereof and arranged to cross diagonally from side to side between such members, and suitable means for drawing such cable or cables taut, thereby compressing the parts and securing a tension-brace of superior strength. It also comprises other features hereinafter fully set forth.

In the drawings, A, A', A'', A''', A'''' , and A^6 indicate the side or edge members of the truss. These are preferably tubular, as shown, in order to combine strength and lightness.

$B B$ represent the brace-blocks interposed between the side members.

a and a' indicate the two tension-cables forming part of the track-truss. These cables are arranged in the same way as cables $E G$, used for the supports or pillars.

For convenience, I will first describe the construction of the track-truss shown in Figs. 1 and 5. In Fig. 1 this section of the track is shown complete in itself; but it is to be understood that in practice the cable will be extended to a greater distance than that indicated in Fig. 1. The track-truss consists of

the combination of the two-edge members, the interposed brace-blocks, the series of attachment-pins projecting from the sides of the edge members, the tension-cables passed about such pins alternately and crossed diagonally between the edge members and brace-blocks, and suitable means—such as the turn-buckles *b* and *d* shown—for drawing the cables taut. As shown in Fig. 1, the end of cable *a* is secured on the inner side of the track or truss to the pin 1, which is one of the series of cable-securing pins which pass through and project from the sides of the tubular edge or side members *A* and *A'*, and are numbered in the drawings from 1 to 27. The cable extends thence diagonally to the axis of the member *A'* upward over the pin 2, which extends through the member *A*, thence it passes diagonally downward to the opposite or outer side of the member *A'* and under the outer projection of pin 3, thence diagonally upward and across to the inner side of member *A* to and over pin 4, thence diagonally downward across to the outer side of the truss or girder to and under the pin 5, thence upward on the same side of the girder to and over the outer end of pin 6, thence diagonally downward across to the inner side of member *A'* to and under pin 7, thence diagonally upward to the outer side of the member *A* and over pin 8, thence downward to the inner side of *A'* and under the pin 9, thence up toward the pin 10 and attached to a turn-buckle *b*, which is secured to the pin 10 on the inner side. The cable *a'* is attached to the pin 10 on the outer side of the member *A* and passes in the same manner as the cable *a* diagonally in and out from the pin 9 to 8, from 8 to 7, and so on to the turn-buckle *d*, which is attached to the pin 1. The cables are tightened by turning the turn-buckles. The cables, by reason of their alternately crossing diagonally from side to side and from member to member of the truss, strengthen the truss and brace the several parts against each other, and thus secure the truss from lateral and vertical motion. The track thus formed of the tubular members *A* *A'* presents a smooth rail upon both its top and bottom, thus permitting the use of a double-traction-motor arranged to grip the track between its driving-wheels. The brace-blocks *B* are preferably formed of tubular sections of the same diameter as the members *A* *A'*, with each end fitted to seat the said members, as shown in the drawings. The two members *A* *A'* of the track are illustrated in Figs. 1, 2, 3, and 5 as being also held together by turn-buckles *C*, arranged between the interposed blocks to bind the edge members firmly thereupon. The heads of the bolts *c* of the turn-buckles conform to the outer contour of the members *A* *A'*, so as to provide a smooth track.

In Figs. 7 and 8 I have shown the cables passing around the outside of the members *A'''* *A''''* and crossing in the mid-width of

the girder between each pair of brace-blocks the same as in Fig. 1. The cables are held in position by the pins *D*, secured upon the outer side of each member and between these the cables cross, as is shown in Fig. 8.

The manner of trussing the double-track pillar or support shown in Fig. 1 is as follows: The cable *E* is attached to the turn-buckle *E'* (which is secured to the base *F*) and passes to the pin 11 on the inner side of the member *A''*, thence to the pin 12 on the outer side of member *A'''*, thence to pin 13 on the inner side of member *A''*, thence to pin 14 on the outer side of member *A'''*, thence to pin 15 on the inner side of the member *A⁶*, thence to pin 16 on the outer side of *A''*, thence to pin 17 on the outer side of *A⁶*, thence to pin 18 on the inner side of *A''*, thence to pin 19 on the outer side of *A⁶*, thence to pin 20 on the inner side of *A'''*, thence to pin 21 on the outer side of *A⁶*, thence to pin 22 on the outer side of *A'''*, thence to pin 23 on the inner side of *A⁶*, thence to pin 24 on the outer side of *A''*, thence to pin 25 on the inner side of *A'''*, thence to pin 26 on the outer side of *A''*, thence to pin 27 on the inner side of *A'''*, and thence to the turn-buckle *E''*, which is secured to the base *F*. The cable *G* is secured at one end to the turn-buckle *G'*, which is attached to the base *F*, and such cable passes to and over the pin 11 on the outer side of the member *A''*, and then passes from outside to inside to the various pins in the same manner as the cable *E*, so that when the cable *E* passes over the end of a pin on the inner side of any of the members the cable *G* passes over the end of the same pin on the outer side of the same member, and vice versa, and the other end of the cable *G* is attached to the turn-buckle *G''*, which is secured to the base *F*. In constructing the supports I bind the members to each other by the bolts *H*, which pass through the two edge members and through the tubular brace-blocks *B*, and are secured by riveting or other suitable means, such as the nuts *h*. The strain of the cables holds the two members firmly against the ends of the brace-blocks when the cables are crossed in the center of the girder between each set of brace-blocks, and the entire structure is braced against lateral strain and an increase of its load increases its rigidity until the breaking point is reached.

In Fig. 6 the trussing is the same as that employed on the track in Fig. 1, and does not require further description. This is designed to show a post for supporting a single track for an elevated road.

In Figs. 7 and 8 the cables pass around the outer face of the edge member *A'''* *A''''* and then cross between the two members from side to side in the same manner as that shown in Figs. 1, 5, and 6. I prefer to use this form of trussing on the track pillars or supports for the reason that by this construction the strain is applied directly to the edge members and

does not come upon the pins which hold the cables in place, as shown in Fig. 1; but this form cannot be employed in the track.

In all the illustrations I have shown my invention as employed in the construction of elevated railroads; but I do not limit my invention to that particular purpose, as it may be employed to advantage in bridge-building or any place where trussing is desired.

The mode of fastening the track to the support is illustrated in Fig. 6.

A bearing-block I is fitted to and between the ends of the members A''' A'''' of the support or pillar truss and secured by a bolt *i*, which passes through both members and also through the block I, thus securing the block I to the members. The center of the block is cut out to form the opening J, and the outer corners of the block and the ends of the members A''' A'''' are formed to receive the members A' of the track, and the clamp-plate *j* fits against the outer side of the track members A A', and the bolts K K, which screw through the outer bar P of the bearing-block I, are tightened to bind the clamp-plate and bearing-block firmly together against the track members. Such bolts are secured by check-nuts *k k*.

To secure the foot of the pillar or support to the base F, which is designed to be made of concrete, I employ solid independent L-shaped auxiliary supporting-feet L, which are respectively provided with a tenon *l*, arranged to fit into the bottoms of the tubular-edge members of the pillar. The tenons are secured therein by means of bolts M, which respectively pass through the member and the tenons of the feet. The foot below the tenon is made of the same size as the tubular member to which it is attached, and the bottom of each member rests upon the supporting-shoulder *m* of its respective foot. By varying the length of the auxiliary foot from the shoulder *m* to the base of such foot the supports may all be manufactured of one length and the bases upon which they are to rest may be built along the line of the road with very little regard to the grade, as the grade may be adjusted by using a foot of suitable length to give the proper height to the support, thus greatly reducing the expense of building the road. The feet L are secured to the base F by bolts *t*.

In Fig. 4 is shown my improved splice for the tubular track, which consists of a transversely-perforated cylindrical metal plug N of the same diameter as the bore of the tubular member A. The end of two sections of the tube A' are brought together and the metal plug or mandrel N is inserted thereinto, so as to extend a distance along the interior of each tube. It is secured to the two sections by the bolts O passing through the sections of the tubular member and the plug, thus producing a simple and strong joint with no projection to obstruct the track.

I consider the manner of trussing I have shown to be preferable; but I do not limit my invention to the form I have illustrated.

I do not limit my claim to the use of the turn-buckles shown for fastening and tightening the cables. The principle of my invention will not be changed by employing other means for drawing the cables taut.

Now, having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an elevated railway, a rail comprising two parallel tubes secured to each other in a vertical plane by intermediate means.

2. A truss comprising the combination of two edge members, a series of brace-blocks interposed between such edge members, and one or more tension-cables attached to the edge members alternately at a series of points along such edge members at the opposite sides thereof and arranged to cross diagonally from side to side between such members, substantially as set forth.

3. The combination of the two edge members, a series of brace-blocks interposed between such edge members, one or more tension-cables attached alternately at a series of points along such edge members at the opposite sides thereof and arranged to cross diagonally from side to side between such members, and means for drawing the cables taut.

4. The combination of the edge members, the interposed brace-blocks, the series of attachment-pins projecting from the sides of the edge members, the tension-cables passed about such pins alternately and crossed diagonally between the edge members and brace-blocks, and suitable means for drawing the cables taut.

5. The truss comprising the combination of the edge members, the interposed brace-blocks, one or more tension-cables attached alternately at a series of points along such edge members at the opposite sides thereof and arranged to cross diagonally from side to side between such members, means for drawing the cables taut, and the turn-buckles C, arranged to bind the edge members firmly upon the interposed blocks.

6. The combination of the edge members of the track-truss, the edge members of the pillar-truss, having their ends fitted to the edge members of the track-truss, the bearing-block I, fitted to and between the ends of the edge members of the pillar-truss, the bolt *i*, securing the block to the members, the clamp-plate *j*, fitted against the outer side of the track members, and the bolts and nuts K *k*, arranged to bind the clamp-plate and bearing-block firmly upon the track members.

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