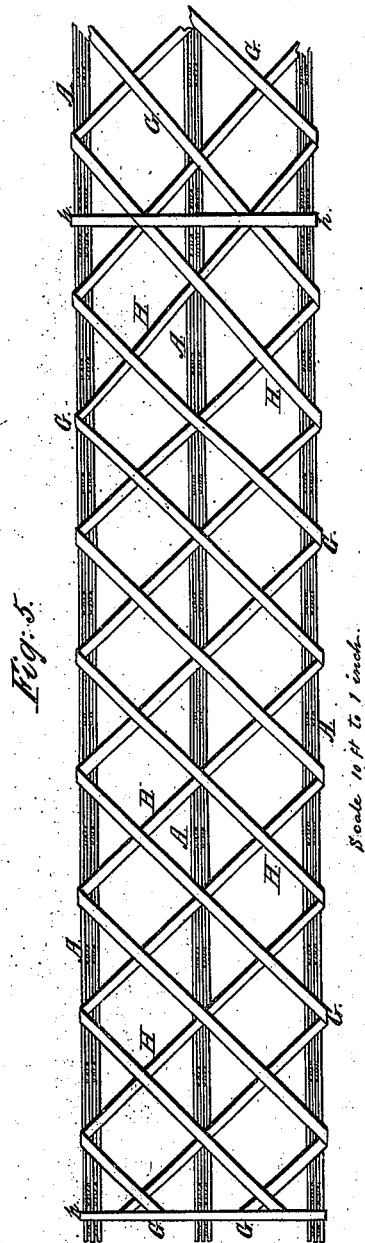
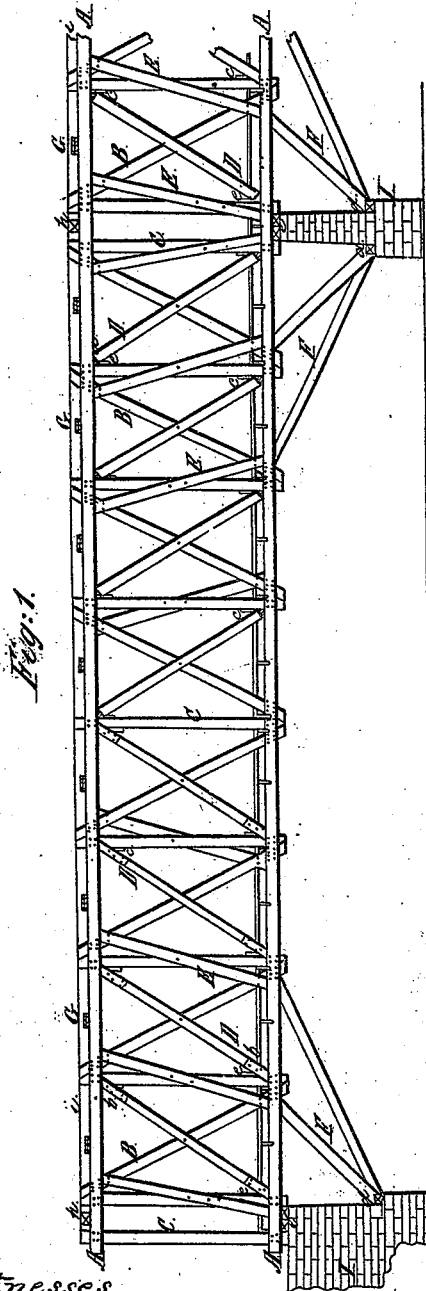


S. H. Long.
Truss Bridge.

N^o 5,366.

Patented Nov 13, 1847.



Scale 10 ft to 1 inch.

Witnesses.

H. S. Blair
C. A. Fuller

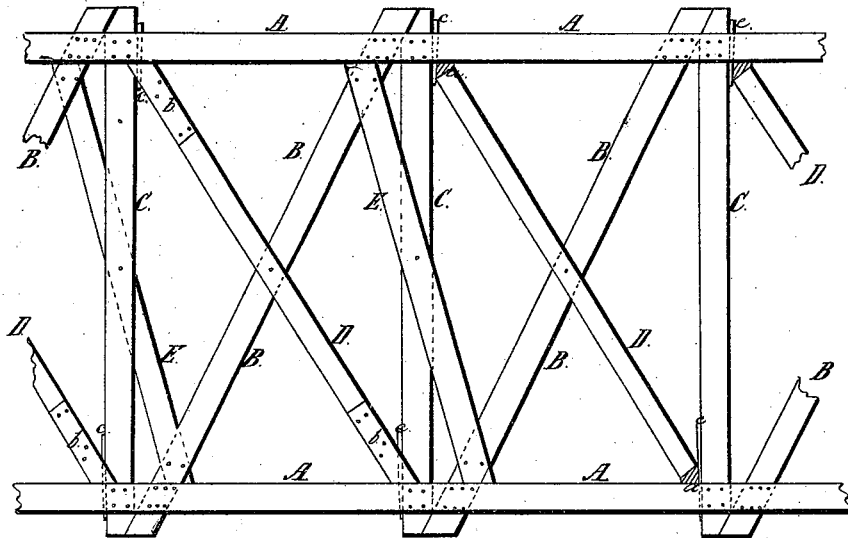
Inventor
Stephen H. Long

S. H. Long.
Truss Bridge.

N^o 5,366.

Patented Nov 13, 1847.

Fig. 2.



Scale 4 ft to 1 inch.

Fig. 4.

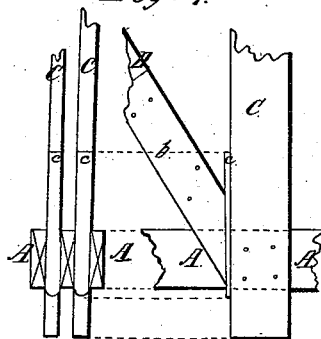
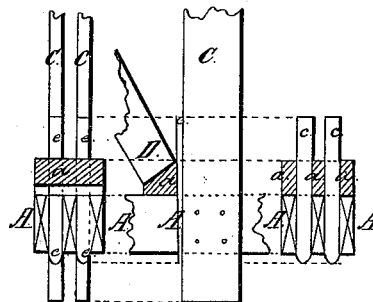


Fig. 3.



Scale 2 ft. to 1 inch.

Witnesses.

W. S. Blair
C. A. Fuller

Inventor
Stephen H. Long

UNITED STATES PATENT OFFICE.

S. H. LONG, OF LOUISVILLE, KENTUCKY.

BRIDGE.

Specification of Letters Patent No. 5,366, dated November 13, 1847.

To all whom it may concern:

Be it known that I, STEPHEN H. LONG, of Louisville, Kentucky, assigned to the U. S. Corps of Topographical Engineers, have
5 invented a new and useful Method of Constructing Wooden or Frame Bridges, which I shall describe under the name and designation of the "Composite Bridge," of which the following is a true and adequate description.

10 The composite bridge is so called from the fact or circumstance that it comprehends the principles of my brace and suspension bridges patented in 1839, combined and rendered operative in the truss frames of a
15 single bridge, and is composed of two or more single, double, triple, or quadruple truss frames, staged, supported and strengthened by the aid of such transverse, and lateral
20 braces, arch braces, flooring, &c., &c., as may be deemed most suitable for these purposes. This bridge is distinguished from other bridges heretofore invented and now in use, by certain differences and combinations in
25 the arrangement and operations of its parts, which will be duly considered in this specification.

Each truss-frame of the composite bridge comprises the following parts all composed
30 of timbers of uniform or nearly uniform transverse dimensions, varying from one to four inches in thickness and from six to fifteen inches in width, their respective lengths being variable according to the positions
35 they respectively occupy in the truss frame. These parts are as follows, viz, strings and splices; main suspensor braces; posts or vertical ties; main thrust braces, brace bolsters or brace gluts; brace keys or wedges together
40 with such arch braces—lateral and transverse braces, flooring, roofing, bolstering, treenailing, &c., as have heretofore been employed in bridge building, or may hereafter be deemed expedient. The strings and their
45 splices are similar in all respects to those employed in my suspension bridge before cited.

The main suspensor braces are inserted in the truss frame in the same manner as specified in my patent for the suspension bridge
50 before alluded to, but are so arranged in their connection with other parts of the truss frame, that they are enabled to act both by tension and by thrust or by either of these
55 forces according to the stresses or actions to

which the posts and main thrust braces of the truss frame, are subjected. These braces are so arranged that they act alternately as main braces and as counter braces, according as the exigencies of the case or the stresses
60 upon the bridge may require the one or the other of these actions.

Note: The main suspensor braces may be rendered contractile by introducing in connection therewith, splicing pieces, gibs, keys,
65 &c., after the manner observed in the application of these parts to the splicings of the inferior arch braces, of my brace bridge, except that they are so arranged as to reduce instead of increasing the length of the braces.

70 The posts or vertical ties instead of abutting against the strings as in my suspension bridge, or of being confined between the string pieces by means of gibs and keys as in my brace bridge, pass through and between the string pieces as in the latter, and are confined by means of tree nails, or other similar fastenings, passing through them and the strings. The posts occupy the same
75 spaces between the string pieces, as those occupied by the suspensor braces, and have their extremities exteriorly of the strings so scarfed and adjusted as to bring them respectively into close contact with the edges
80 of the braces with which they are associated. Their operation is such as to keep the upper and lower strings of the truss frame at fixed distances asunder, obviating any and every
85 tendency both to increase and to diminish these distances.

Note: Whenever I have occasion to insure and maintain the action by tension in the main suspensor braces, (together with that by thrust in the main thrust braces,) I employ in connection with the posts, stretchers
90 composed of splicing pieces, gibs and keys, &c., after the same manner as those employed in the inferior arch braces of my brace bridge; by means of which the distances between the upper and lower strings, may be
100 increased or diminished at pleasure. This arrangement contemplates merely the action of thrust in the posts, and not that of tension.

The main thrust braces occupy the relative
105 positions assigned to the main braces in my specification of the brace bridge, before cited. The parts of which each brace is composed are clamped together by means of treenails or screw bolts, and blocks or gluts interven-
110

ing between the parts, in such a manner as to keep them all in their appropriate relative positions. The number of brace pieces in each panel of the truss frame, is the same as the number of string pieces in each of the strings, instead of being the same as the number of spaces between the string pieces, and instead of abutting against the posts, they abut against the string pieces or brace bolsters; moreover instead of being closely connected to the posts by means of tuscums and shoulders their extremities are rendered movable along the strings, by means of bolsters or gluts and keys or wedges, whereby the trussing of the bridge is effected in a manner different from any method heretofore adopted for this purpose. The main thrust braces may be inserted in or withdrawn from truss frame, at pleasure.

Note 1: Instead of the relative positions assigned as above to the main thrust braces I sometimes introduce these parts in a manner to extend diagonally through two or more panels, and to subserve the purposes of side arch braces as well as those of main braces. The arrangement here contemplated, is such, that two sets of braces may rise from the lower string at and near the second part of the span, counting from the abutment or pier, one set extending through the second panel, and the other through the second and third panels from the abutment or pier, also that two other sets may rise in like manner at and near the foot of the third post, one set extending through the third, fourth, and fifth panels, from the abutment or pier. This arrangement is duly represented in the accompanying drawings.

Note 2: I sometimes fortify the truss frame by inserting extra braces especially in the first and second panels from the abutment or pier, in connection with the main suspensor braces and the posts. The extra braces rise from the lower string about midway of the abutment or pier panel, or immediately back of the suspensor braces at their points of connection with the lower string, cross the suspensor braces and the posts obliquely and terminate at the lever side or edge of the upper string. The extra braces may comprise the same number of parts as the main thrust braces and are confined in their places near their heads and feet, by treenails passing through them and the suspensor braces at the places where these parts cross each other.

The brace bolsters are situated at the extremities of the main thrust braces, occupying a position between their extremities and two alternate angles of each panel of the truss frame, and serving as recipients of the thrust or action communicated by the main thrust braces. The length of the bolsters is at least equal to the horizontal thickness of each string. Their transverse sec-

tion is in the form of a trapezoid with two right angles at its base and one oblique side opposite to the same, the base is applied to the string, and its longest perpendicular, or back side, to the post. The obliquity of the sloped side, is such as to form a right angle or nearly a right angle with the direction of the main thrust brace, on the back of each bolster, or the side applied to the post, recesses are formed in the bolsters adapted to the reception of keys or wedges which are inserted between the edges of the post and the bolster as a means of forcing the latter, together with the end of the brace, to slide along the string in a manner to subserve the trussing of the frame, and of imparting to it the requisite camber.

Instead of bolsters as just described I sometimes use brace gluts as a means of trussing or straining the bridge. These are pieces of timber of the same width and thickness as the brace pieces, and two to four feet in length. The gluts are inserted between and at each end of the brace pieces protruding beyond the ends of the latter, for enough to reach nearly or quite through the string. They are firmly fixed in the braces, by means of treenails passing entirely through them and the braces. Each glut is scarfed or sloped at its outer end in such a manner as to admit a key or wedge between it and the edge of the post, by means of which the tressing and cambering of the frame is effected as before.

The brace keys or wedges are inserted as before remarked, between the brace bolsters or gluts and the posts, and their adjustments may be such as to admit of their being driven either upward or downward as circumstances may require. In general I find such adjustments as will admit of driving the lower keys downward and the upper keys upward, the most convenient, and useful. The length of the keys, ordinarily may vary from two to three feet. Their width must be equal to the thickness of the post or brace timbers, and their thickness may be about one inch at the points and three or four inches at the butts. They may be sheathed on their faces and heads, with sheet iron of any suitable thickness, if deemed advisable.

The relations subsisting between the several parts above described, and the manner in which they are connected together, are clearly shown in the accompanying drawings, which together with the explanations thereof are intended to constitute a part of this specification.

The treenails, screw-bolts, screws &c. should be similar in size, shape and dimensions, to those described in my patent of 1839 before cited, moreover, the lateral, the transverse, and the arch bracings of the bridge, as also its floorings, its roofing &c.,

&c., may be such as have been described in my former patents, or such as have been adopted in other methods of bridge building.

In constructing my composite bridge I usually keep the lower string as nearly straight as practicable, while to the upper string I give a rising or curving camber, such as may result from a rise of about one inch at each successive post, counting from the abutment or pier, toward the center of the bridge span, varying the successive rises in such a manner as to produce a regular curve in the upper string, so that in a bridge span of twelve panels, the distance between the upper and lower strings, will be about six inches greater at the center than at the extremities of the span, and this distance will be increased or diminished in proportion as the span contains a greater or less number of panels. The camber thus given will be somewhat increased, when the trussing of the bridge shall have been effected by driving the brace keys intended for this purpose.

In further illustration of my invention as above I hereto annex the accompanying drawings and explanatory references, which I have prepared for this purpose, and to which I refer as part and parcel of this specification, viz:

Figure 1, is a side view of one of the truss frames of the composite bridge, showing the manner of arranging and connecting the several parts of which it is composed. N. B.—The right half of this figure, represents the manner of introducing the brace bolsters, and the left half, the manner of introducing the brace gluts. Fig. 2, shows the manner of introducing the brace bolsters and gluts, and their keys, the manner of connecting the main suspensor braces, main thrust braces and the posts or vertical ties, at the places of their insertion in the strings together with the application of the extra braces. Fig. 3, enlarged sectional views of the bolster and other parts connected therewith projected into each other. Fig. 4, enlarged sectional views of the glut and other parts connected therewith projected into each other. Fig. 5, the lateral bracing of lattice work as applied to the composite bridge.

References to the parts represented in the figures A, A, &c., are the strings of the truss frame composed of two or more pieces, together with the splicings, as heretofore patented. B, B, &c., the main suspensor braces, each consisting of one or more pieces. C, C, &c., the posts or vertical ties, consisting of the same number of pieces as the main suspensor braces. D, D, &c., the main thrust braces. The number of pieces in each brace,

exclusive of the bolsters or gluts, &c., may be the same as that of one of the strings. a, a, &c., the brace bolsters; b, b, &c., the brace gluts; c, c, &c., the brace keys; d, d, &c., the arch brace bolsters; e, e, &c., the bridge bolsters. E, E, &c., the extra braces, and their positions with respect to other parts of the truss frame. F, F, &c., the inferior arch braces. G, G, &c., the lateral bracing with its ribands, &c. H, H, &c., the lattice braces; h, h, the beams; i, i, &c., the ribands. I, I, &c., the abutments or piers of the bridge.

N. B.—The places of the treenails, screw bolts &c., are indicated in the several figures by small circles or dots. Moreover the parts in each figure are uniformly represented by the same letter.

Having thus fully described the manner in which I construct my composite bridge, I hereby declare that the improvements claimed by me as new therein, and which I desire to secure by Letters Patent are the following, that is to say:

1. I claim as new, useful and original the method of trussing or straining the truss-frames of bridges and other analogous structures, in the manner and by the means set forth and described in the foregoing specification, that is, by inserting and driving keys or wedges, between the posts, or vertical ties which are stationary, and the bolsters or gluts which are movable; whereby the said bolsters, or the said gluts, together with the ends of the main thrust braces, may be made to slide along the strings; and the requisite trussing or straining may be produced, and imparted to the truss-frames, without changing the relative positions of the strings, posts, or main suspensor braces.

2. I also claim as new, useful and original the application and use of the extra or auxiliary braces in connection with the posts and main suspensor braces, and abutting against the string pieces, in the manner set forth and described in the said specification, for the purpose of strengthening, stiffening, and otherwise fortifying the truss-frames of bridges.

3. The several arrangements and combinations of parts and principles, contemplated in the foregoing specification and claims together with the various actions and operations therein considered, are to be regarded as distinguishing features of my composite bridge when compared with those of all other bridges.

STEPHEN H. LONG.

Witnesses:

JAMES S. PIPER,
SAM. STELLINEW.