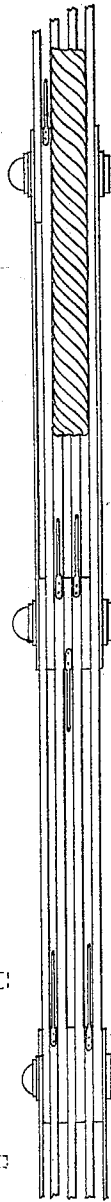
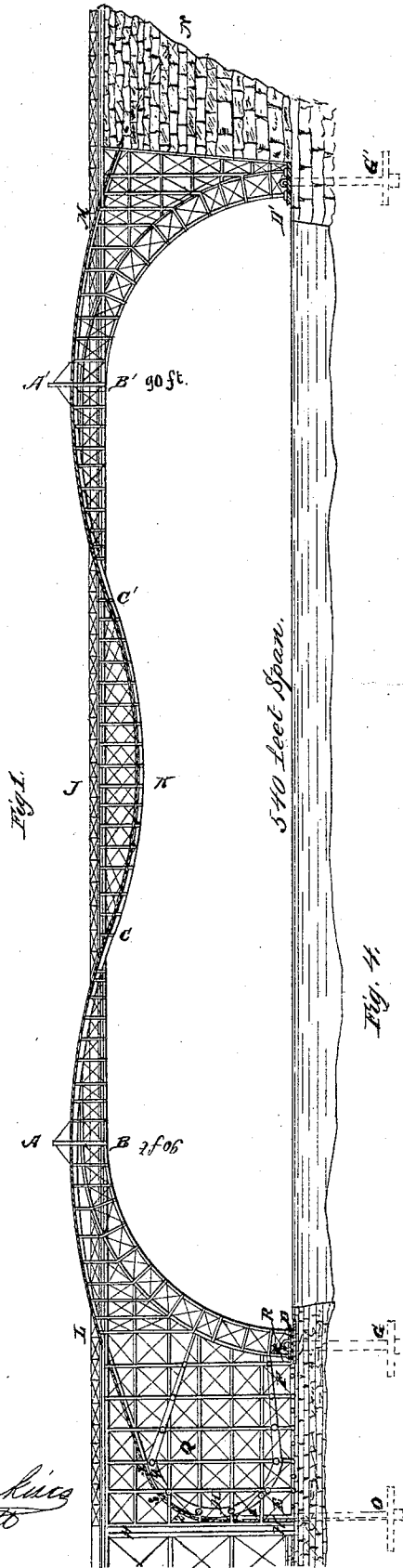


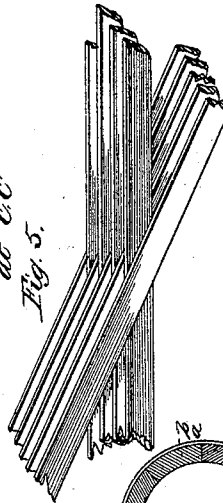
J. D. PIERCE.
Iron Bridges.

No. 141,458.

Patented August 5, 1873.



Isometrical view of Crossing of the Chords.
at C' C'.



Vertical Section at Joints.

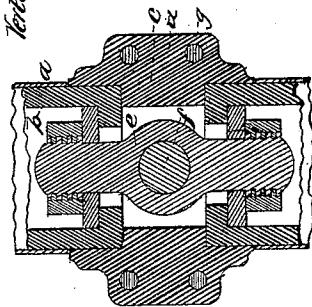
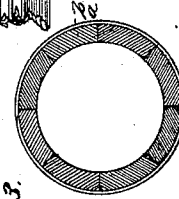


Fig. 3.



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2 Sheets--Sheet 2.

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Fig. 6.
Section through A-B, A'B'.
(Fig. 1.)

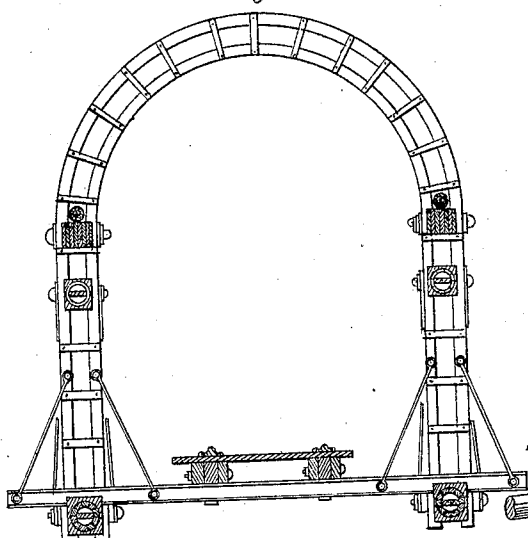


Fig. 7.
Elevation at A-B (Fig. 1.)

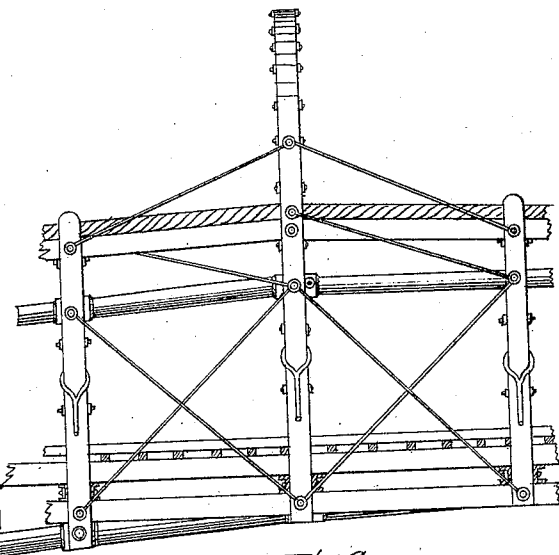


Fig. 8.
Section at C (Fig. 1.)

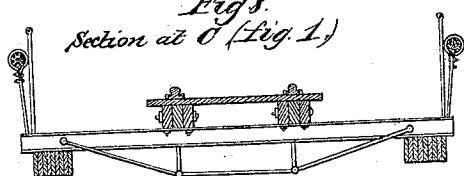


Fig. 10.
Section at J-K

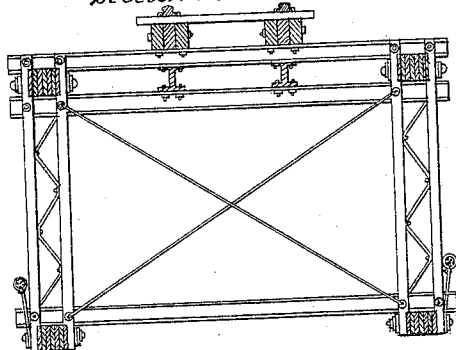


Fig. 9.
Elevation at C (Fig. 1.)

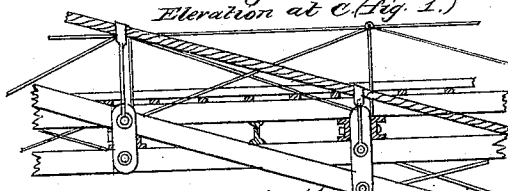
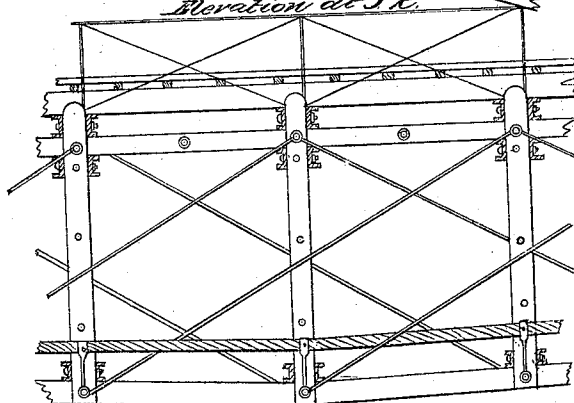


Fig. 11.
Elevation at J-K



Attest.

Wm. Harkness
Geo. C. Brink

Inventor.

Jacob D. Pierce

UNITED STATES PATENT OFFICE.

JACOB D. PIERCE, OF COLUMBIA, MISSOURI.

IMPROVEMENT IN IRON BRIDGES.

Specification forming part of Letters Patent No. **141,458**, dated August 5, 1873; application filed June 17, 1872.

To all whom it may concern:

Be it known that I, JACOB D. PIERCE, of the town of Columbia, county of Boone and State of Missouri, have invented a certain new and useful Improvement in Steel or Iron Bridges, of which the following is a specification:

My invention consists, principally, in considering girders, trusses, and arches as bridge material or members of a bridge only; and in the arrangement of these members or materials in combinations, so as to present a bridge, as a whole, different in organization and architectural appearance from any heretofore made.

The accompanying drawings make a part of this specification, in which—

Figure 1 is a side view of the bridge.

The curved chord $L A C K C' A' M$, with the straight chord $L C J C' M$ intersecting it at O and C' , may be considered as making three "bow-string girders," though each chord is continuous and unbroken, forming, as may appear, a linked truss. The side or end trusses $L C$ and $C' M$ are considered as pivoted at B and B' on the ribbed arches $B D$ and $B' D'$, and made secure in place by throwing their curved chords into tangents at L and M and anchoring these securely at O and N . The middle or center trusses $C C'$ are formed by reversing the curved chords $L A C$ and $M A' C'$ at C and C' , and the straight chord $L C$ produced to C' . This middle truss may be viewed as suspended from the other two end or side trusses, or resting on their ends at C and C' . This center truss or span is further supported by a wire cable coming over the crown of the other two trusses or end spans, as if over towers, and swinging by its side with slings to be fastened to the pins joining the foot of the struts to the curved chord. By tightening up these slings from the cable the tension of the continuous chords $L A C K C' A' M$ is relieved at will, and much stability and compactness given to the whole structure in fixing it to the earth at each end. The cable is securely anchored at O and N with the curved chord produced at the same places. The bridge is considered fixed at D' upon and against masonry immovable. The other end at D is arranged for expansion and contraction, thus: The ribbed arch ends on an ample

iron or steel plate resting on rollers carried by another plate bedded in the masonry. At R is an upper roller in the upper end of the anchor G . Thus the arches end on a plate between upper and lower rollers, between which it is free to move, according to thermal demands. This is sufficient for the arches or compressive members; but the cable and the tension-chord $L K M$, in the matter of harmonious expansion and contraction with the ribbed arches, is provided for as follows: The trestling at Q is especially strong and consolidated and united with the ribbed arches; it rests on flanged rollers from E to F , carried by rail. The grooved and curved member H is fixed to and between the vertical and inclined supports of this trestle. This forms a drum-like arrangement, around which the curved chord and the cable can be turned from a tangent and carried to their anchorage at O . An open space, covered by slip joints, is left at $H H$. Thus, all this end of the bridge is free to move together, according to thermal demands, from H to D , and all expansion or contraction of the tension-chord and cable is conformed to by the longitudinal expansion and contraction of the bridge at large exactly. The curved chord in its passage through the trestle from L to anchorage at O is bolted by its link-pins to the trestle at 1 2 3 4 5. Thus this end of the bridge and trestle becomes bonded and rooted to its foundation, and left free to move longitudinally on its rollers only, and then only from the demands of change of temperature.

In the way of further elucidation of this side view or elevation reference is hereby made to Figs. 2, 3, 4, 5, 6, 7, 8, 9, 10, and 11.

The ribbed arches are modeled in the main after those in the Illinois and St. Louis bridge, (by special permission,) particularly so as to compression, but how far they coincide in arrangement for tension I do not know.

Fig. 2 is a vertical section of a joint in the arches between D and B .

a shows a cylindrical lap-welded tube; b , the steel staves; c , the cuff; d , a flange to the cuff; e , large bolt with washers and nuts to link the staves; f , bolt to hold struts, &c.

Fig. 3 shows section of tube and its steel staves between joints.

From A to B to $A' B'$, Fig. 1, all chords are

alike, but properly linked, for tension or compression, to the arches.

Fig. 4 is a partial plan of the chord, showing how they are linked at intersection of each post or strut, and with the same pin bolted to them. This figure also shows how the cable rests on the upright portion of the tension-chord in its passage to support of the span in the center, with some resultant firmness to the whole structure.

Fig. 5 shows how the curved chords and direct chords pass through the respective slots of each without injury to one or the other.

Figs. 6, 7, 8, 9, 10, and 11 show so plainly for themselves that a written description is not deemed necessary for their elucidation.

I have not undertaken to go into full details of the construction of any of the arches, girders, or trusses, as a knowledge of these in other structures readily applies in this case.

What I claim herein as new, and desire to secure by Letters Patent, is—

1. The arrangement of one of the chords of a bridge in three reversed curves to act alternately as a top and bottom chord, and the extension of the same in full size at tangent to anchorage, as one of the main or primary features of seating or upholding the bridge.

2. The application of cables to the support of the center of bridges by passing them over arches combined with trusses in place of upright towers.

3. The combination of upright and suspended arches with three trusses in the organization of one span of a bridge, and all without the aid of towers, substantially as and for the purpose described.

Witnesses: JACOB D. PIERCE.

ROBERT L. TODD,
JNO. T. CLARKSON.