Nov. 23, 1926. 1,607,875

A. DAVINO

SEMIRIGID SUSPENDED RAILWAY STRUCTURE

Filed Dec. 17. 1923 3 Sheets-Sheet 1

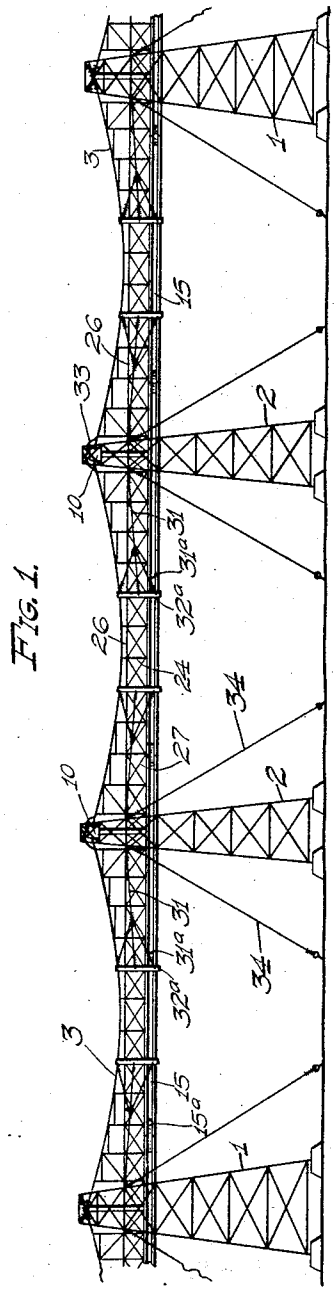


FIG. 1.

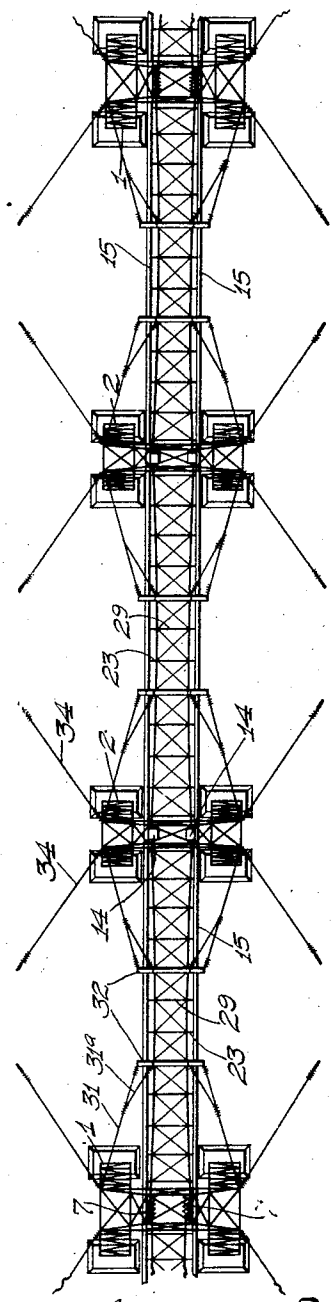


FIG. 2.

Inventor

ALPHONSO DAVINO.

By A. B. Bowman

Attorney

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A. DAVINO

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Filed Dec. 17, 1923 3 Sheets-Sheet 2

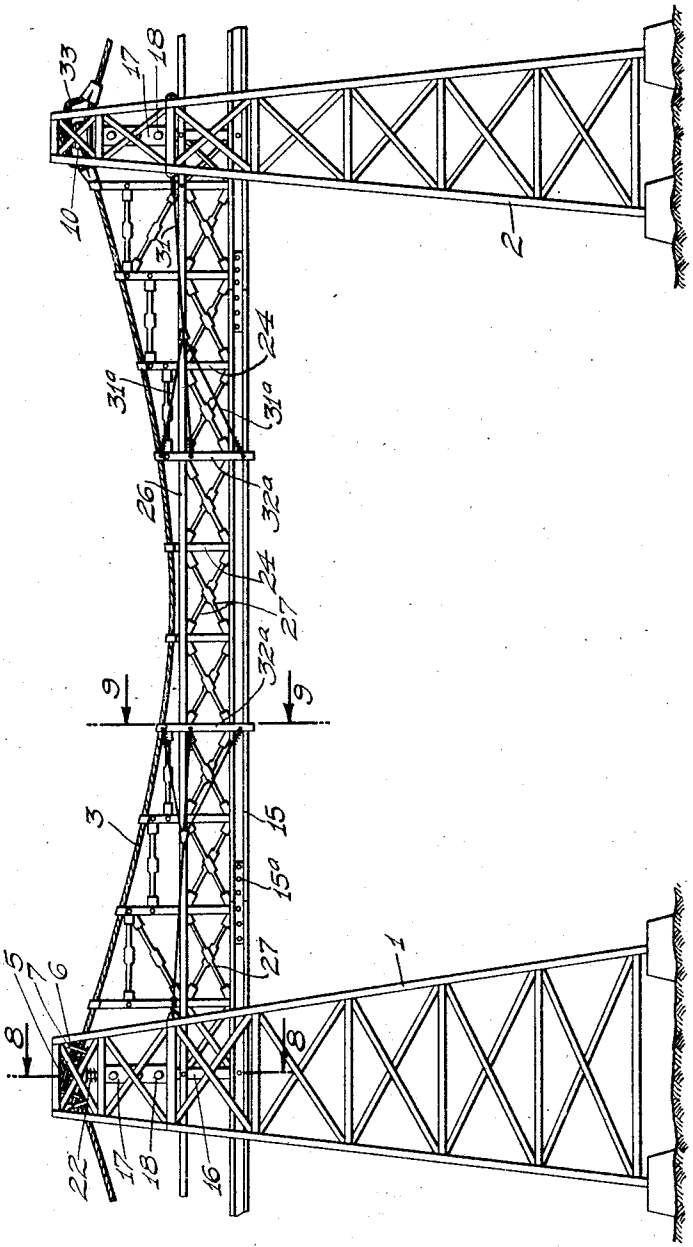


FIG. 3.

Inventor

ALPHONSO DAVINO.

By A. B. Bowman

Attorney

Nov. 23, 1926. 1,607,875

A. DAVINO

SEMIRIGID SUSPENDED RAILWAY STRUCTURE

Filed Dec. 17, 1923 3 Sheets-Sheet 3

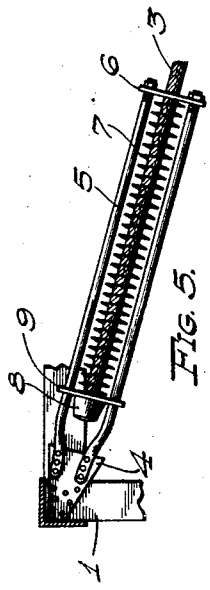


FIG. 5.

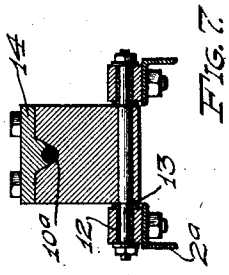


FIG. 7.

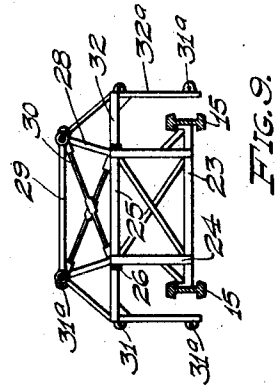


FIG. 9.

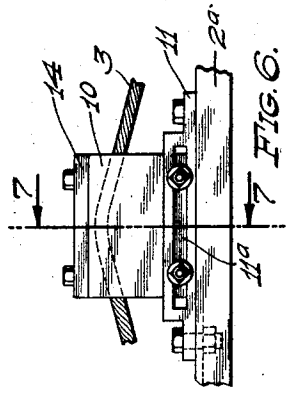


FIG. 6.

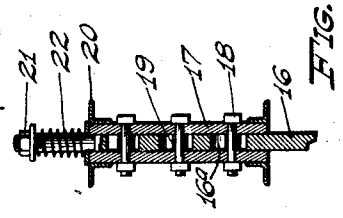


FIG. 8.

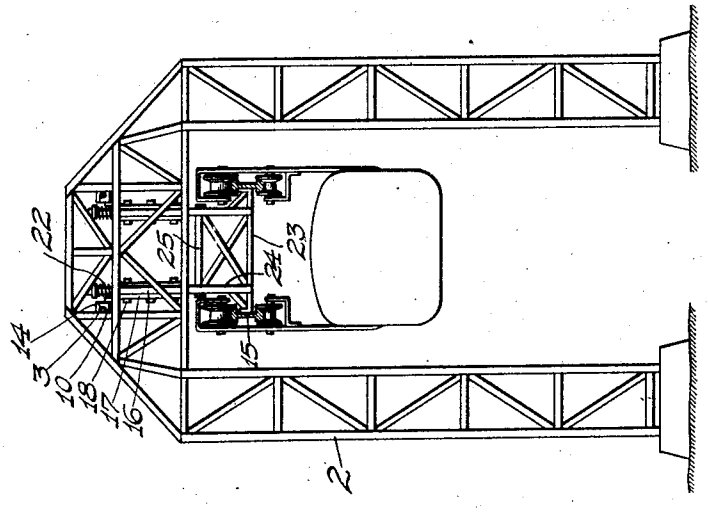


FIG. 4.

Inventor

ALPHONSO DAVINO.

By A. B. Bowman

Attorney

Patented Nov. 23, 1926. 1,607,875

UNITED STATES PATENT OFFICE.

ALPHONSO DAVINO, OF LOS ANGELES, CALIFORNIA.

SEMIRIGID SUSPENDED RAILWAY STRUCTURE.

Application filed December 17, 1923. Serial No. 681,136.

My invention relates to a semi-rigid, suspended railway structure, and the objects of my invention are: first, to provide such a structure for supporting aerial vehicles in which the rails thereof will yield vertically when subjected to vertical strains imposed upon the same by the weight and movement of the vehicle; second, to provide a structure of this class in which the rails are supported by flexible cables yieldably supported on towers at their ends and intermediate their ends; third, to provide a structure of this class in which the flexible cables supporting the rails are made in relatively short lengths to minimize the cost of coupling the cables together and also to insure greater safety; fourth, to provide such a structure in which the ends of the short cable sections are secured by yieldable spring means supported on certain towers in the structure; fifth, to provide such a structure in which the rails are directly supported from the towers and resiliently suspended therefrom; sixth, to provide a structure of this class in which the structure directly supporting and reinforcing the rails is of a rigid type yieldably supported by and suspended from towers and cables; seventh, to provide novel means for bracing the structure, directly supporting the rails intermediate the towers, against the lateral sway; eighth, to provide as a whole a novelly constructed structure for supporting aerial vehicles, and ninth, to provide such a structure which is very simple and economical of construction, durable, and which will not readily deteriorate or get out of order.

With these and other objects in view, as will appear hereinafter, my invention consists of certain novel features of construction, combination and arrangement of parts and portions, as will be described hereinafter in detail and particularly set forth in the appended claims, reference being had to the accompanying drawings and to the characters of reference thereon, which form a part of this application, in which:

Figure 1 is a side elevational view of a portion of my semi-rigid, suspended railway structure, showing two main towers and intermediate towers; Fig. 2 is a plan view thereof; Fig. 3 is an enlarged, side elevational view of my suspended railway structure showing more in detail the relation and construction of a main tower and an intermediate tower; Fig. 4 is an end elevational view thereof showing an aerial vehicle suspended from the rails thereof; Fig. 5 is a side view of the resilient means for supporting the ends of the cables from the main towers; Fig. 6 is a side elevational view of the movable supporting means for supporting the cables intermediate their ends; Fig. 7 is a sectional elevational view thereof taken through 7—7 of Fig. 6; Fig. 8 is a fragmentary, sectional elevational view of the resilient means for directly supporting the rails on the towers, and Fig. 9 is a transverse, sectional elevational view of the rail supporting structure with the section taken through 9—9 of Fig. 3.

Like characters of reference refer to similar parts and portions throughout the several views of the drawings.

The main towers 1, intermediate towers 2, cables 3, supporting members 4, guide rods 5, plates 6, compression springs 7, cable retaining members 8, plates 9, cable supporting blocks 10, block supports 11, rollers 12, spindles 13, cable securing members 14, rails 15, vertical rail supporting members 16, guide members 17, bolts 18, spacing members 19, supports 20, nuts 21, compression springs 22, cross members 23, vertical members 24, horizontal members 25, longitudinal members 26, angular braces 27, rods 28 and 29, angular braces 30, sway cables 31, arms 32, safety cables 33, and the guy wires 34, constitute the principal parts and portions of my suspended railway structure.

The main towers 1 supporting the cables 3 at their ends and the intermediate towers 2 supporting the same intermediate their ends, as shown in Fig. 1 of the drawings, are preferably of arched construction built up of structural columns on either side and a structural truss extending across and supported at the upper ends thereof. The supporting cables 3 consist preferably of sections of relatively short length which extend between three or four towers and are resiliently supported at their ends on the main towers 1. The resilient means for supporting the cables at their ends consists of a supporting member or plate 4, secured to the towers, guide rods 5, extending from said plates and secured together at their extended ends by means of a plate 6, and a compression spring 7 positioned between said guide rods with one end against the plate 6. The end of the cable extending through said compression spring 7 is provided with an enlarged retaining member 8 secured to the end of said

cable, which member 8 is positioned against a plate 9 reciprocally mounted on said guide rods and positioned in engagement with the opposite end of said compression spring. It will be noted that when the cable 3 is subjected to a tensional strain the spring 7 is compressed by the plate 9 engaging the end of the same. The means supporting the cables 3 intermediate their ends consist of supporting blocks 10 shiftably supported on supports 11 secured near the upper ends of the towers 2. Each of the blocks 10 is provided with a plurality of rollers 12 revolubly mounted on spindles 13 extending to the sides of the blocks 10. Said rollers 12 extend into longitudinal slots 11[a] in the supports 11 in which the same are permitted to roll, thus guiding said blocks 10 in their shifting or reciprocating movement. The supports 11 are preferably supported on cross members 2[a] extending across and secured to the upper ends of the towers 2. The blocks 10 are provided with circular grooves 10[a] which conform with the curvature of the cables and with the shape thereof when the same are under tension. Said cables are secured within said blocks by means of securing plates 14 secured to the upper ends of said blocks.

The rails 15 of my structure consist of rail sections of I-shape, considerably enlarged at their upper and lower bearing portions, which are secured together at their ends by means of fish-plates 15[a]. Said rails 15 are directly supported from the towers by means of vertical supporting members 16, which are reciprocally mounted near their upper ends in guide members 17 secured together by means of bolts 18 and spaced apart by means of the spacing members 19, said guide members 17 being supported on the supporting members 20 secured to the towers. The rail supporting members 16 are preferably longitudinally slotted, as indicated by 16[a] in Fig. 8 of the drawings, through which extend the bolts and spacing members 19. The upper ends of the members 16 are preferably reduced and threaded and provided with nuts 21 between which and the upper ends of the guide members 17 and the supports 20 are positioned compression springs 22, thus resiliently supporting the rails from the towers.

The rails 15 are supported relatively to each other and from the cables 3 by means of a rigid structure consisting of cross members 23, securing and positioning the rails relatively to each other, vertical members 24, secured at their lower ends to the members 23, other horizontal members 25, connecting the upper ends of the members 24, and longitudinal members 26 also connecting the upper ends of the vertical members 24 longitudinally with each other, all of said members 23, 24, 25 and 26 being reinforced with each other by means of angular cross braces 27 of turnbuckle construction. Said rigid structure, as described, is suspended from the cables 3 by means of rods 28 extending downwardly from the cables to said rigid structure, said cables being positioned relatively to each other at the upper ends of said rods by means of tension cross rods 29. Said rods 28 and 29 are reinforced relatively to each other and with said rigid structure by means of angular cross braces 30.

The structures extending between the various towers are braced against lateral sway, due to wind and the like, by means of cables 31 secured at their one ends to the towers and at their opposite ends to arms 32 extending outwardly from the rigid rail supporting structure intermediate the towers. Other auxiliary cables 31[a] are connected at their one ends to the cables 31 intermediate the ends of the latter, and at their opposite ends, respectively, to the supporting cables 3 and to the arms 31[a] extending downwardly from the arms 32.

It will be here noted that there are provided safety cables 33 at each of the intermediate towers 2 which are secured at their one ends to said towers and at their opposite ends to the cables 3 at points slightly spaced from the shiftable supporting means, so that in case the supporting cables are ruptured at their supporting portions the same will not drop a great distance but will be supported by the cables 33.

The towers 1 and 2 are preferably braced from the ground by means of guy wires 34, as shown best in Figs. 1 and 2 of the drawings.

It is obvious from this construction, as illustrated in the drawings and disclosed in the foregoing specification, that there is provided a structure of a semi-rigid type for supporting aerial vehicles as aimed at and set forth in the objects of the invention, and though I have shown and described a particular construction, combination and arrangement of parts and portions, I no not wish to be limited to this particular construction, combination and arrangement, but desire to include in the scope of my invention the construction, combination and arrangement substantially as set forth in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. A structure of the class described, including spaced towers, flexible cables yieldably supported thereby, and substantially rigid rails suspended from said cables and separately and resiliently supported by said towers.

2. A structure of the class described, including towers spaced from each other, flexible cable sections resiliently supported

at their ends by said towers, and rails suspended from said cable sections, said rails being also resiliently supported at said towers.

3. A structure of the class described, including main and intermediate towers, flexible cable sections resiliently supported at their ends by said main towers and yieldably supported intermediate their ends on said intermediate towers, and substantially rigid rails suspended from said cable sections.

4. A structure of the class described, including main and intermediate towers, flexible cable sections resiliently supported at their ends by said main towers and yieldably supported intermediate their ends on said intermediate towers, rails suspended from said cable sections, and resilient supporting means on each of said towers resiliently supporting said rails at said towers.

5. A structure of the class described, including spaced towers, flexible cables yieldably supported thereby, rails suspended from said cables, arms extending outwardly from said cables and said rails, and anti-sway cables secured to said towers and to said arms.

6. A structure of the class described, including towers spaced from each other, flexible cable sections resiliently supported at their ends by said towers, rails suspended from said cable sections, arms extending outwardly from said cable sections and said rails, and anti-sway cables secured to said towers and said arms.

7. A structure of the class described, including main and intermediate towers, flexible cable sections resiliently supported at their ends by said main towers and yieldably supported intermediate their ends on said intermediate towers, rails suspended from said cable sections, arms extending outwardly from said cables and said rails and reinforced relatively thereto, and cables secured to said towers and said arms.

8. A structure of the class described, including main towers and intermediate towers, the latter positioned between and spaced from said main towers, cable sections extending betwen said towers, spring means connecting the ends of said cable sections to said main towers, longitudinally shiftable means on said intermediate towers yieldably supporting said cable sections intermediate the ends of the same, and rigidly connected I shaped rails suspended from said cable sections.

9. A structure of the class described, including main towers and intermediate towers, the latter positioned between and spaced from said main towers, cable sections extending between said towers, spring means connecting the ends of said cable sections to said main towers, longitudinally shiftable means on said intermediate towers yieldably supporting said cable sections intermediate the ends of the same, a substantially rigid rail supporting structure suspended from said cable sections, and rigidly connected I shaped rails supported at the sides of said rigid rail supporting structure.

10. A structure of the class described, including main towers and intermediate towers, the latter positioned between and spaced from said main towers, cable sections extending between said towers, resilient means securing the ends of said cable sections to said main towers, longitudinally shiftable means on said intermediate towers yieldably supporting said cable sections intermediate the ends of the same, rails suspended from said cable sections, and spring means supported by each of said towers for resiliently supporting said rails at said towers.

11. A structure of the class described, including towers spaced from each other, flexible cable sections resiliently supported at their ends by certain of said towers, rails suspended from said cable sections, and auxiliary means secured to each of the other towers and said cable sections intermediate their ends for supporting the same in event of rupture of said other towers.

12. A structure of the class described, including main and intermediate towers, flexible cable sections resiliently supported at their ends by said main towers and yieldably supported intermediate their ends on said intermediate towers, rails suspended from said cable sections, and auxiliary means secured to each of said intermediate towers and said cable sections intermediate their ends for supporting the same in event of rupture at the yieldable supporting means of said intermediate towers.

13. A structure of the class described, including main towers and intermediate towers, the latter positioned between and spaced from said main towers, cable sections extending between said towers, resilient means securing the ends of said cable sections to said main towers, longitudinally shiftable means on said intermediate towers yieldably supporting said cable sections intermediate the ends of the same, rails suspended from said cable sections, and auxiliary means secured to each of said intermediate towers and said cable sections intermediate their ends for supporting the same in event of rupture at said longitudinally shiftable supporting means.

In testimony whereof, I have hereunto set my hand at San Francisco, California, this 27th day of November, 1923.

ALPHONSO DAVINO.