J. L. Jones,

Truss Bridge,

No. 39,447, Patented Aug. 4, 1863.

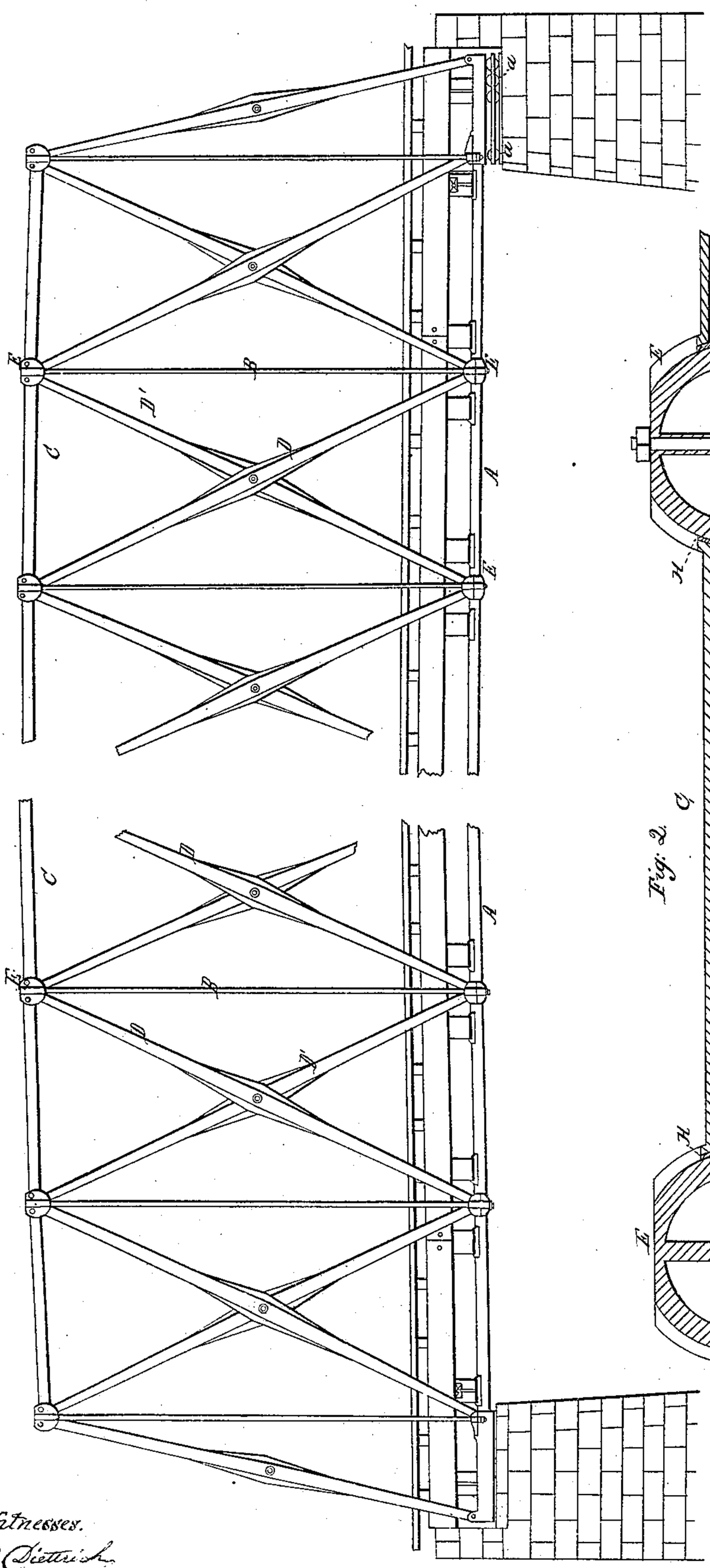

Fig. 1.

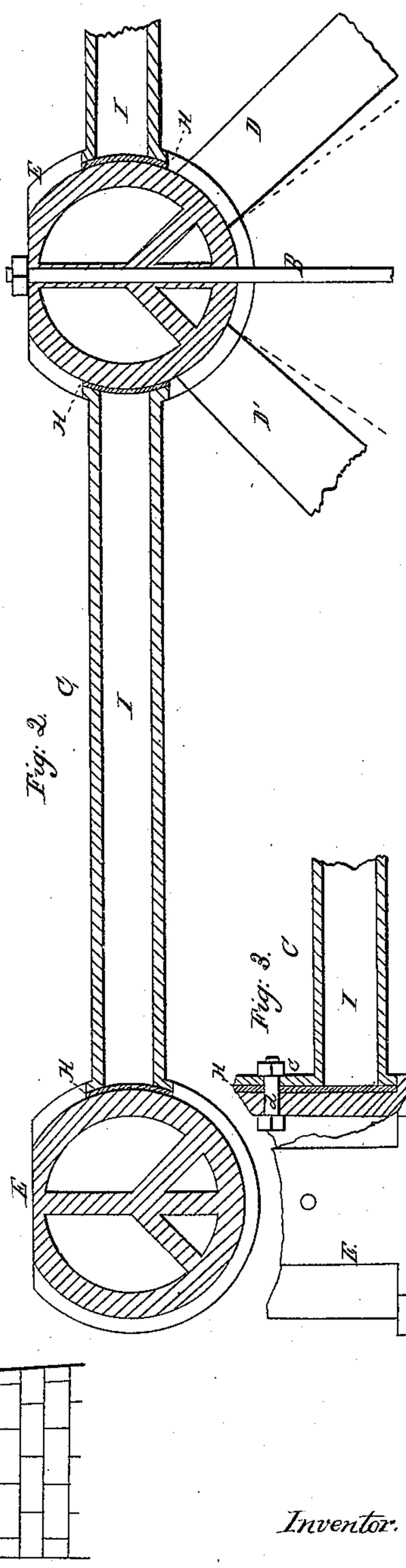

Fig. 2.

Fig. 3.

Witnesses.
Gustave Dietrich
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Inventor.
Jonathan. L. Jones

UNITED STATES PATENT OFFICE.

JONATHAN L. JONES, OF ST. LOUIS, MISSOURI, ASSIGNOR TO HIMSELF AND JAMES V. WESTLAKE, OF SAME PLACE.

IMPROVEMENT IN TRUSS-BRIDGES.

Specification forming part of Letters Patent No. **39,447**, dated August 4, 1863.

To all whom it may concern:

Be it known that I, JONATHAN L. JONES, of St. Louis, in the county of St. Louis and State of Missouri, have invented a new and useful Improvement in Changing or Reproducing Camber in Iron Truss-Bridges; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevation of an iron truss-bridge patented to me on the 6th of November, 1860, with the addition of rollers *a a* and my present invention. Fig. 2 is a vertical section showing my present invention applied to said bridge, or as it may be applied to any jointed truss-frame operating on the same principle. Fig. 3 is a top and sectional view of my invention.

Similar letters of reference in the several figures indicate corresponding parts.

The trusses of my bridge consist of a system of chords and stringers, braces and screw-rods, all arranged in such manner that the component parts of each truss can accommodate themselves to such variations in the camber or "verse sine" of the bridge as may be produced by the changes of temperature, heavy weights running over the bridge, and from other causes, and also from the application of my present invention to the bridge for the purpose of restoring or reproducing the camber, which, on account of the causes just mentioned, may have been seriously impaired or destroyed in such a manner as to render the bridge incapable of sustaining itself or heavy weights passing over it.

To enable others skilled in the art to make and use my invention, I will proceed to describe the same with reference to the drawings.

A is a lower chord for a bridge. It is jointed at the point where the vertical tie-rod B intersects the same. C is the upper stringer of the bridge. It also is jointed at the point where the vertical tie-rod intersects it.

D D′ are the main and counter braces, the main braces D standing diagonally to the counter braces D′, and both sets abutting against the cylindric blocks E, which constitute the axis around which the various parts of the truss move in the path of a vertical circle. I will here state that one end of the bridge rests on rollers *a a*, and that, as the parts of the truss change their relative positions in a manner to lengthen or shorten the chords, this end of the bridge moves over these rollers without straining the masonry in a longitudinal direction. The bridge represented I prefer to employ in connection with my present invention as a practical demonstration of the same over the Joachim Creek on the St. Louis and Iron Mountain Railroad has proven the superior utility of the plan; but while I prefer this plan, I do not restrict my present invention to it, as it is useful and important in connection with all jointed bridges which are liable to lose their supporting capacity by a falling of the chords below a horizontal line.

The nature of my invention consists in increasing, restoring, or producing a camber or the verse sine of a truss bridge by the employment of plates to lengthen the sections of the upper stringer. These plates are rendered necessary from the fact that, as the chord of the arc of the lower stringer is shortened to give the desired camber, the chord of the arc of the upper stringer is lengthened, this operation being due to the approximation of the upper and lower stringers, and the moving apart of the sections of the upper stringer and the drawing toward one another of the ends of the lower stringer, all as hereinafter described.

It is well known by bridge-builders that a camber can be imparted to any truss-frame by increasing the distance between the tie-rods or the length of the respective sections of the upper stringer with respect to the length of the sections of the lower stringer in proportion to the camber that may be desired. This is generally done by increasing the length of the center sections of the upper stringer. Then, if in a metallic truss-framed bridge the camber is impaired by the subsequent elongation of the stringers, which may, with good reason, be expected to take place, I employ in my bridge the device of metallic plates H, which are inserted between the ends of the upper stringer-sections, I, and the cylindric blocks E, as represented. I can attain the same result in a more perfect manner. In order to prevent the entire separation of the blocks and sections, I form flanges *c* on the sections I, and insert

bolts *d* through the flanges, plate, and shell of the blocks. The bolts are furnished with screw-threads to receive nuts, and they are made long enough to allow the sections to move apart, and to allow this movement the nuts are slackened at the proper time. The holes in the shell of the blocks are elongated in the circle of the blocks, so as to allow the parts of the bridge to change their respective relations with one another as occasion requires. The plates H are of a thickness proportionate to the degree of camber that it is desirable to produce or reproduce.

The importance of imparting, and at all subsequent periods to the erection of the bridge, to maintain a camber or verse sine in a truss-bridge or frame is well known to practical bridge-builders; for it is evident that whenever a truss-frame sinks or settles below a horizontal line the upper stringer no longer offers resistance in a longitudinal direction by compression, but the force is changed to a transverse strain. So, also, the strain on the lower chords or stringer is in a manner changed from direct tension to tension combined with cross-sectional strain. The thickness of plates used to reproduce or change the camber can be ascertained by calculation, as both the upper and lower chords or stringers are designed to represent arcs of "concentric circles." The verse sine and number of sections of the bridge being known, also the height of truss, we may by calculation ascertain the circumference of each circle represented by the upper and lower chords or stringers of the truss, and, in proportion to the circumference of each segment or arc so is the difference in the length of each section of the upper and lower stringers. The vertical tie-rods represent radial lines passing through each segment or arc and terminating in the direction of a common center. For example, I wish to construct a bridge on my plan of one hundred and forty feet span, the truss being divided into fourteen panels or sections and twenty feet high, and I desire the verse sine or camber to be five inches when the bridge is adjusted and the false work removed; and, further, the truss to have five feet bearing on each abutment. I divide the "clear" span into fourteen equal panels or sections of, say, nine feet three and one-half inches, then by calculation, as before mentioned, I find that I must make the sections of the upper stringer about nine feet four and one-eighth inches long.

In the course of a few years, by the constant passage of heavy trains, the joints become compressed or the lower stringer elongated, so as to cause the truss-frame to sink to or below a horizontal line. When such becomes the case, as is frequent, the bridge is unsafe for the passage of trains, and to avoid rebuilding the bridge or making new sections for the upper stringer, I employ my invention on plates of a thickness proportionate to the degree of camber or verse sine desired, and in order to apply them to reproduce a camber it will only be necessary to replace the scaffolding or false work and unpack or disjoint the upper stringer of the bridge and insert the plates, as represented. Should such elongation or compression take place to a greater degree in one or more panels or sections than in other sections, which is likely to be the case, I have only to ascertain the fact with the "tram-rod" or other instrument and vary the thickness of the plates so as to compensate for the unequal lengths of the sections in proportion to such elongation or compression. In ordinary bridges the counter-braces must be lengthened, either by keys or plates inserted under the ends of the counter-braces, while the distance between the upper and lower stringers remains the same; but in my bridge, by lengthening the sections of the upper stringer in proportion to the elongation of the lower stringer by means of plates H at the joints or ends of the upper sections, and the screws at the ends of the tie-rods B, this process in the old style of bridges is obviated, for I lessen the distance between the upper and lower stringers, and the angles of the braces become obtuse, as indicated by the red diagonal lines, and thereby re-establish the camber which was impaired or destroyed by the elongation of the stringers or from other cause. If the restoration of the camber be accomplished by keeping up the counter-braces, the keys will become loose and work out, as a downward force operating on a truss-frame has a tendency to loosen any keys that may be used to lengthen the braces; but if plates be inserted in the upper stringer according to my invention, the compressive action that a downward force produces will cause them to retain their places at all times.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The production of a camber or verse sine or changing or reproducing the same in a truss-bridge by means of plates H, or their equivalents, applied in combination with longitudinal sections of the upper stringer, substantially as set forth.

2. The construction of the plates H with bolt-holes, in combination with the perforated blocks and perforated flanges of the longitudinal sections of the upper stringer, substantially as and for the purpose set forth.

3. The use of the plates H, in combination with the blocks E, the tie-rods B, and braces D D′, substantially as and for the purpose set forth.

4. The combination of the plates H, blocks E, tie-rods B, braces D D^2, and upper and lower sectional stringers, substantially as and for the purposes set forth.

JONATHAN L. JONES.

Witnesses:
CHAS. L. RICHARDS,
GUSTAVE DIETERICH.