(No Model.) 3 Sheets—Sheet 1.

R. C. FORSYTH.

ELEVATED SUSPENSION RAILROAD.

No. 386,120. Patented July 17, 1888.

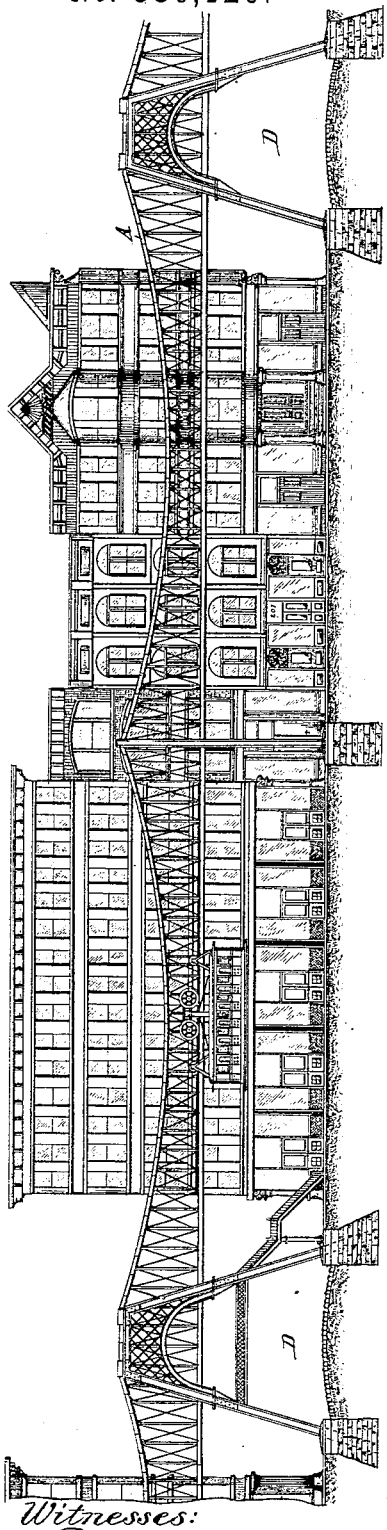


Fig. 1.

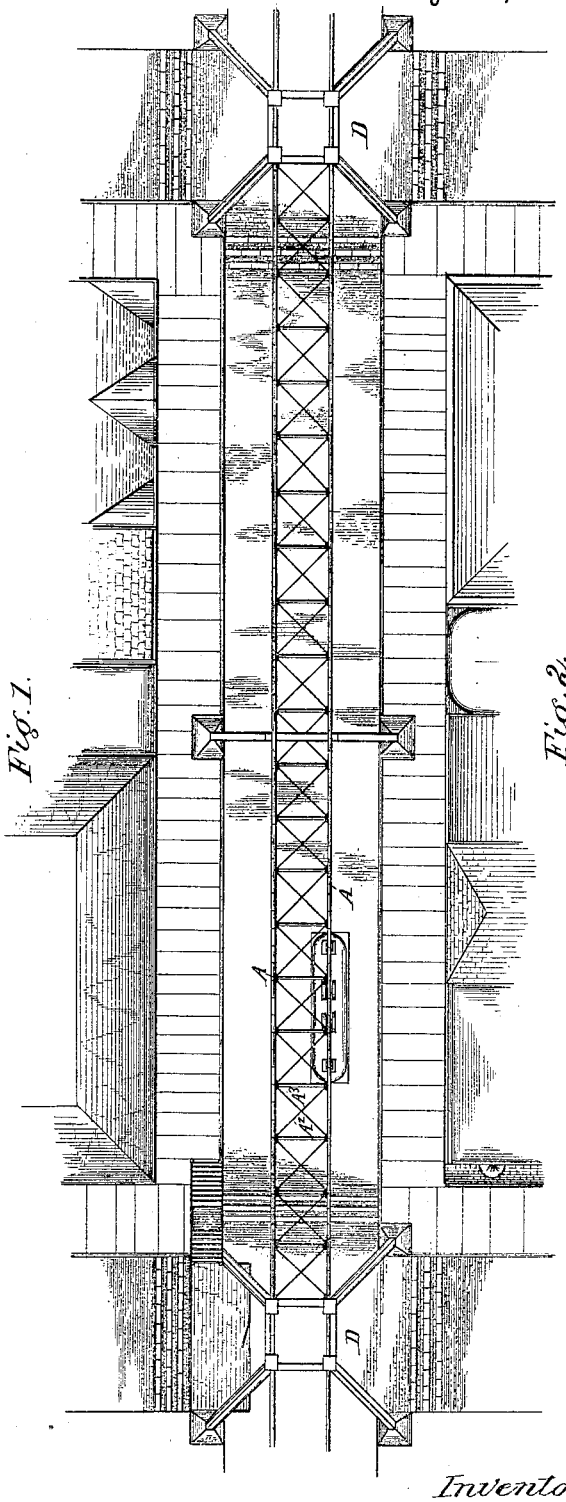


Fig. 2.

Witnesses:
C. M. Davenport.
Chas. F. Barnett.

Inventor:
R. Clarke Forsyth.
By S. B. Dover.
Atty.

(No Model.) 3 Sheets—Sheet 2.

R. C. FORSYTH.

ELEVATED SUSPENSION RAILROAD.

No. 386,120. Patented July 17, 1888.

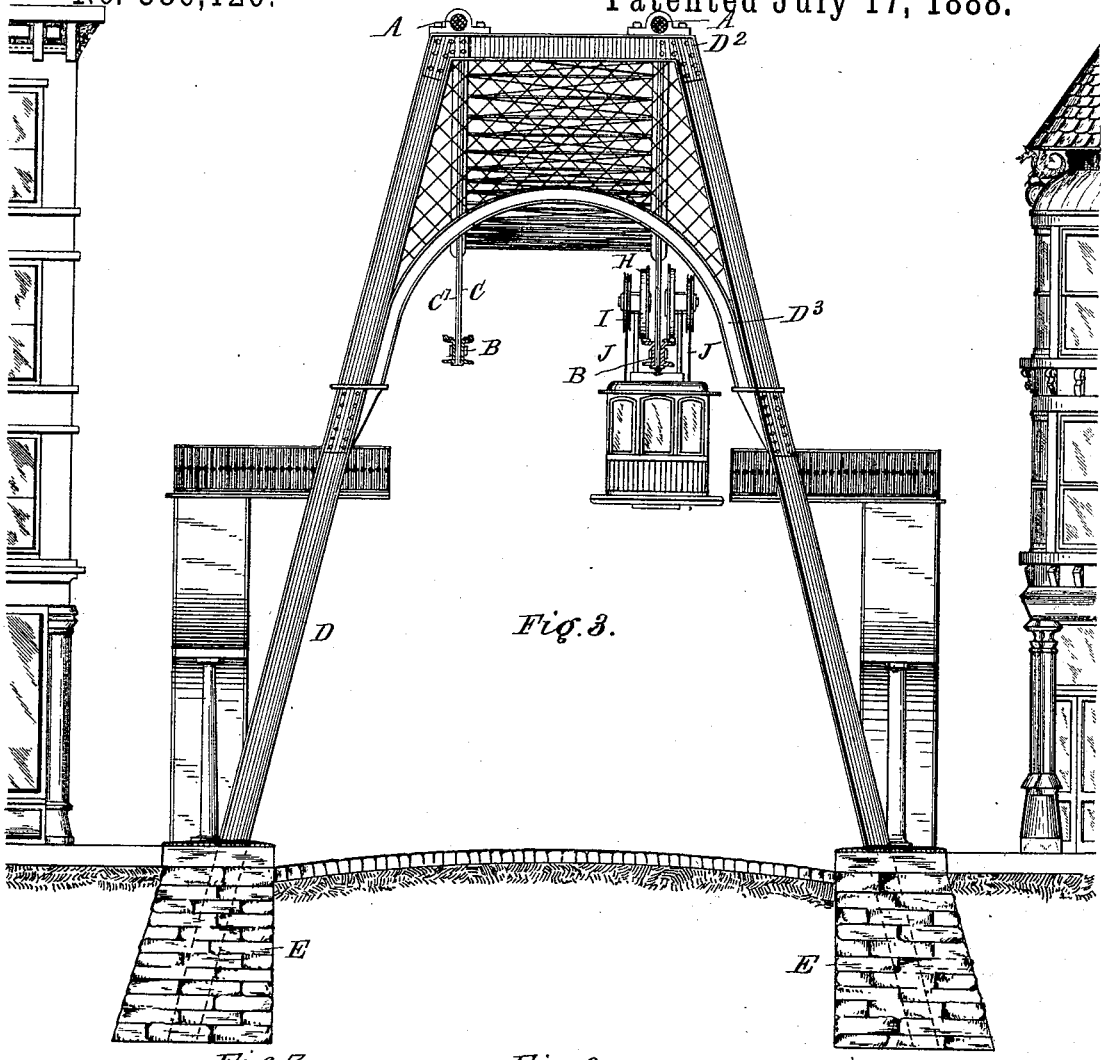


Fig. 3.

Fig. 7.

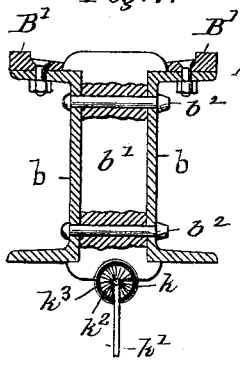


Fig. 8.

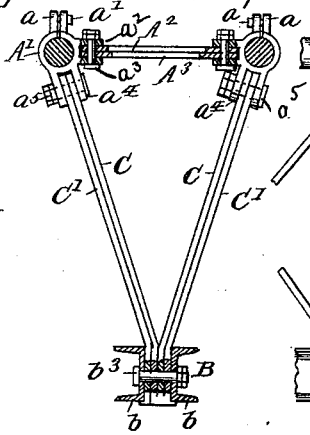
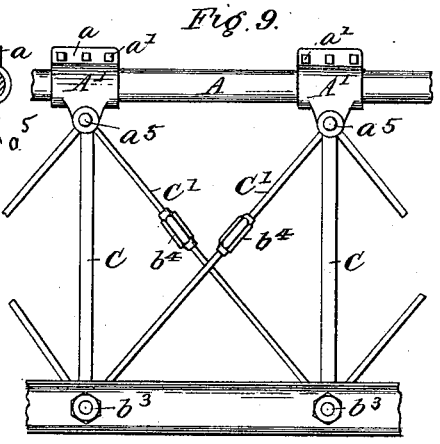


Fig. 9.



Witnesses:
C. W. Davenport,
Chas. L. Bartlett.

Inventor:
R. Clarke Forsyth.
By S. B. Dover.
Atty.

(No Model.) 3 Sheets—Sheet 3.

R. C. FORSYTH.

ELEVATED SUSPENSION RAILROAD.

No. 386,120. Patented July 17, 1888

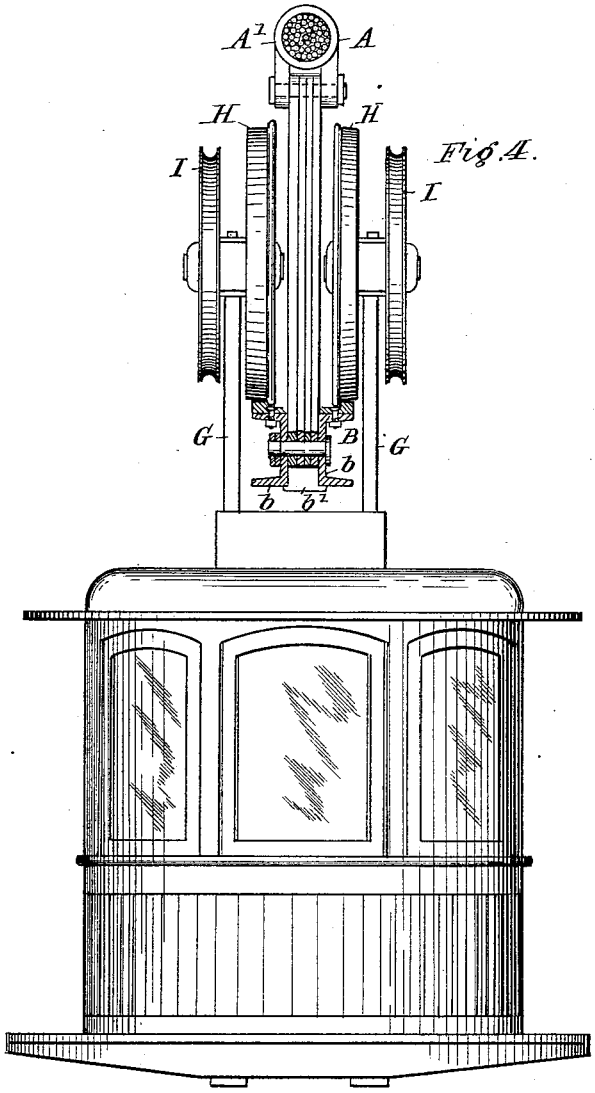
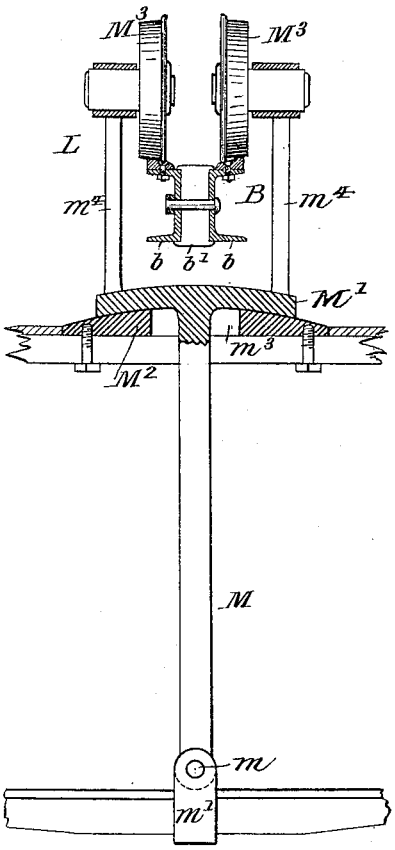


Fig. 4.

Fig. 6.



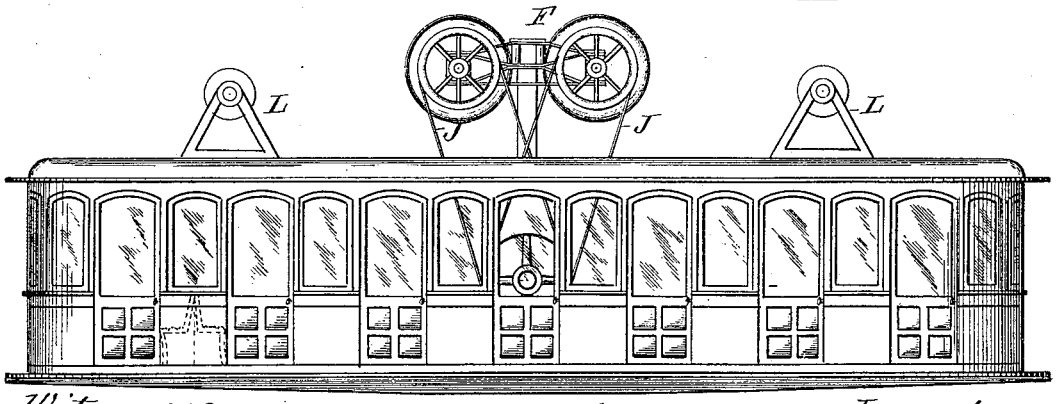


Fig. 5.

Witnesses:
C. W. Davenport.
Chas. L. Bartlett.

Inventor.
R. Clarke Forsyth
By S. B. Dover.
Atty.

UNITED STATES PATENT OFFICE.

R. CLARKE FORSYTH, OF CHICAGO, ILLINOIS.

ELEVATED SUSPENSION-RAILROAD.

SPECIFICATION forming part of Letters Patent No. 386,120, dated July 17, 1888.

Application filed March 19, 1888. Serial No. 267,693. (No model.)

To all whom it may concern:

Be it known that I, R. CLARKE FORSYTH, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Elevated Suspension-Railroads, of which the following is a full and exact description.

My invention is principally designed for use with light cars in high-speed transit for street-service, and for the transmission between cities of express-packages, mail-matter, and similar freight.

It consists, essentially, of two cables approximately parallel, braced and tied together, extending from the top of and between open arched piers. From these cables is suspended by suitable ties and struts a road-girder, upon which is secured the track-rail from which the car depends.

In the accompanying drawings, illustrative of the preferred form of my invention as applied to street traffic, Figure 1 is an elevation of an entire block of the railway, showing at the intersections of the two streets the arched piers supporting the cables. Fig. 2 is a plan view of the same. Fig. 3 is an enlarged transverse sectional view of the roadway, showing a pier in elevation. Fig. 4 is an enlarged sectional view of the cable and roadway, with a car shown in end elevation suspended from the track. Fig. 5 is a side elevation of the car and its running-gear. Fig. 6 is a broken sectional view of the car, with the end supporting-trucks shown in detail. Fig. 7 is a detail sectional view of the road-girder and the means for securing its component parts rigidly together. Fig. 8 is a detail sectional view of two cables and a roadway suspended therefrom, being the necessary modification of my invention when but one-way track is desired. Fig. 9 is a broken detail elevation showing the preferred form of ties, struts, and connections for securing the road-girders to the cables.

A A are the cables, from which are suspended the road-girders B B. These girders, as shown in Fig. 7, are formed of two channel-beams, *b b*, arranged back to back and secured rigidly together by castings b' and rivets or bolts b^2, the castings being of such shape as to allow the beams to lie within recesses formed by the side projecting ends of the castings, and thus relieve the shearing strain on the rivets. These beams break joints with each other, and, riveted together, form a stiff girder capable of taking considerable lateral as well as downwardly-deflecting strain. Upon the upper flange of each of these channel-beams rails B′ of ordinary form are secured by inverse cone-headed bolts sunken into their surfaces, as shown, so as to form a continuous track.

Upon the cables at suitable intervals along their length, as preferably constructed, are mounted steel castings A′, formed with an opening at one side between flanges *a a*, through which flanges the bolts a' a' pass to tighten the castings upon the cables to prevent their slipping out of place. From the inner sides of these castings on either cable project lugs a^2 a^2, provided with bolts a^3 a^3. Struts A^2 and ties A^3 connect these bolts and bind the two cables firmly together as a unit. From the lower side of the castings project lugs a^4 a^4, provided with a bolt, a^5, to form hinging-connections with the struts C and ties C′, depending therefrom. These struts and ties receive at their lower end similar bolts, b^3, passing through the webs of the channel-beams, as shown most clearly in Fig. 4, and carry the road-girders from these connections. The ties are provided for adjustment with the usual turn-buckles, b^4, to produce and maintain a perfect alignment of the roadway below. A strong and rigid road-bed is thus produced.

When my invention is applied to street-railroads in cities, I prefer to erect at each street intersection a pier, D, formed, as shown most clearly in Figs. 1, 2, and 3, of structural iron. Heavy concrete and masonry foundation anchorages E are built at each of the four corners of the street intersection, and from each of these anchorages springs upwardly and obliquely toward the center of the street a straight-line column, D, of the necessary proportions and strength, as determined by the character of the structure which it is to carry. These columns approach each other at their tops, and are rigidly united one to the other by transverse beams D^2, securely attached thereto. In very heavy structures a secondary arch or tie-piece, D^3, may still further increase the strength of the arch thus formed, and this in

turn be braced by lattice-work to its adjacent beams. Over the apex of the pier thus formed is passed the cables A A. These may be secured to the transverse beams by fastenings of such description as to allow of the adjustment in length of the cable to take up the slack, and thus provide for additional means of maintaining the perfect alignment of the intermediate portions of the roadway lying between the piers.

It is obvious that by the construction of the pier as shown great strength is given it to resist strains in all directions without additional anchorage. The downward strain of the cables and the weight of the roadway are received as a direct downwardly-crushing strain in the direction of the axis of the columns and in the line of its greatest resistance. The pier, owing to its being formed of obliquely-erected members having a large base area and narrow apex, is braced against side strain in every direction. The streetway is entirely unobstructed, the foot of each column being within the curbstone line. Midway between these arched piers, in blocks of unusual length, an additional supporting-arch may be placed, to avoid the necessity of making the piers at the intersections of the streets of excessive strength, as would be necessary to carry the entire block, and thereby producing piers of unsightly and cumbersome appearance, my object being largely to produce a roadway of great stiffness and strength, while at the same time it may be light and graceful, and thus avoid obscuring the street overhead.

It is designed to have stations at suitable intervals along the road for local traffic. These stations may be very suitably provided for between the double arches at the street intersections, stations for uptravel being upon one side of the arch and stations for downtravel being upon the other, and each provided with stairs upon which to ascend from the sidewalk below.

I will now describe the car, which is a feature of my invention.

As shown most clearly in Fig. 5, the floor-beams extend from each side to receive a foot-board of convenient width. Opening out upon this foot-board between each double row of seats, which are placed transversely to the car, is a door upon each side of the car, serving for admission and exit to those occupying these seats. It is designed to seat four persons on each seat. It will thus be seen that every eight occupants of the car are provided with ample accommodations for entering and leaving the car with facility and without crowding, and thus rendering accident liable. The doors upon the opposite side of the car from the depot-platforms are locked during the entire trip, while those upon the platform side are intended to be controlled from a central point by the conductor of the car or other person in charge, thus preventing their being opened while the car is in motion.

A rigid steel casting, G, sustains the floor-beams of the car, and rising through the roof spans the roadway and attaches to truck-carrying frames suitably provided with springs and sustained on flanged wheels H, mounted upon the rails on the top flanges of the channel-beams, each on its respective side. Boxes are provided on these trucks, in which are journaled shafts, on one end of which is carried the flanged driving-wheel H and upon the other a double-flanged pulley, I, two of these pulleys being upon each side of the track. These pulleys may be actuated by belts J, driven by any suitable motor situate within the car.

I prefer to suspend an electric conductor from the roadway below the beams and take off therefrom current to supply electromotors.

The form of conduit preferred is here shown in Fig. 7 as having an outside metallic casing, k, slotted at the bottom to admit of a bar, k', projecting upwardly and into it. Within this casing k a copper tube, k^2, or other good conductor of electricity, is placed, insulated from the outside casing in any of the usual methods. A brush of wire, k^3, is arranged to be carried by the bar K and to receive the electric current from the conductor k^2. From this brush the current may be carried to an electric motor placed within the car, and thus propel it through the belts J and drivers H.

In cars of considerable length it is necessary to provide auxiliary trucks L upon the forward and rear ends of the car, and acting as leading and trailing trucks to the main truck. These may be provided with flangeless wheels to allow the car to round curves; but I prefer the construction illustrated in Fig. 6. As here shown, a frame, M, is pivoted at m to a strap, m', embracing a floor-beam of the car, this frame being provided with a base-plate, M′, which is bedded upon the casting M^2, secured to the roof-timbers of the cars. The castings M^2 has its upper surface an arc of a circle having its center at m^2, the frame M being free to move in the casting through the slot m^3.

The base-plate M′ carries standards m^4, in which are axled flanged wheels M^3, free to roll upon the track-rail B′. Side play is thus given the truck with its wheels, and it is free to move laterally to accommodate itself to the varying line of the track.

I have described my invention as applied to a double-track road having traffic in opposite directions. The double-cable system of suspension is equally applicable to a single roadway, as illustrated in Fig. 8. In this modification the strut C and ties C′ from both cables approach each other at their lower ends, and are received upon the same bolts between the two channel-bars b b, thus supporting and bracing it firmly in the two directions.

I have described a preferred motive power and a preferred form of car. It is obvious that the roadway as constructed is equally well fitted for any other means of locomotion and

may receive any form of car found suitable. I do not wish therefore to confine myself to those described; but

I claim—

1. In an elevated suspension-railway, two or more cables trussed together laterally, in combination with a road-girder suspended from the cables by suitable connections, and with track-rails mounted upon the said girders to afford a way for a car carried below, substantially as described.

2. In an elevated suspension-railway, a series of piers, in combination with two or more cables trussed together laterally and suspended from and lying intermediate to the piers, a road girder or girders supported from the cables by suitable connections, and track-rails mounted upon the said girder, one upon each side of the top thereof, all as and for the purpose specified.

3. In a road-girder, the combination of two channel-beams, *b b*, arranged back to back, strut-castings *b'*, in the recesses of which the channel-beams rest, rivets or bolts b^2, which secure them together, and track-rails mounted one upon the top flange of each of the channel-beams and continuous with them, as and for the purpose specified.

4. In an elevated suspension-railway, the combination of two or more cables with a road-girder suspended therefrom, and with the struts and ties connecting them, the lower ends of the said struts and ties being intermediate to the channel-beams forming the girder, and attached to them by bolts passing through the web of both the beams, thus permitting the tops and sides of the beams to be unobstructed to allow of the free passage of car-trucks, substantially as specified.

5. In an elevated railway, the combination of a road-girder formed of two channel-beams secured together back to back, rail B', struts C, ties C', and cables A A, trussed together laterally, substantially as specified.

6. In an elevated suspension-railway, the combination of cables A A, trussed together laterally, road-girder B, struts C, ties C', and castings A' A', secured at intervals upon the cables, substantially as specified.

7. In a double-track elevated railway, two cables, A A, approximately parallel, trussed together laterally, each cable having suspended from it by suitable struts and ties a road-girder adapted each to form a roadway upon which suspended cars may run, substantially as and for the purpose specified.

In testimony whereof I hereunto subscribe my name this 14th day of March, A. D. 1888.

R. CLARKE FORSYTH.

Witnesses:

CHAS. L. BARTLETT,

C. W. DAVENPORT.