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ELEVATED OR BRIDGE STRUCTURE.

No. 429,470. Patented June 3, 1890.

Fig. 1

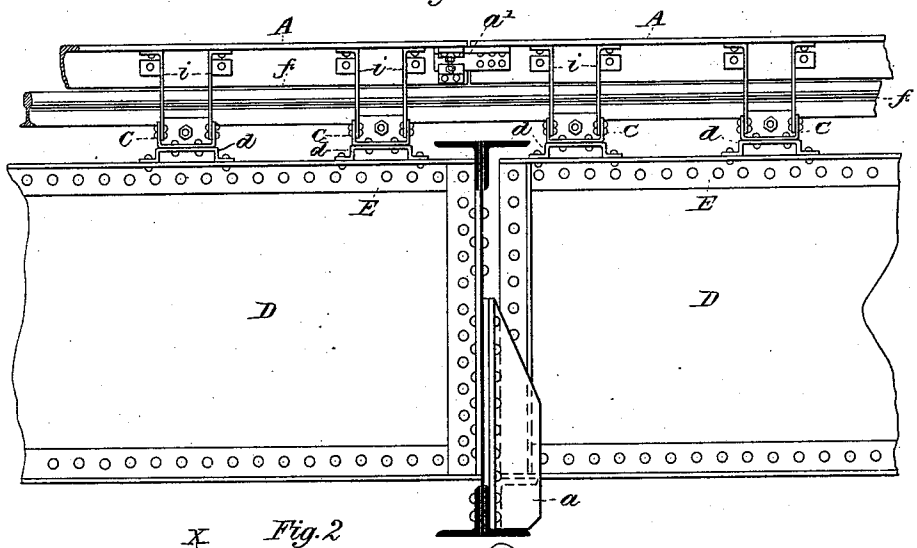
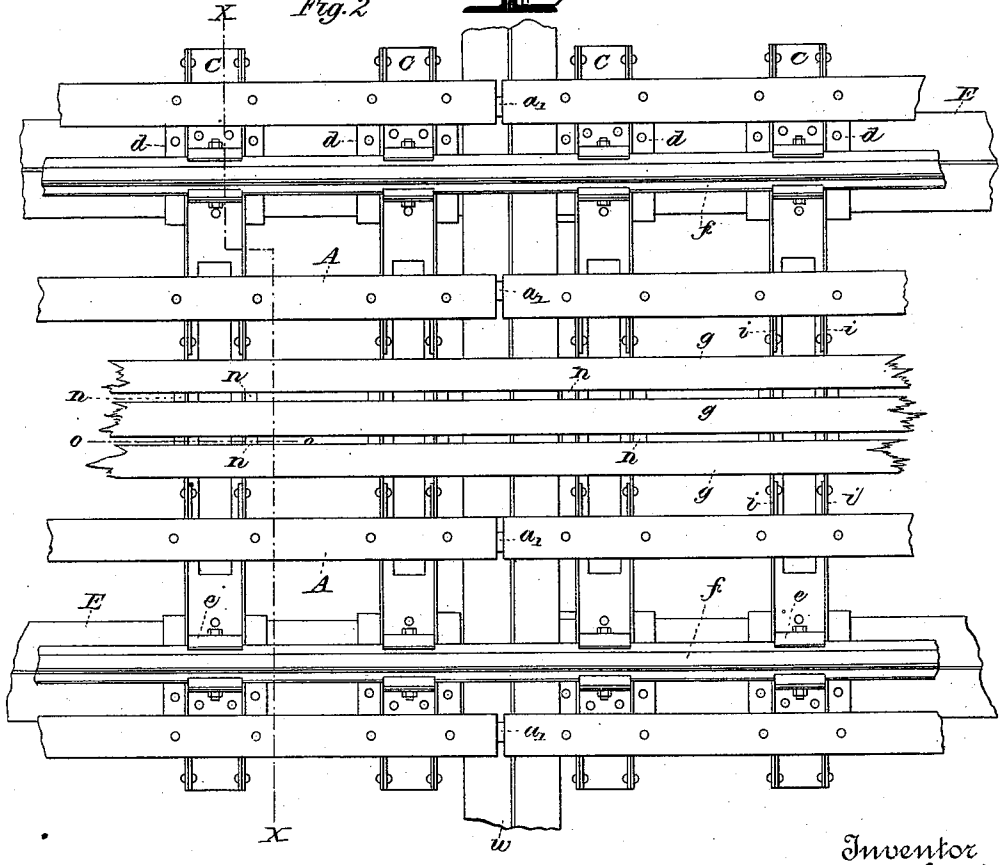


Fig. 2



Witnesses
B. Schieldrap
P. Rittenhouse

Inventor
Isaac S. McGiehan
By his Attorney E. G. Walker

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I. S. McGIEHAN.

ELEVATED OR BRIDGE STRUCTURE.

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Fig. 3.

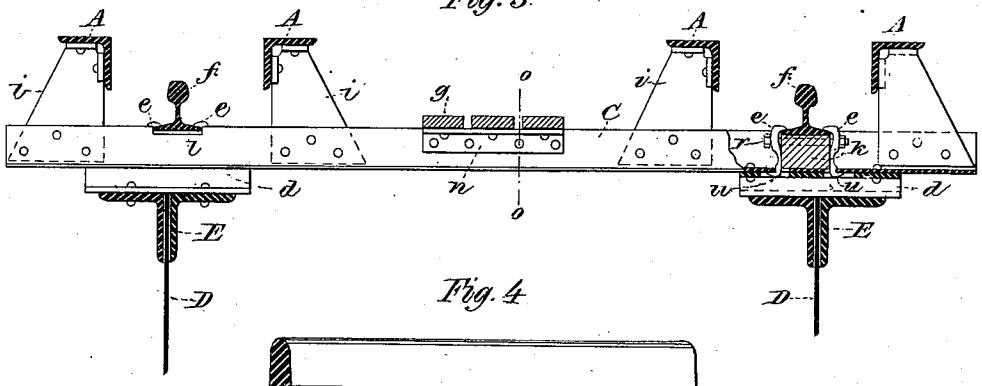


Fig. 4

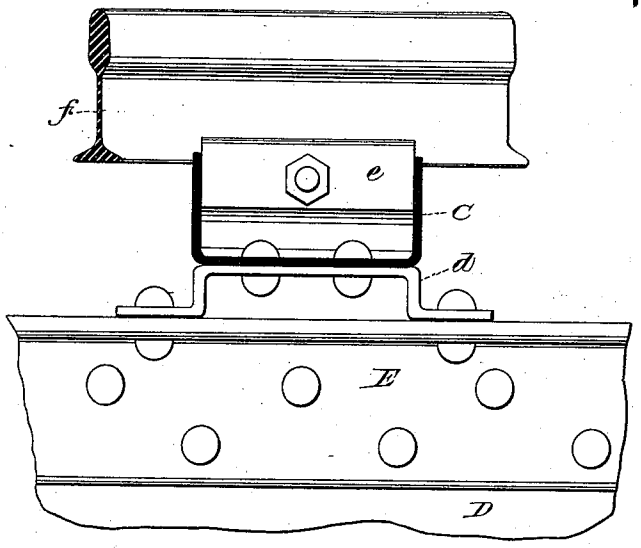


Fig. 5

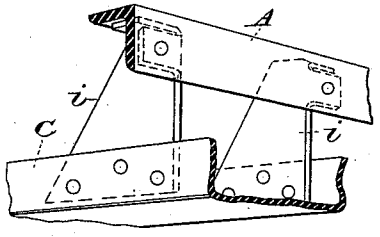
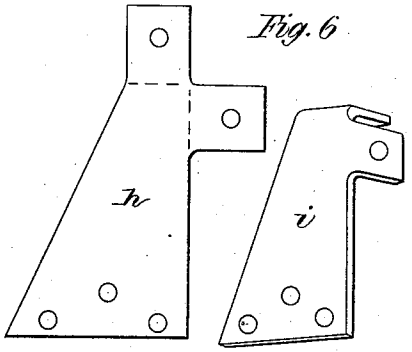


Fig. 6



Witnesses
B. Schieldrop
F. P. Ritter Jr.

Inventor
Isaac S. McGiehan
By his Attorney E. W. Walker

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I. S. McGIEHAN.

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Fig. 7

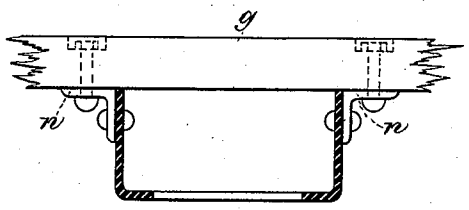


Fig. 8

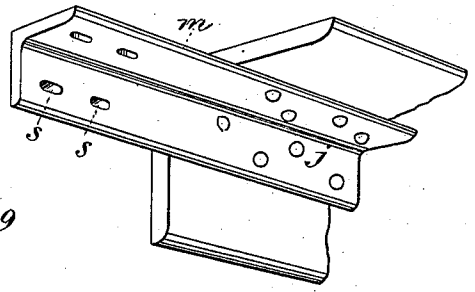


Fig. 9

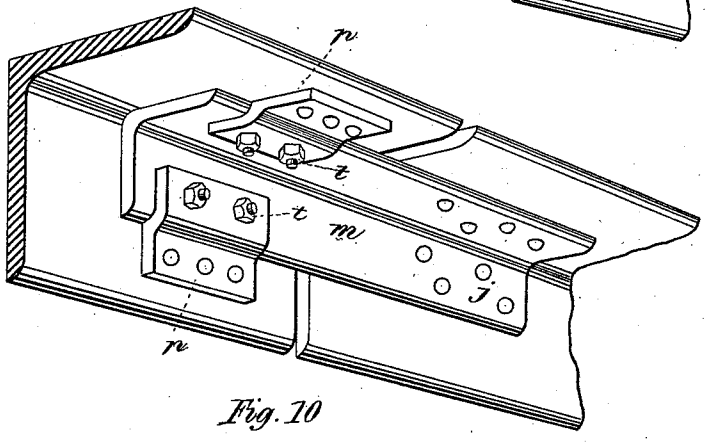


Fig. 10

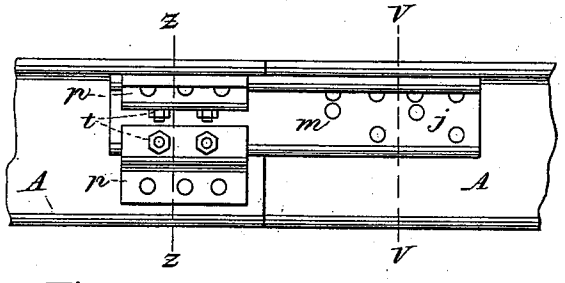


Fig. 12

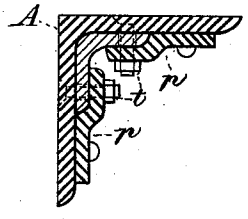
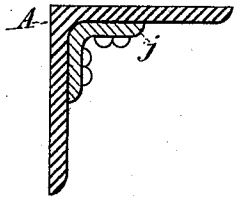


Fig. 11



Witnesses
B. Schieldrop
F. P. Fuller Jr.

Inventor
Isaac S. McGiehan
By his Attorney
E. Walker

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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I. S. McGIEHAN.

ELEVATED OR BRIDGE STRUCTURE.

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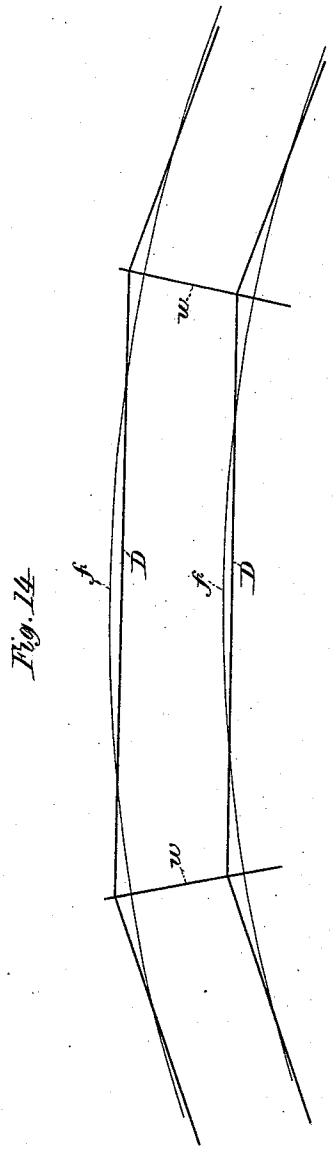


Fig. 14.

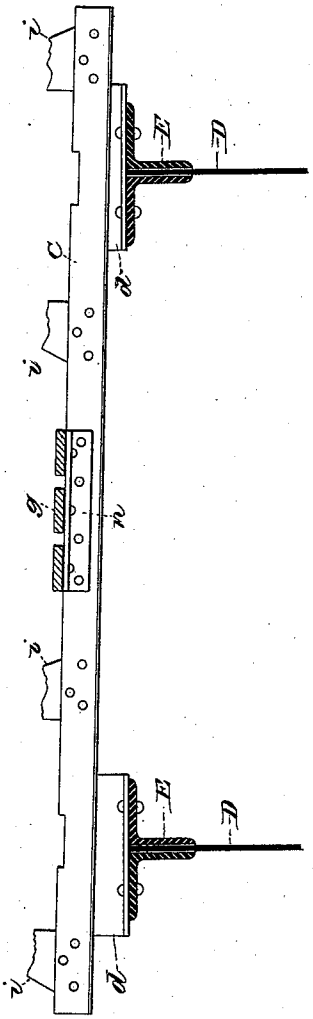


Fig. 13.

Witnesses
B. Sewell Crap
F. P. Phillips

Inventor
Isaac S. McGiehan
By his Attorney E. D. Walker

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ISAAC S. McGIEHAN, OF NEW YORK, N. Y.

ELEVATED OR BRIDGE STRUCTURE.

SPECIFICATION forming part of Letters Patent No. 429,470, dated June 3, 1890.

Application filed February 11, 1890. Serial No. 340,077. (No model.)

To all whom it may concern:

Be it known that I, ISAAC S. McGIEHAN, of the city, county, and State of New York, have invented a new and useful Improvement in Elevated and Bridge Structures, of which the following is a specification.

This invention relates to elevated-railroad and bridge structures, and has for its object to construct the cross-ties and guard-rails of metal, and form the same so as to make them a part of the main structure, as will be hereinafter described.

It has been the custom heretofore in building such structures to lay the wooden ties crosswise of the upper chord of the longitudinal girder and bolt them thereto by means of hook-bolts—*i. e.*, bolts with a hook on the lower end, that engage under the flange of the upper chord, pass through the tie, and are secured by nuts on top of the tie. The track is then laid on the ties and spiked thereto in the usual manner. On either side of the track the guard-rails, which usually consist of long yellow pine strips eight inches by six inches, are placed at the requisite distance apart and bolted to the ties. Thus the entire upper structure, consisting of the cross-ties, rails, and guard-rails, is held only by the hook-bolts that pass through the ties and engage with the upper chord. This form of structure has been found very unsatisfactory, expensive, and dangerous—first, because, when the wooden ties get wet and swell, the nut which holds the hook-bolt is drawn down into the tie, and when the tie again gets very dry the bolt is quite loose, and thus the entire "upper structure" is comparatively free to vibrate and do damage to the main structure, besides being very noisy and dangerous; second, the wooden cross-ties and guard-rails get rotten and increase danger, and, third, they often take fire from hot coals dropped by the locomotives, and create heavy losses.

Another serious disadvantage with the wooden cross-ties on such structures is maintaining the proper elevation of the outer rail at curves. The elevation is usually obtained by placing under the outer rail an additional block of wood, which is spiked or bolted to the original tie. The strain and wear on these additional pieces are very great, and they either split or wear out quite rapidly. When it becomes necessary to insert a new block, it invariably must be made thinner than the original to compensate for the wear which has fallen upon its neighbors. Thus the original and proper elevation of the outer rail is lost, and the elevation thereafter becomes irregular, insufficient, and unreliable, because of the very imperfect hold which the rail-spikes have in the split and half-worn elevation-pieces.

In addition to the above objections the necessary repairs to the wooden ties, elevating-pieces, and guard-rails make them all very expensive.

The objections and defects above enumerated are entirely obviated by my invention, which is fully illustrated in the accompanying drawings, with similar letters of reference to indicate corresponding parts, the same forming a part of this specification.

Owing to the necessity of illustrating detail parts of my invention, it has required the use of four sheets of drawings, which are numbered and contain figures as follows:

Sheet 1: Figure 1 represents a part of a side elevation of an elevated railroad, showing the expansion-pocket *a*, with the guard-rail expansion-joint *a'* above it, the ends of the steel cross-ties *c c c c* and the intermediate elevation-pieces *d d d d*, also guard-rail A and rail *f*. The plate (longitudinal) girders are indicated by D D, and the upper chord by E. Fig. 2 represents a plan or top view of the same section, showing, in addition to the above-named parts, the platform-planks *g g g*, also the top part of the clips *e e*, which hold the rail *f*.

Sheet 2: Fig. 3 represents a transverse vertical section through the top portion of the structure, as shown in Figs. 1 and 2, and indicated by the line *x x*, Fig. 2. The same letters of reference are used to indicate corresponding parts, and, in addition thereto, *n* represents a piece of angle-iron, which is riveted to the side of the tie *c* to form a foundation for the platform-planks *g g g*, and *i i* represent the guard-rail braces. Fig. 4 represents part of a side elevation enlarged to better illustrate the parts, showing a side view of the upper chord E, clips *e*, and rail *f*, also end views of the tie *c* and the intermediate plate *d*. Fig. 5 represents a perspective

view of a portion of the tie *c*, guard-rail A, and braces *i* to illustrate the manner of securing those parts together. Fig. 6 represents the guard-rail brace *i*, with *h* illustrating the blank from which it is formed, and *i* the brace after it is formed and ready to be riveted to the tie *c* and receive the angle-iron which forms the guard-rail A.

Sheet 3: Fig. 7 represents a transverse section through the line *o o*, Figs. 2 and 3, showing the angle-iron *n*, which creates the foundation for the platform *g*. Fig. 8 represents, perspectively, a part of the contraction-joint *a'*, Fig. 1, showing the elongated holes *s s*, through which the bolts *t*, Fig. 9, pass, and which permits the splice-piece *m* to slide within the clamp-pieces *p p*. Fig. 9 represents an enlarged perspective view of the contraction-joint *a'* with the joint open. Fig. 10 represents a side elevation of the same with the joint closed. Fig. 11 represents a transverse section through the lines *v v*, Fig. 10; and Fig. 12 represents a transverse section through the lines *z z*, Fig. 10.

Sheet 4: Fig. 13 represents a transverse vertical section through the upper chords E and a part of the girders D, showing the intermediate pieces *d d*—one thicker than the other—to elevate one end of the tie, and thereby properly elevating the outside rail. Fig. 14 is an outline plan view showing about the relative positions between the longitudinal girder D and the rails *f*, the lines *w* representing the transverse vertical girders, all of which will be hereinafter more fully explained.

The character of the girders in the structure has no particular bearing upon this invention. They may be made with an upper and lower chord and diagonal bracing of angle or other iron in between; or they may be made with plates in between the upper and lower chord, as illustrated, or any other form which it may be most advisable to adopt.

It will be readily understood from a careful review of this invention that the whole structure is made more rigid and very much stronger by the use of steel for guard-rails and cross-ties when they are riveted together, as illustrated. The structure is much lighter, cheaper, and of course much more durable. In the first place, the intermediate plates *d* are riveted crosswise of the upper chord, as shown in Figs. 2, 3, and 4, which stiffens the upper chord and keeps it from twisting or buckling. The ties *c* are in turn riveted on top of the intermediate plates *d*, as shown also in Figs. 1, 2, 3, and 4, one end of the tie being riveted to the intermediate plate *d* of one upper chord and the other end of the tie riveted to the intermediate plate *d* of the opposite upper chord. Thus the ties *c* do service also as transverse braces to the upper chords and girders, and, while the structure is thereby made more rigid, it is also cheapened by the saving in transverse bracing.

The guard-rail braces *i*, constructed as shown at *h* and *i*, Fig. 6, are riveted to the sides of the ties *c*, as shown in Figs. 1, 2, 3, and 5. On top of the braces *i* the guard-rail proper, consisting of a piece of angle iron or steel the requisite size, is riveted, as illustrated in Figs. 1, 2, 3, and 5, and becomes a supporting part of the main structure as well as a very substantial guard-rail.

The rail-fastening which it is intended to use with this structure is like that described and shown in the patent of Henry Shultzen, of July 17, 1888, and numbered 386,356. It consists, as illustrated in a part of Fig. 3, of two clips *e e*, provided with two lugs *u u* on their lower side, which hook into and under the tie-bottom. The upper portion of the clips have jaws, which are beveled to conform to the rail-base and are brought together over the rail-base by a bolt *r*, which passes through both clips, and a block of wood *k*, which is placed under the rail *f* in the channel of the tie *c* on its end grain to afford better resistance. The sides of the ties are cut down, as shown at *l*, Fig. 3, so that the rails *f* rest upon the block *k* and not upon the metal. The block *k* acts as a cushion and destroys the metal contact and reduces the noise. This form of fastening is so powerful that it practically converts the rails *f* into a part of the structure, there being no possibility of rail vibration independent of the main structure.

The guard-rails A are provided at intervals with expansion and contraction joints, as shown at *a'*, Fig. 1, and illustrated in enlarged sections in detail in Figs. 8, 9, 10, 11, and 12. The manner of constructing the same is as follows: The joint or splice piece *m* is riveted rigid to one of the ends of the guard-rail, as shown at *j*, Figs. 8, 9, 10, and 11. The opposite end of the splice-piece, as shown at *s s*, Fig. 8, is provided with four elongated holes, through which the bolts *t* pass, and which permit the splice-piece to slide within the clamps *p p* sufficient to compensate for the contraction and expansion of the angle-iron which forms the guard-rail.

The clamps *p p* are riveted, as illustrated, to the end of the guard-rail, intended to be joined to the one already described, so that when the two ends are put together and the bolts *t* adjusted the guard-rails can contract and expand to the limit allowed in the elongated holes *s s*, and at the same time the joint will be very strong and rigid.

In order to support the platform composed of the pieces *g g g*, Figs. 2 and 7, a piece of angle-iron is riveted on each side of the tie, and the platform-pieces are bolted thereto, as shown at *n*, Figs. 2, 3, 7, and 13.

As shown by the outline drawings, Fig. 14, the longitudinal girders D do not form a true circle in building a curve, but, on the contrary, form a series of angles. As also shown by Fig. 14, the track or rails *f* do, or rather should, form a true circle. Thus the rail *f*, which should properly be directed over the longitudinal girder, is only occasionally

over it, and the rail bearing upon the girder is never the same on curves, the weight which the rails carry being alternated first on one and then the opposite side of the girder, and it is partly to overcome this alternating strain that I have adopted the intermediate plate *d*. These plates are made long enough to permit of the ties being laid with their rail-slots forming a true curve to receive the rail. Their being riveted to the ties and their form materially assist the ties to carry the load, and prevent them from bending or breaking when the rail *f* rests on one side of the girder.

Another great advantage of the intermediate plate *d* is in elevating the outer rail at curves. This is accomplished, as shown in Fig. 13, by making the plate *d* under the end of the ties which carries the outside rail higher than the one on the opposite end and making the plates of a wedge shape, to line the upper surface for the ties to rest upon. It will be readily understood that an elevation once obtained in this manner will always remain the same, and new blocks, ties, rails, or guard-rails can be inserted without altering or changing the proper elevation of the outer rail.

While the intermediate plate *d* is a very valuable part of the structure illustrated, there may be times when it would be advisable to dispense with its use and rivet the tie *c* directly on the upper chord.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In an elevated-railway or bridge structure, the combination, with the upper chords of the longitudinal girders, of intermediate tie-supporting plates secured thereto and provided with vertically-inclined upper faces, and metal ties secured to the inclined faces of said plates, one of said plates being higher than the other to elevate the outside rail on curves, substantially as and for the purposes described.

2. In an elevated or bridge structure, the combination, with the longitudinal girders having flanges at their upper edges, of inverted-**U**-shaped plates having flanges by which they are secured to the flanges of the girders, and metallic cross-ties or braces supported on and secured to the opposite plates, substantially as and for the purposes described.

3. In an elevated-railway structure, the combination, with the flanged girders, of plates secured to the flanges thereof, metal channel beams or ties secured to said plates, traction-rails secured to said ties, and angle-iron guard-rails located on opposite sides of each traction-rail and secured by means of braces *i* to the vertical flanges of the tie, substantially as and for the purposes described.

4. The combination of the guard-rail A, braces *i*, metal cross-tie *c*, and the intermediate plate *d*, arranged and constructed as described, with the upper chord E of the longitudinal girder D, substantially as set forth.

5. The combination of the tie *c*, clips *e e*, bolt *r*, block *k*, and rail *f* with the inverted channel-plate *d*, located intermediate between the tie *c* and upper chord E of the longitudinal girder D, substantially as described and specified.

6. In a guard-rail contraction and expansion joint, the combination of the splice-piece *m*, riveted to one end of the guard-rail and provided with the elongated holes *s s*, with the clamp-pieces *p p*, riveted to the end of the adjacent guard-rail, and bolts *t*, all constructed and arranged substantially as set forth.

In testimony that I claim the foregoing improvement in elevated-railroad and bridge structures, as above described, I have hereunto set my hand this 30th day of January, 1890.

ISAAC S. McGIEHAN.

Witnesses:
HARRY McGIEHAN,
W. H. SPENCER.