



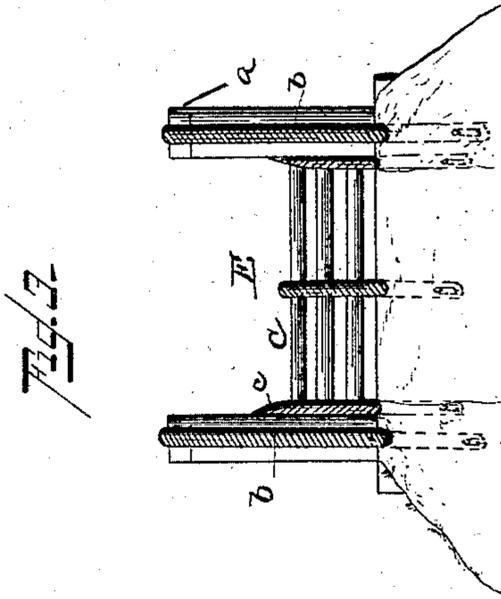
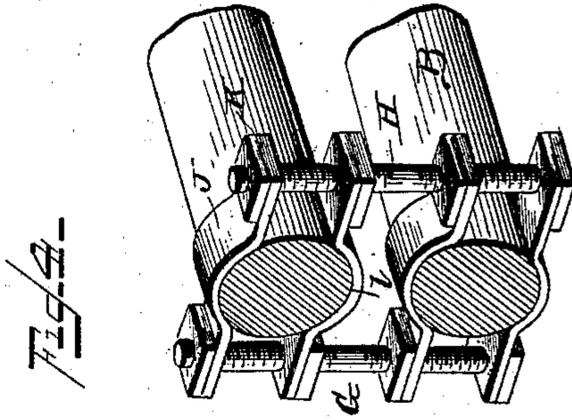
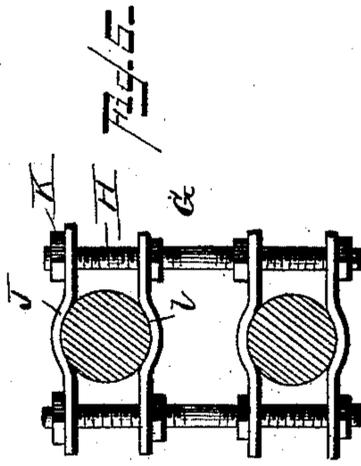
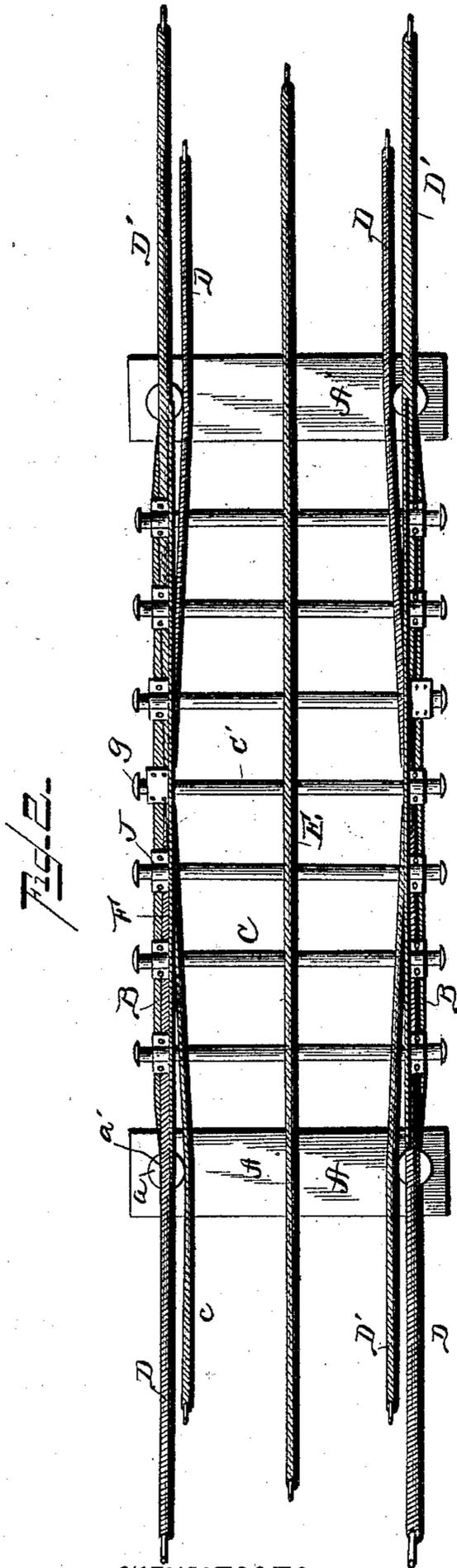
(No Model.)

2 Sheets—Sheet 2.

G. W. LITTLE.  
SUSPENSION BRIDGE.

No. 417,054.

Patented Dec. 10, 1889.



WITNESSES  
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# UNITED STATES PATENT OFFICE.

GEORGE W. LITTLE, OF CARBONDALE, KANSAS.

## SUSPENSION-BRIDGE.

SPECIFICATION forming part of Letters Patent No. 417,054, dated December 10, 1889.

Application filed July 19, 1889. Serial No. 317,977. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE W. LITTLE, a citizen of the United States, residing at Carbon-  
5 Kansas, have invented certain new and useful Improvements in Suspension-Bridges; and I do hereby declare the following to be a full,  
10 clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention has relation to certain new and useful improvements in suspension-  
15 bridges; and the object of the same is to provide a bridge which shall be light in weight, strong, durable, simple of construction, and which at the same time will permit of the same  
20 being so constructed as to meet the various demands made upon bridges of this character.

My invention further has for its object the preventing of the swagging and vibration of the bridge while being crossed, and to means  
25 whereby the cables may be prevented from slipping out of the adjusted position.

My invention further relates to the means whereby the cables and cross-tie rods may be adjustably secured together, and whereby the cross-tie rods may be retained between the  
30 cables.

With these objects in view my invention consists in certain new features of construction and arrangement of parts as will be here-  
35 inafter more fully pointed out in the drawings and described in the specification.

Referring to the drawings forming a part of this application, Figure 1 is a perspective  
40 view of my improved bridge arranged across a stream; Fig. 2, a plan view of the same; Fig. 3, an end view of the bridge; Fig. 4, a detail perspective view, and Fig. 5 is a detail view showing the cables secured between the plates of the cable-clamp.

Similar letters of reference are used to denote corresponding parts throughout the en-  
45 tire specification and drawings.

The letters A A' are used to represent abutments placed at opposite ends of the bridge, and A<sup>2</sup> A<sup>3</sup> hollow cylindrical wrought-iron  
50 pillars secured to the top of the abutments, two upon each. These pillars are provided at their top with the saddles a a.

A pair of supporting-cables B B, anchored at points b beyond the abutments A A', extend over the top of the pillars A<sup>2</sup>, over the  
55 stream or chasm, over the top of the opposite pillars A<sup>3</sup>, and run thence to the point b', where they are anchored. These cables form a support or foundation for the cross-tie rods C, which rest thereon, excepting the center  
60 rod C', over which the center of said cables pass, and which rod is secured to the cables in a manner hereinafter described.

The side stringers are indicated by the letters D D' and consist of four in number, two  
65 to each side of the bridge. The stringer D is anchored at the point d, and runs from thence over the top of the pillar A<sup>2</sup>, over the chasm or stream, passing over the abutment A' between the pillars A<sup>3</sup>, and is secured at the  
70 point of anchorage d'. Stringers D' are anchored at c, pass over the top of pillars A<sup>3</sup>, thence across the stream, over the abutment A, between the pillars A<sup>2</sup>, and are anchored at the point c'. It will thus be seen that the  
75 stringers cross each other at their center directly over the tie or locking rod C', and that the stringers D D' and cables B B rest upon each other at the top of the hollow cylindrical  
80 pillars, and run from thence to their respective points of anchorage interwoven, (so to speak,) thus greatly adding to the strength of the same. The side stringers D D' pass over  
85 the outer ends of the cross-tie rods, thereby holding the same securely upon the cables B B. This pressure upon the tie-rods and cables causes the latter to assume the position  
90 shown in Fig. 1 of the drawings, thus converting the same into truss-cables for the support of the entire structure.

In order to more securely hold the tie-rods in position between the truss-cables and  
95 stringers, and to prevent undue vibration of the structure, I provide the center cable E, which is anchored at opposite points beyond and between the pillars. Said cable passes directly over the center of the tie-rods, and, besides forming means for holding the same  
100 in position, it affords a support for the center of the bridge-flooring, which floor is secured to the side stringers and said central cable in any well-known manner.

The hand-rail of the bridge is represented

by the letters F F, and the free ends of the same pass over the top of the pillars and are wound around the truss-cables and stringers, thereby forming a more secure binding of the same, and are anchored at the points *d c*. At suitable intervals across the bridge the hand-rails and stringers are connected by short rods or cables *f f*, thereby preventing lateral movement thereof.

The tops of the pillars, as before stated, have secured thereon the saddles *a a*, which have the grooves *a'* cut therein, so as to form a snug seat or rest for the several cables passing thereover, and to prevent the projecting of the same over the tops of the pillars. If so desired, the saddles may be provided with covers, in order to protect the top of the cables from the action of the weather.

The outer ends of the cross-tie rods and center tie-rods *C'* are provided with the flange, collar, or head *g g*, so as to prevent the same from being displaced by lateral movement from between the truss-cables and side stringers. This head, flange, or collar may be cast integral with the rods or be made separate therefrom and screwed on.

The whole of the structure is tightened and securely fastened together by means of the tension-clamp G, which clamp consists of the screw-threaded tension-rods H, clamping-plates J J, sliding or working upon said rods, and the nuts K. The clamping-plates have grooves *l* formed therein for the cables to pass through and be more firmly held therebetween. The truss-cables B are secured between the lower clamping-plates and the side stringers between the upper ones, while the tension of the bridge is regulated by the tightening or loosening of the nuts K.

The central tie-rod *C'*, crossed side stringers, and truss-cables are all three secured together by means of the clamp I, which is made somewhat heavier and slightly different, as shown, from the previous-described clamps.

I am aware that many minor changes may be made in the construction of parts herein shown and described without departing from the nature and scope of my invention.

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

1. In a suspension-bridge, the combination, with the end pillars thereof, of the side stringers, truss-cables, said cables and side stringers running over the top of the end pillars and being anchored at points beyond and between the same, and the cross-tie rods fitting between the side stringers and truss-cables, substantially as and for the purpose shown and described.

2. In a suspension-bridge, the combination, with the side stringers thereof, of the end pillars, cross-tie rods, said rods extending the entire width of the bridge, running beneath the side stringers, of the truss-cables extend-

ing over the top of the end pillars and running obliquely downward to the first cross-tie rod and thence beneath the same, and means for connecting the side stringers and truss-cables, substantially as and for the purpose set forth.

3. In a suspension-bridge, the combination, with the cables, for the purpose of adjusting them with relation to each other, of a series of tension devices consisting of screw-threaded rods, clamping-plates located at opposite points of said rods, the inner or opposing faces thereof being centrally recessed, and nuts for adjusting the plates upon said screw-threaded bolts, substantially as set forth.

4. In a suspension-bridge, the combination of the end pillars, grooved saddles secured to the top of said pillars, side stringers running from opposite points across the stream over the grooved saddles of the pillars, said stringers crossing at their center, cross-tie rods passing beneath the side stringers, and the truss-tables extending over the grooved saddles and running from thence obliquely downward to the first tie-rod and thence beneath the same, said truss-cables holding the cross-rods in position, substantially as and for the purpose set forth.

5. In a suspension-bridge, the combination, with the end pillars, of the centrally-crossed side stringers, cross-tie rods located beneath said stringers, central supporting or locking rod, truss-cables running over the end pillars and extending obliquely downward to the first tie-rod, said cables running beneath the cross-tie rods and over the central locking-rod, and of the tension-clamps for holding the cables, side stringers, and cross-tie rods in place, substantially as and for the purpose herein specified.

6. In a suspension-bridge, the combination, with the end pillars, of the centrally-crossed side stringers, cross-tie rods located beneath said stringers, truss-cables running over the end pillars and extending obliquely downward to the first tie-rod, said cables running beneath the transverse tie-rods, and a centrally-located longitudinal cable passing over the abutments and tie-rods and having their ends suitably anchored, substantially as set forth.

7. In a suspension-bridge, the combination, with the end pillars, of the centrally-crossed side stringers, truss-cables, tie-rods fitting between said stringers and the truss-cables, central locking-rod running beneath the stringers and truss-cables, tension-clamps for securing the same together, central cable passing over the tie-rods, hand-rail running above the side stringers and over the top of the end pillars, the free ends of said rails being wound around the cable and stringers, and of the rods or cables for forming connection between the hand-rail and side stringers, substantially as set forth.

8. The combination, with the centrally-crossed side stringers and truss-cables, of the

cross-tie rods having their outer ends provided with a projecting head, collar, or flange, so as to provide against displacement of the same by lateral movement, said rods passing  
5 between the side stringers and truss-cables, and the central cable passing over said tie-rods, said cable being anchored at opposite points beyond and between the end pillars, substantially as and for the purpose set  
10 forth.

9. In the herein-described suspension-bridge, the combination, with the centrally-crossed side stringers, truss-cables, and cross-tie rods, of the tension-clamps, said clamps con-

sisting of the tension-rods, grooved clamping- 15 plates working on said tension-rods, and of the nuts for tightening or loosening the pressure upon the plates, and of the central locking tie-rod secured centrally beneath the stringers and truss-cables, substantially as 20 and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE W. LITTLE.

Witnesses:

JULIUS CLARK,  
HENRY LITTLE.