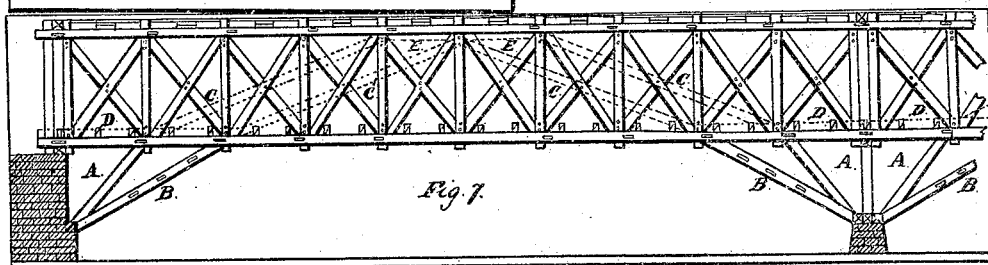
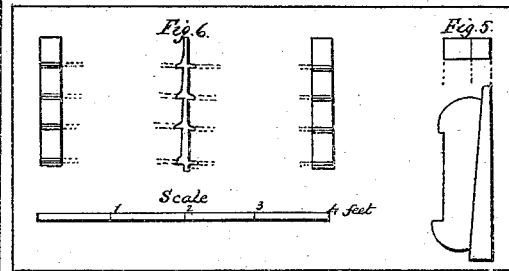
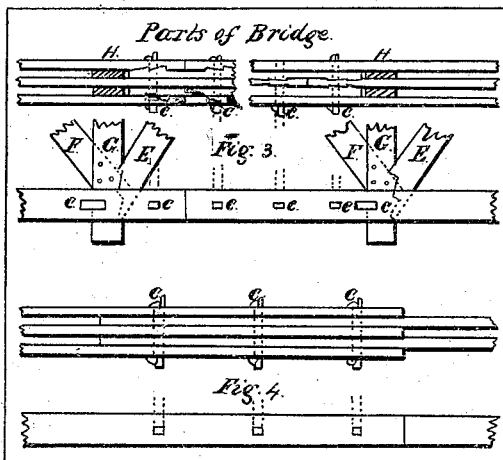
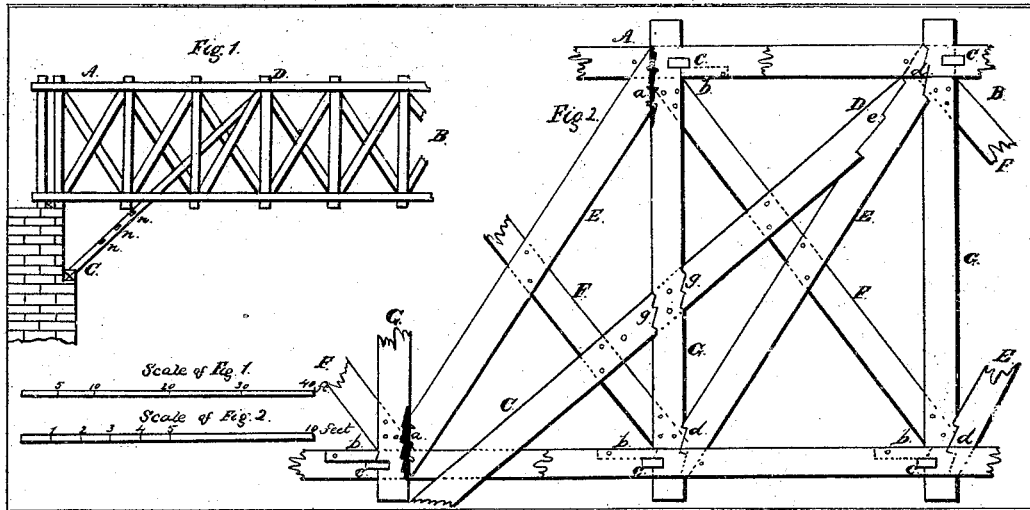


S.H. Long.

Truss Bridge.

No 1,398.

Patented Nov. 7, 1839.

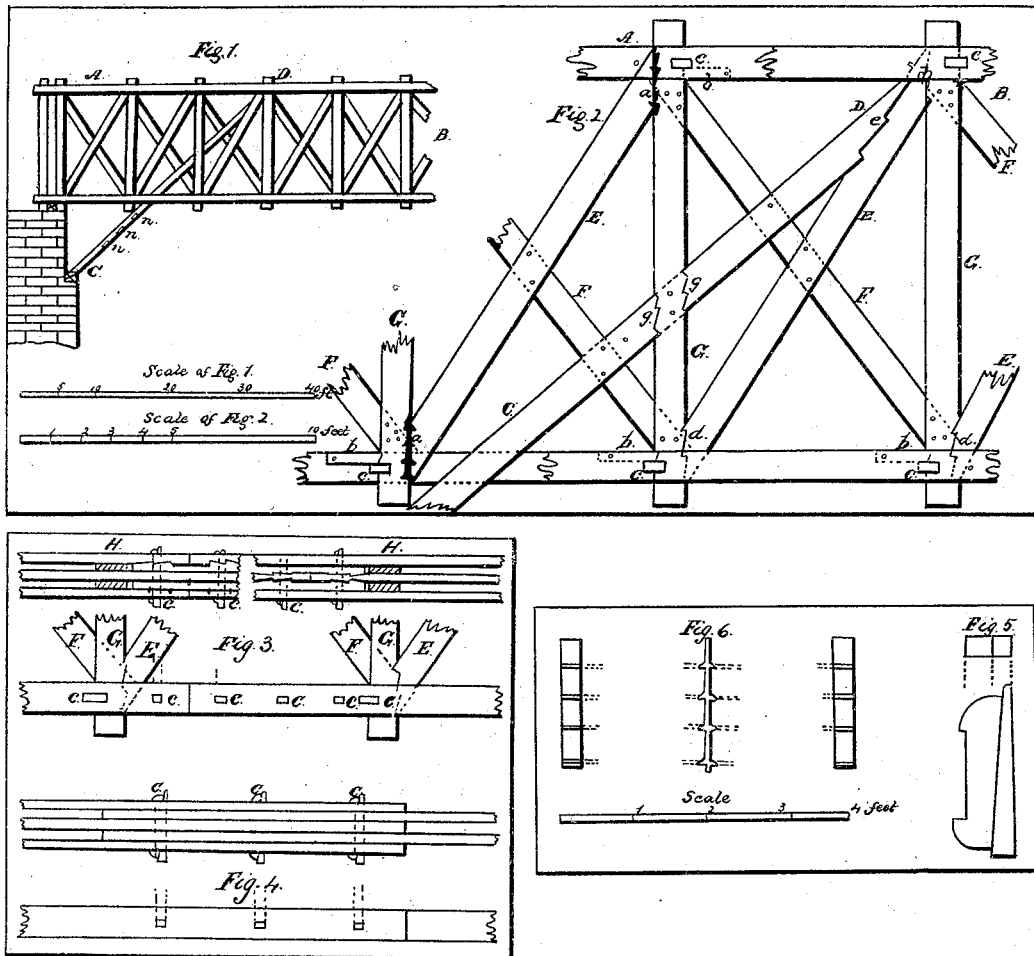


S. H. Long

Truss Bridge.

No. 1398.

Patented Nov. 7, 1839.



# UNITED STATES PATENT OFFICE.

STEPHEN H. LONG, OF THE UNITED STATES ARMY.

## WOODEN-FRAMED BRACE-BRIDGE.

Specification forming part of Letters Patent No. 1,398, dated November 7, 1839; Reissued July 20, 1841, No. 34.

*To all whom it may concern:*

Be it known that I, STEPHEN H. LONG, of the United States Engineers, have invented certain Improvements in the Construction of  
5 Wooden or Frame Bridges, the objects of which are greater simplicity, economy, and efficiency in the mode of bridge-building and in the arrangement of the parts of bridges than have hereto been attained by any combination of principles or arrangement of  
10 parts heretofore adopted in structures of this nature.

The several parts of the bridge to which said improvements relate are the strings and  
15 the splices, the posts, the main braces, the counter braces, and the arch braces of a truss frame, and also the manner of trussing or straining the truss frames.

The several parts above enumerated have  
20 the same relation to the bridge and are intended to impart a similar efficiency in sustaining it as those designated by the same names in the several patents obtained by me for wooden or frame bridges, and to which  
25 reference may be had. These parts, however, in the structure herein described vary materially in their relative, and especially in their transverse, dimensions of the timber used from those contemplated and described  
30 in the patents above cited. Instead of timbers of various sizes and of nearly a square form, the several parts alluded to are to be uniform, or nearly so, in all their transverse dimensions, a transverse section of each timber of all the parts having the form of a  
35 parallelogram, varying from two to four inches by eight to twelve or fifteen inches, according to the length of the bridge-span, the weight of the load to be sustained upon  
40 the bridge, and other circumstances connected with these considerations. Instead of notches, or recesses, in the string-pieces and posts, by means of which these parts are locked together, and instead of wedges at  
45 the insertions of the posts between the string-pieces, the connections between the posts and strings are effected by means of gibs and keys passing entirely through the strings transversely thereof, and at the same  
50 time resting in notches prepared for the reception of the gib and key, in the back of the post, or in the side opposite to the points, or steps, at which the main braces communicate their thrust against the posts, the  
55 notches serving to regulate and maintain the

relations, with respect to distance, between the upper and the lower strings, the gibs serving to clamp the string-pieces together and the keys serving not only to confine the strings to the posts, but also to impart the  
60 requisite trussing to the truss frame, and at the same time to force the counter braces into appropriate action. Joggles, or pieces of timber about two feet long, three inches thick, and three or four inches wide, are inserted in the spaces between the string pieces and immediately behind the posts, for the  
65 purpose of aiding the gibs and keys in counteracting the thrust of the main braces. The joggles are applied subsequently to the adjustments effected by trussing, being confined at one end by appropriate notches in the posts for their reception and at other by  
70 treenails passing through them and the string pieces. The main braces are connected to the posts by means of notches, or steps, in the latter, adapted to the reception of tuscums at the ends of the former.

Instead of tuscums and steps, as described in the preceding paragraph, steps of cast-iron, with appropriate lugs or bearers on opposite sides of each step, adapted to suitable receptacles for the same in the post and  
80 braces, as represented in the accompanying drawings, may be substituted for the purpose of receiving and resisting the action to which these parts are subjected.

The counter braces occupy the entire distance between the upper and lower strings diagonally of each panel of the truss frame, and are confined between the posts by treenails passing through them and the posts near the strings. They may also be confined to the main braces by treenails passing through them at the intersections of the  
90 former with the latter. The counter braces are brought into their appropriate action by straining upon the gibs and keys of the strings, in the manner before explained.

The arch braces rise in three or more  
100 pieces from a bench, or bolster, attached to the abutment, or pier, below the bridge, pass through the lower string in two or more pieces, within the openings, or interstices, occasioned by the posts and main braces,  
105 enter the first, second, or third panel of the truss frame, counting from each end of the bridge span, and thrust against the farthest-most posts of the panel entered, being intercepted by these posts, against which the  
110

thrust of the arch braces is communicated in part by means of appropriate notches in the former and corresponding tuscums in the latter. The action of the arch brace is continued past the posts, by similar pieces and connections within the next panel and by the aid of a splicing piece situated between the posts, and extending from the counter brace of the panel first entered to that of the panel beyond and occupying the space between the side pieces of the arch brace. Thus continued, the arch brace extends to the head of the next main braces, and is connected with them near the upper string by means of corresponding tuscums and notches. In order to render the action of the arch brace more certain and efficient, another splicing piece is inserted, extending from the counter brace last mentioned to the head of the next counter brace, and occupying, as before, the space between the cheeks, or side pieces, of the arch brace. The several parts of the arch brace situated within the truss frame, as also the posts and main braces at the crossings, or intersections, of the arch braces, are firmly united by treenails passing entirely through the several pieces of which they are composed.

The inferior portions of the arch braces, situated between the truss frames, are respectively furnished with a series of gibs and keys, which serve not only to confine together the pieces of which they are composed, but also to render the arch braces extensible, or the reverse, as may be found necessary, either to give appropriate action to the arch braces or to increase or diminish the camber of the bridge.

The splicings of the outside string pieces are effected by means of wooden splicing pieces with appropriate notches and corresponding tuscums, or with coggles of iron or of wood situated in appropriate notches prepared for their reception in the splicing piece and string piece, and may be clamped together by gibs and keys or by screw bolts passing entirely through the strings. The central string-piece may also be spliced in a similar manner or by means of treenails of wood passing entirely through the strings, no other clamping being required in this case.

The lateral bracing is effected by means of locked lattice work, banded by ribbands on both sides of each truss frame of the bridge, both above and below the lateral braces. The ribbands are confined to the lateral braces by treenails passing entirely through them and the braces at every intersection of the former with the latter.

The accompanying drawings will serve to illustrate and make known the manner in which I construct the respective parts of my brace bridge and carry my improvements into operation.

In Figure 1, A, B, C, D, represent a side view of part of a truss frame, C, D, being the arch brace with its lower end C, resting on a bench, or bolster, on the abutment, or pier, below the bridge, *n, n, n*, showing the situation of the gibs and keys by which the respective thicknesses of timber of which the arch piece consists are confined together. In Fig. 2, A, B, C, D, is an enlarged view of a part of such a frame, drawn to a scale sufficiently large to exhibit the mode of connecting the respective parts thereof. C, D, is the arch brace. E, E, are the main braces; F, F the counter braces and G, G the posts. The timbers constituting the arch brace are connected at *g, g*, with the posts G, by means of tuscums and notches and with one of the main braces E, by similar means, as shown at *e*. The main braces E, E, are likewise connected with the posts G, G, both above and below, by like means. The posts G, G, extend a few inches above the upper and below the lower strings. These strings consist, each, of three thicknesses of stuff, as shown at H, Fig. 3. The posts G, G, and the main braces E, E, are each of them double, and their ends are received into the spaces between the center and the two outer string pieces. The counter braces F, F, are single, and abut against the center string pieces, both above and below. They are treenailed at each end to the posts G, G, and also to the main braces where they pass between them. The space between the two pieces of timber which constitute the arch brace C, D, I usually fill up by inserting what I denominate splicing timber, and connect the whole together by passing treenails through them.

It has been mentioned above that *n, n, n*, in Fig. 1, show the situation of the gibs and keys by which the respective timbers composing the arch beam are connected together. Such gibs and keys are also employed for the same purpose in various other parts of the structure. Thus, for example, they are employed in the mortises through the timbers shown at *c, c, c*, Fig. 2. The manner of constructing these gibs and keys and of inserting and fixing them, so as to confine the timbers together, will be manifest upon reference to Fig. 5, where they are represented on an enlarged scale. They are also shown as passing through the string-pieces in Fig. 3 and through the arch braces in Fig. 4. Between the string pieces and immediately behind and in contact with the posts I insert joggles, or blocks of timber, represented by *b, b, b*, which I fasten in place by treenails. These are for the purpose of sustaining the posts and preventing their yielding or splitting at the gib notches. The mortises *c, c, c*, shown on the upper and lower string pieces in Fig. 2 intersect the posts in those parts, and the posts are

necessarily notched out to allow the gibs and keys to pass on their sides opposite to the main braces. These notches in the posts serve, as above remarked, to maintain the relative distance between the upper and lower string pieces, to clamp and confine them together, and to impart the requisite power of trussing to the truss frame.

Fig. 3 exhibits different views of a portion of the string pieces, showing the manner of splicing them; and also the relative positions of the string-pieces, posts, and braces as they project into and are connected with each other. These representations apply equally to the upper and the lower portions of the truss frame.

Fig. 4 represents a portion of the arch brace, with the manner of applying the gibs and keys thereto, by which it may be extended or contracted at pleasure, the several mortises for the gibs and keys being at equal distances from each other. By this arrangement the camber of the truss frames may be increased or diminished, as may be required. The center and the two outer pieces of the five thicknesses represented as clamped together in Fig. 4 are those which rest upon the bench, or bolster, of the abutment, or pier. The other two pieces are those which pass up into the truss frame.

Instead of the notches and tuscums formed in the timber for connecting the main braces and the posts, I sometimes employ steps, or bearings, of cast-iron which are furnished with lugs, or tuscums, projecting out from each of their sides and entering corresponding notches made in the posts and braces. These are shown in place at *a, a*, Fig. 2, and separately, on an enlarged scale, at Fig. 6. Similar steps or pieces of cast-iron may be employed for splicing and uniting the string

pieces, being substituted for the intermediate, notched, splicing pieces of wood, represented as used at H, H, Fig. 3.

Having thus fully described the manner in which I construct my brace bridge and connect the respective parts thereof together, what I claim as new therein, and desire to secure by Letters Patent, are the following; that is to say:

1. I claim the forming of the truss frames of bridges by connecting and combining the string pieces, posts, main and counter braces and arch braces, by the aid of gibs and keys, constructed as set forth, using therewith such bolts, or treenails, as I may deem proper, but not intending to claim the use of bolts and treenails, as making any part of my invention.

2. I claim the employment, or use, of the gibs and keys, formed in the manner set forth, and passing through the string pieces, and into the posts, near their ends, for the purpose of trussing and straining the frame, generally.

3. I claim the manner of arranging the arch braces so as to diminish, or increase, the camber of the truss frames by the employment of gibs and keys passing through those portions thereof which constitute the lower parts of said arch braces.

4. I claim the construction and employment of a bearing, or step, of cast-iron, furnished with lugs, or tuscums, which are let into corresponding notches in the head and foot of the main braces, and the posts, in the manner, and for the purpose, set forth.

STEPHEN H. LONG.

Witnesses:

H. L. CURRIER,  
T. STOCKTON.