No. 666,058. Patented Jan. 15, 1901.

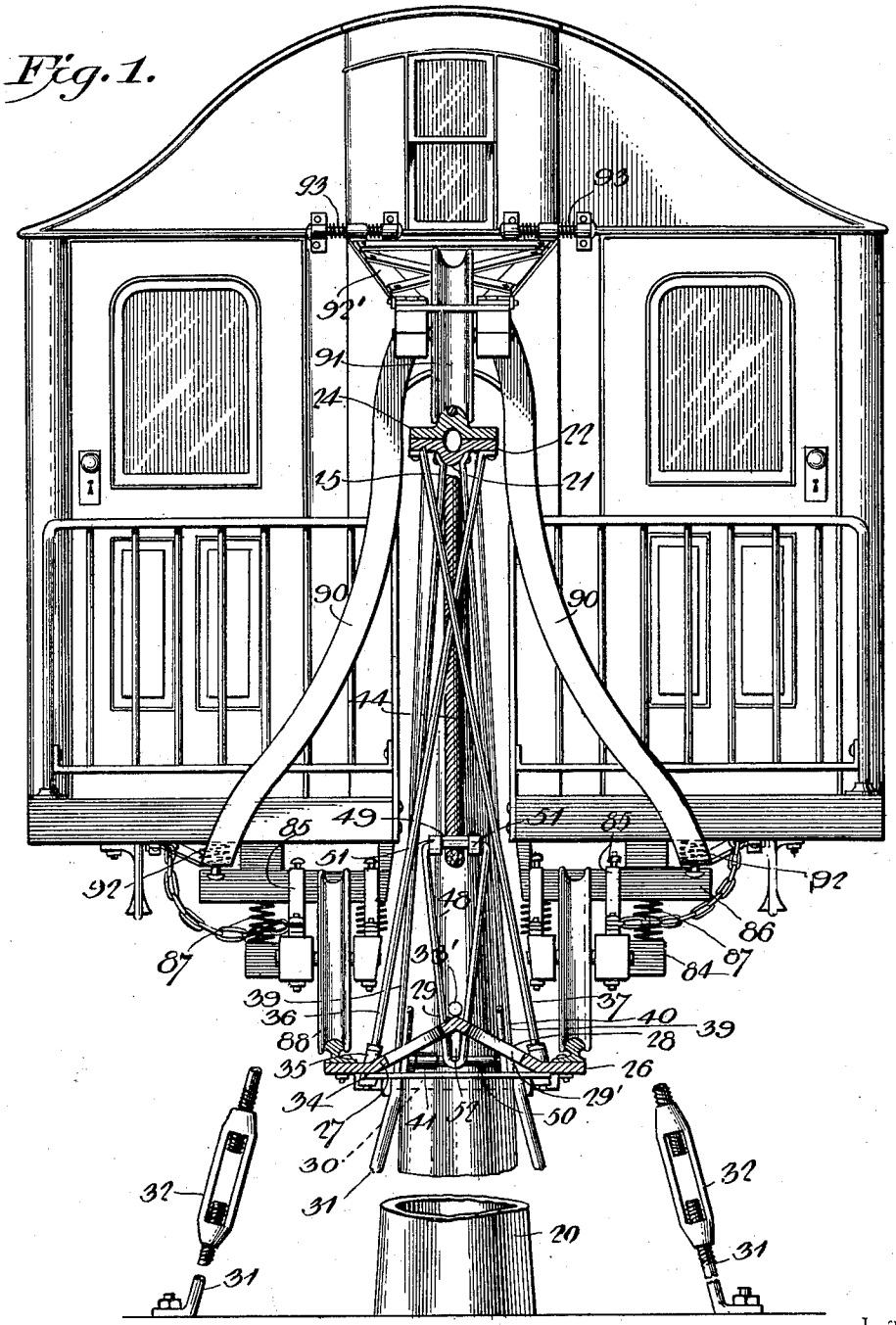
B. KIENHOLZ.

ELEVATED RAILWAY.

(Application filed Apr. 16, 1900.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



Witnesses

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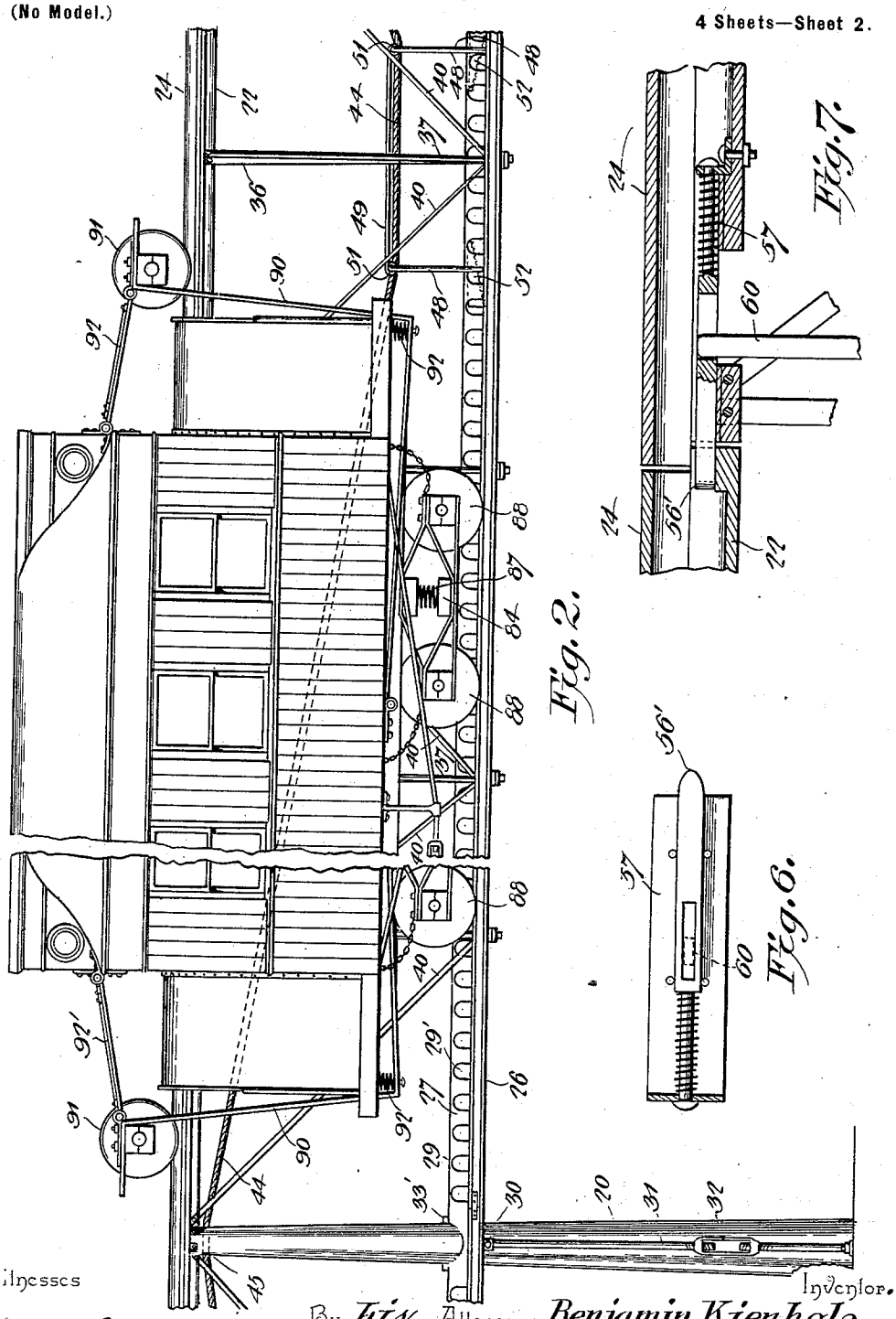


Fig. 2.

Fig. 7.

Fig. 6.

Witnesses

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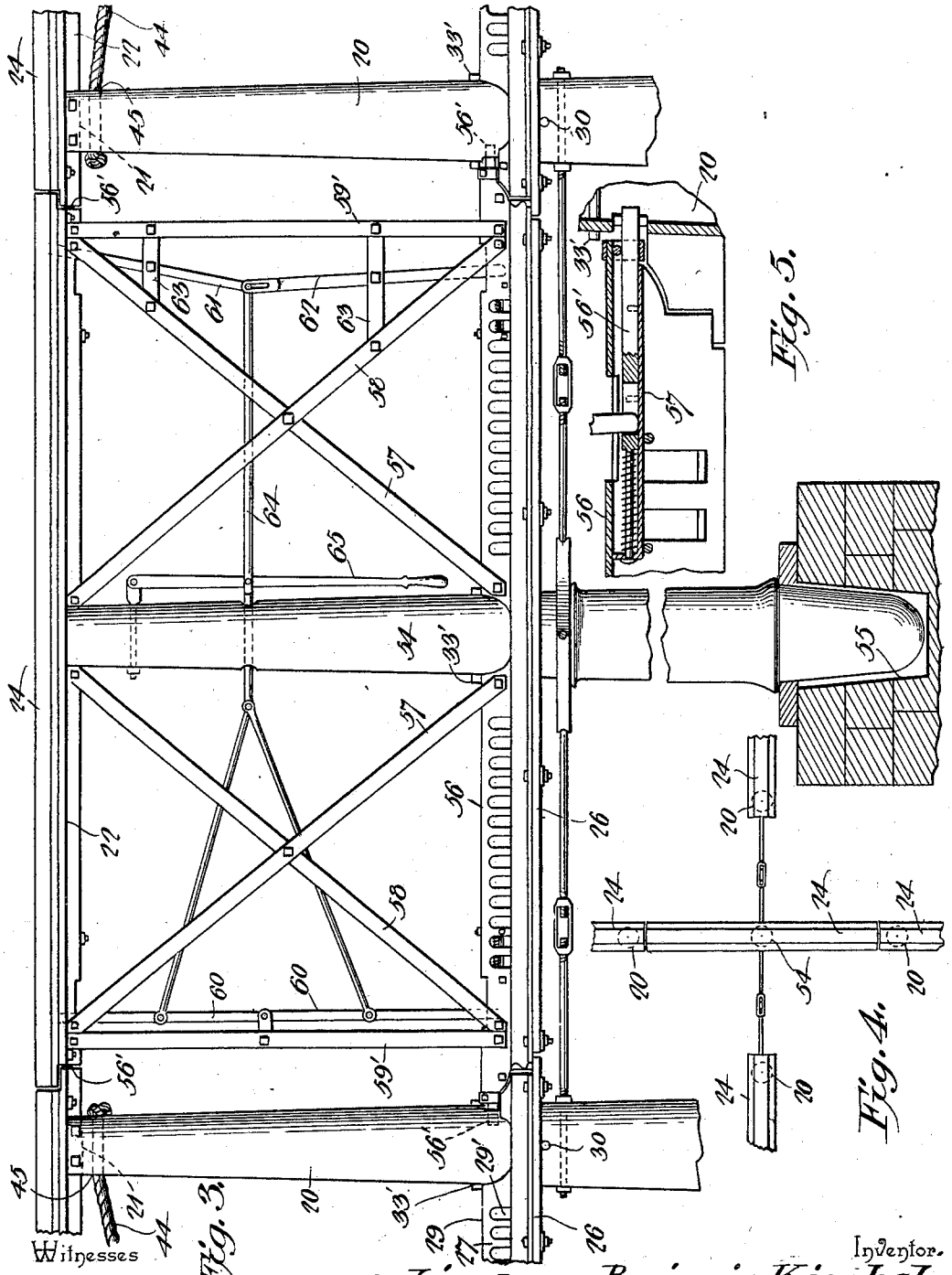


Fig. 3.

Fig. 5.

Fig. 4.

Witnesses

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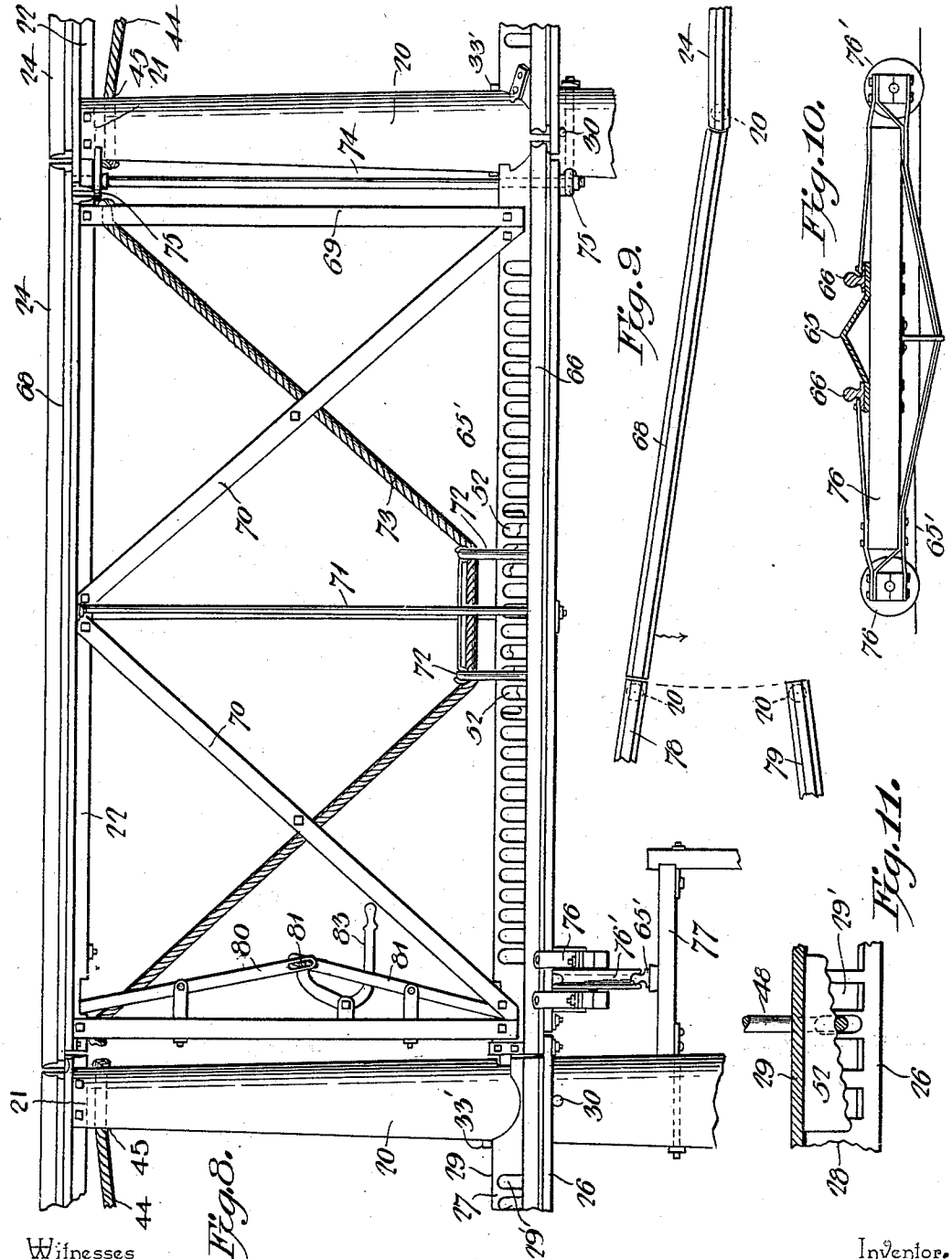


Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

Witnesses
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UNITED STATES PATENT OFFICE.

BENJAMIN KIENHOLZ, OF HALLOCK, MINNESOTA.

ELEVATED RAILWAY.

SPECIFICATION forming part of Letters Patent No. 666,058, dated January 15, 1901.

Application filed April 16, 1900. Serial No. 13,116. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN KIENHOLZ, a citizen of the United States, residing at Hallock, in the county of Kittson and State of Minnesota, have invented a new and useful Elevated Railway, of which the following is a specification.

This invention relates to railways in general, and more particularly to elevated railways, and it has specific reference to elevated railways in which the car runs upon a central upper rail and lower laterally-spaced rails, the car having a passage through its center to permit the supporting mechanism of the upper rail to pass.

One object of the invention is to provide a rigid elevated structure and one that is durable and at the same time comparatively cheap, a further object being to provide a simple and efficient form of switch and also to provide a form of crossing which may be rotated from one position to another to accommodate the trains of crossing trackways and to permit shifting of cars from one to another of crossing trackways.

Additional objects of the invention will be apparent from the following description.

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts in the several views, Figure 1 is a front view of a supporting-post and the hanging and supporting arrangement carried thereby, a car being shown in end elevation and the track and suspension-cable being shown in transverse section. Fig. 2 is a side elevation of a portion of a trackway and a car thereon, portions being broken away to permit a large scale. Fig. 3 is a view partly in side elevation and partly in section and showing a crossing-switch in its operative relation to the main trackway, parts of the posts being broken away. Fig. 4 is a diagram showing the ends of the four rails at a crossing and illustrating the manner in which the switch-rail coöperates with the crossing tracks alternately. Fig. 5 is a longitudinal section of one end of the rail-supporting bench and an adjacent portion of a post adjacent to the pivot-post of the cross-over-switch and showing the arrangement of the locking-bolt for holding the switch in operative position. Fig. 6 is a top plan view of the locking-bolt. Fig. 7 is a longitudinal section of a portion of one end of the upper rail and showing the locking-bolt therein and the engagement of its operating mechanism. Fig. 8 is a side elevation of a pivoted switch-section of the railway, the lower portions of the posts being shown as broken away. Fig. 9 is a diagram showing the method of operation of the pivoted switch-section to throw either of two rails into operative relation with a third rail. Fig. 10 is an elevation showing the truck that supports and carries the free end of the switch-section shown in Fig. 8 of the drawings. Fig. 11 is a detail section taken longitudinally of the rail-supporting bench and illustrating the method of taking up the stretch of the suspension-cables.

Referring now to the drawings, the present railway is supported upon posts 20, which are preferably tubular and are set firmly in the ground and with their upper ends at the proper elevation. In the upper ends of the posts and in the direction of the line of posts are formed slots 21, in which the upper rail of the structure is seated. This upper rail consists of a lower cross-sectionally-curvilinear portion 22, having oppositely and horizontally disposed flanges, the curvilinear portion extending downwardly from the flanges and lying in the slots of the posts, while the flanges lie upon the upper ends of the posts. The upper section of the upper rail, as shown at 24, is similar in form to the lower section and has its curvilinear portion disposed upwardly to form the tread of the rail, while the flanges thereof lie upon the flanges of the lower section.

The lower rails, which lie at the ends of the base of an imaginary triangle having the upper rail at its apex, are carried by a bench 26, comprising downwardly-diverging sides 27 and 28, the lower edges of which are bent outwardly to lie in a common horizontal plane, while the upper edges of the sides meet at a ridge 29. These sides are cut away, as shown at 29′, to lighten the structure, the portions between the cut-away parts giving sufficient strength.

The bench 26 is made in sections to lie be-

tween the posts 20, and the ends of the sections are shaped to fit snugly against the curvilinear sides of the posts and rest upon the heads of bolts 30, which are passed transversely through the posts and act to secure the upper ends of stay-rods 31 to the posts, the lower ends of the rods being anchored in the earth in any suitable and well-known manner. The stay-rods are each formed in two sections, having their mutually adjacent ends threaded, and with these threads are engaged turnbuckles 32, through the medium of which the rods may be put under tension to hold the posts firmly against lateral movement. Pins 33′ are passed through the posts directly above the bench and prevent upward displacement of the bench. In addition to these supports lugs may be formed upon or secured to the post 20 to receive pressure of the bench.

Secured to the under sides of the bench-sections and suitably spaced are plates 34, having openings therein which are disposed to register with sleeves 35, formed upon the bench-sections. Through these sleeves and the perforations of the plates are disposed the lower threaded ends of supporting-rods 36 and 37, disposed in pairs, a rod 36 engaging the perforation at one end of a plate, while a corresponding rod 37 engages the perforation at the other end of the plate. The rods 36 and 37 of each pair are crossed, as shown, and their upper ends are engaged with the flanges of the upper rail either by means of bolts passed through their laterally-turned ends or in any other suitable manner.

The rods 36 and 37 are of sufficient rigidity to sustain the upper rail from the bench, and in order to prevent depression of the bench at the location of the cross-plates 34 the plates nearest to the posts are tied to the posts, at the tops of the latter, by means of tie-rods 39 and 40, the upper ends of which are engaged with the lower member of the upper rail adjacent to the posts, while their lower ends are passed through the chair, at the slanting sides of the latter. The rods 39 and 40 are disposed in pairs, and the lower ends of each pair of rods are held in place by a common bolt 50, engaged with the eyes in the lower ends of the rods, the rods being held properly spaced by a sleeve 41, through which the bolt is passed.

Beginning at the left-hand post in Fig. 2 and moving in the direction of the right-hand post, the bench at the lower ends of the first rods 36 and 37 is connected with the upper rail adjacent the left-hand post, while the same point of the bench is connected with the upper ends of the next pair of rods 36 and 37, or rather to the upper rail adjacent the upper ends of such rods, by tie-rods 39 and 40. A third pair of tie-rods connect the upper rail adjacent the second supporting-rods with the bench adjacent the third supporting-rods, and this arrangement is continued throughout the interspace between the posts and is continued throughout the entire system and between all of the posts, the result being a truss connection. In addition to this truss construction I desire to employ a suspension-cable 44, which is passed through openings 45 at the upper ends of the posts, and midway of the posts this suspension-cable is connected with the rail-supporting bench.

As a means for connecting the suspension-cable with the bench a plurality of triangular hangers are employed, each of these hangers consisting of a rod or bar 48, bent into triangular form and having its ends welded and lying with its base uppermost, while the lower end incloses the ridge of the bench, the bar at the apex of the triangle passing below the ridge. A number of these triangular frames are employed in a group, and they are connected together by a plate 49, disposed upon the uppermost portions of their bases and connected to such bases by ears 51, formed upon the plate and bent around the bars. The bars are thus held from movement either toward or away from each other, and the suspension-cable is passed through the frames formed by the bars, and it lies against the inner sides of the bases of the bars and between the ears of the plate 49. A wedge 52 is driven between the lower face of the ridge of the bench and the lower end of each of the triangular frames or hangers, and by driving these wedges inwardly the hangers are drawn downwardly, or rather the bench is forced upwardly, to compensate for stretching of the suspension-cable.

With the above explanation it will be seen that there is provided a trackway supported upon posts in part and in part suspended therefrom and that in combination therewith there is a truss arrangement, all of which acts to provide an extremely strong and efficient structure. In establishing a system of this nature it is of course essential that means be provided for the crossing of one track in the plane of another, and for this purpose I have designed a turn-table arrangement comprising upper and lower rails constructed and arranged in the same manner as are the corresponding fixed rails and which turn-table rails are adapted to be moved into operative relation to the rails of the intersecting trackways alternately.

Referring particularly to Figs. 3, 4, and 5, wherein the turn-table is shown, the end posts of the system at the sides of the crossing are constructed in the same manner as above described, the upper and lower rails projecting slightly therebeyond. The track at the upper part of the table is mounted in a groove in the upper end of a pivot-post 54, which is rotatably mounted in a socket 55, and the lower rails are carried by a bench 56, the same in all respects to that above described, with the exception that at each end thereof is arranged a sliding bolt 56′, mounted upon a plate 57, secured

within the inclosure of the bench, and which bolt is adapted to be projected into engagement with a slot in the adjacent face of the adjacent post 20. The bench, which projects slightly beyond each of the posts 20, is cut to receive the similarly-cut ends of the bench 56 and support the latter when in operative engagement therewith. Similar bolts are slidably disposed within the inclosure of the upper rail, which latter has its under side cut away at its ends to receive the corresponding ends of the upper rails which project beyond the adjacent end posts 20.

To sustain the structure of the turn-table, batter-posts 57′ rest with their lower ends upon the bench 56 adjacent the pivoted post, while tie-rods 58 connect the ends of the bench 56 with the upper rail adjacent the upper end of the pivoted post. The outer ends of the batter-posts and tie-rods, at the ends of the table and at each side thereof, are connected by inclined braces 59′.

In order to operate the bolts, those at one end of the table are connected by a vertical rod 60, the ends of which are slidably disposed in slots in the lower section of the upper rail and in the bench, while the bolts at the other end are connected by a toggle-lever comprising links 61 and 62, the outer ends of which are slidably engaged with the bolts, while their mutually adjacent ends are slidably connected. Between its ends each link is pivoted to a support 63, fixed to the adjacent elements of the bridgework, and with the pivot that slidably connects the ends of the links is connected a reciprocatory rod 64, leading to a hand-lever 65, pivoted to the central or pivoted post. This rod 64 extends entirely through the post, and to its opposite end are connected two connecting-rods that lead to the bar or rod 60. Thus as the lever 65 is operated in one direction it will draw all of the bolts simultaneously, and when it is moved in the opposite direction it will press them home. The bolts have the usual springs for holding them yieldably in their engaging position. Thus by operating the lever 65 the bolts may be disengaged, and the turn-table may be then rotated to cause its rails to aline with whatever of the rails of the crossing may be desired, and when desired the bolts may be again withdrawn and the table returned to its former position.

In Figs. 8, 9, and 10 of the drawings there is shown a form of switch wherein a section of the entire trackway, including both upper and lower rails, is moved pivotally to communicate these movable rails with either of two diverging sets of rails. In this construction a bench-section 65′ has rails 66 thereon, and arranged thereabove is a top rail 68, corresponding in arrangement to the rails above described. The top rail is connected with the bench, at the ends thereof, by upwardly-converging posts 69, and batter-posts 70 connect the lower ends of the posts 69 with the central point of the upper rail 68, from which point are suspended hanger-rods 71, which are engaged at their lower ends with the bench in the same manner as rods 36 and 37. Hangers 72, similar to hangers 48, are engaged with the bench 65, and through these hangers is passed a cable 73, the ends of which are taken upwardly and connected with the posts 69. The bench and top rail are connected at one end pivotally with the adjacent post 20 through the medium of a pintle 74, engaged with perforations in the rail and hanger and in ears 75 upon the post. The bench at the opposite end is mounted upon a truck 76, having wheels 76′, which engage and are adapted to run upon a track 65′, mounted upon a suitable framework 77.

Locking-bolts are slidably engaged with the upper rail and with the bench and are adapted to enter openings in the adjacent post 20, it being of course understood that there are two of these latch-posts 20, corresponding to the two rails 78 and 79. (Shown in Fig. 9.) These bolts are operated by pivoted levers 80, the free ends of which are slidably connected by a pin 81, operating in slots of the ends, and with this pin is pivotally connected one end of an operating hand-lever 83, which when operated seats and withdraws the bolts.

The car that is employed in connection with this trackway has a central longitudinal and covered passage opening through its ends and through its bottom, so as to receive in such passage the trackway. The car has trucks, comprising beams 84, having vertical guide-rods, which engage guide-openings 85 in the bolsters 86, mounted upon the car. Helical springs 87 below the car rest with their ends against the bolster and truck-beam and absorb the jar. The wheels 88 of these trucks rest upon the lower track-rails. Hangers 90, comprising downwardly-diverging members, are provided for the car and straddle the upper track. At the upper ends of the members of the hangers are journaled supporting-wheels 91, which engage the upper track, the lower ends of the hangers being bent rearwardly and taken beneath the car and attached at their extremities to the under side thereof. The hangers are of spring material, and between them and the bottom of the car, at the ends of the latter, there are disposed helical springs 92, so that the wheels 91 are yieldably held. The upper ends of the hangers are connected with the ends of the car by hinge-plates 92′, about the pintles of which are coiled springs 93, which act to hold the wheels 91 against the upper track. With this construction it will be seen that the car is supported above the surface of the earth in a simple and advantageous manner, while the structure is extremely strong and can thus withstand great strain. Furthermore, it is impossible for the car to leave the tracks.

Any suitable power may be employed for operating the car or cars, and the cars may

have any general structure desired, and various modifications may be made and changes in materials and proportions may be made without departing from the spirit of the invention.

What is claimed is—

1. In an elevated railway, the combination with spaced supporting-posts, of bench-sections mounted upon the posts and projecting inwardly therebeyond, rails mounted upon the bench-sections at both sides of the posts, and a movable bench-section disposed between the spaced posts and adapted to rest upon the projecting ends of the adjacent bench-sections said movable section having rails mounted thereon for alinement with the rails of the fixed bench-sections.

2. An elevated railway comprising posts having grooves in their upper ends, an upper rail having a downwardly-extending portion engaged with the grooves of the posts and having lateral flanges lying upon the upper ends of the posts, said rail having also an upwardly-extending tread portion, lower rails arranged on both sides of the posts and connected therewith, truss connections between the lower rails and the upper rail, and a suspension-cable passed through the upper portions of the posts and connected with the lower rails between the posts.

3. An elevated railway comprising supporting-posts, a rail upon the upper ends of the posts, a bench supported upon the posts below the rail, additional rails secured to the bench at both sides of the posts, said bench having openings therein, truss connections between the bench and the upper rail, hangers removably engaged with the bench for adjustment with respect thereto and a suspension-cable passed through the posts and connected with the hangers.

4. An elevated railway comprising a series of supporting-posts, a rail mounted upon the posts, a bench supported by the posts below the rail, additional rails upon the bench, truss connections between the bench and the upper rail, hangers removably engaged with the bench for adjustment longitudinally thereof and a suspension-cable passed through the posts and connected to the hangers between the posts.

5. An elevated railway comprising supporting-posts, a rail mounted upon the posts, a bench supported by the posts below the rail, additional rails mounted upon the bench, hangers connected with the bench and comprising each a bight lying below the bench and a bight lying above the bench, a suspension-cable passed through the upper bights of the hangers and connected with the posts and a wedge disposed between the lower bight and the adjacent face of the bench, whereby when the wedge is driven inwardly, the bench will be raised with respect to the suspension-cable.

6. An elevated railway comprising supporting-posts, a rail disposed upon the upper ends of the posts, a bench secured to the posts below the rail, said bench comprising downwardly-diverging sides and outwardly-directed flanges at the lower edges of the sides, additional rails secured upon the flanges of the bench, the sides of the bench terminating in a ridge at their upper edges, hangers passed through one side of the bench, then under the ridge and upwardly through the opposite side, suspension-cables engaged with the hangers and the posts, and wedges driven between the hangers and the under sides of the ridge to raise the bench with respect to the cable.

7. An elevated railway comprising supporting-posts having grooved upper ends, a rail having a depending portion engaged with the grooves and flanges lying upon the ends of the posts, said rail having also an upwardly-directed tread, a bench secured to the posts below the rail and comprising downwardly-diverging sides terminating in outwardly-directed flanges the upper edges of the sides meeting in a ridge, supporting truss-bars connecting the flanges of the upper rail with the flanges of the bench, tie-rods connecting the bench with the depending portion of the upper rail, hangers engaged with the bench and comprising loops which lie transversely of and beneath the ridge of the bench, a wedge engaged with the loop of each hanger and with the under face of the ridge of the bench, and a suspension-cable engaged with the posts and with the hangers.

8. An elevated railway comprising fixed rails and a turn-table in operative relation thereto, said turn-table comprising a rotatable post having upper and lower rails mounted thereon for bodily movement with the post into and out of coöperative relation to the corresponding fixed rails, truss connections between the upper and lower rails of the table, latch-bolts carried by the table for engagement with the adjacent supporting-posts of the fixed rails, a bar connecting the bolts at one end of the table, pivoted levers engaged with the bolts at the opposite end and having their mutually-adjacent ends connected by a slidable pivot, a rod connecting said pivot with the bar of the opposite bolts and a lever for reciprocating the bar to operate the bolts.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

BENJAMIN KIENHOLZ.

Witnesses:

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CHAS. I. MOORE.