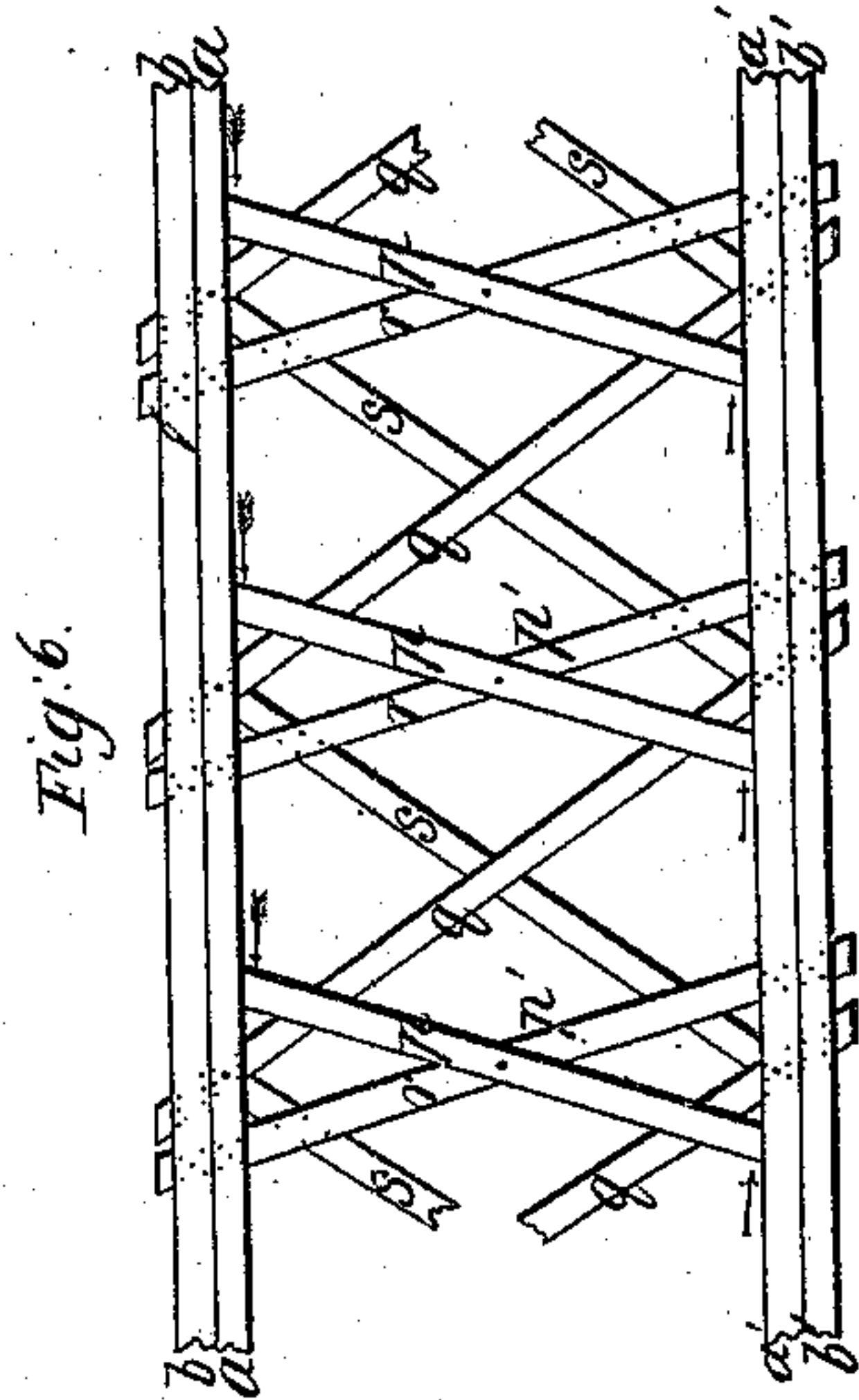
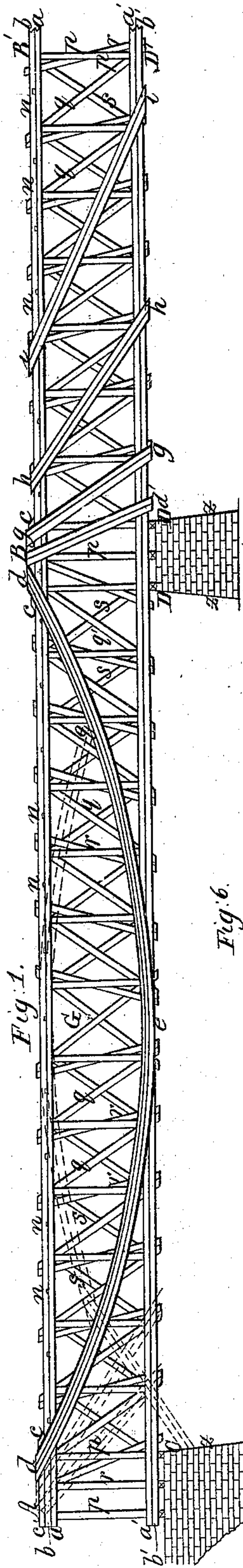
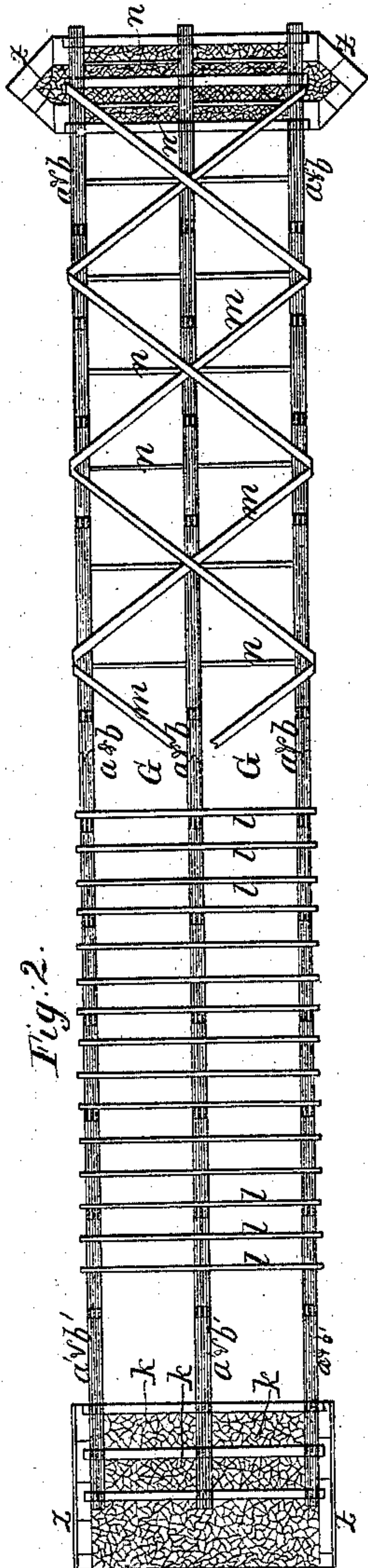
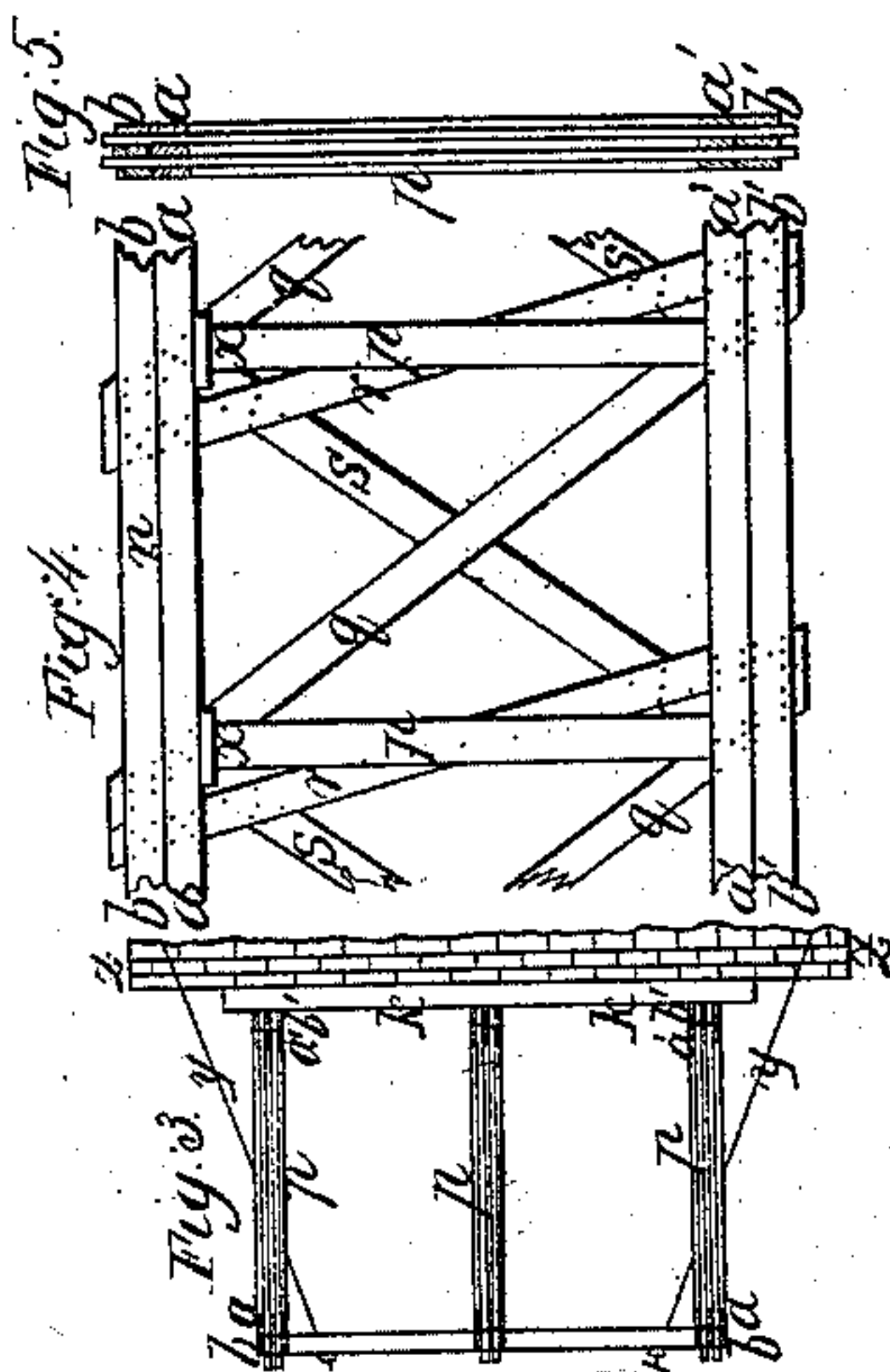


S. H. Long Truss Bridge.

N^o 21,203.

Patented Aug. 17, 1858.



Witnesses;
H. C. Long
J. S. Long

Inventor;
Stephen H. Long

UNITED STATES PATENT OFFICE.

STEPHEN H. LONG, OF LOUISVILLE, KENTUCKY.

BRIDGE.

Specification of Letters Patent No. 21,203, dated August 17, 1858.

To all whom it may concern:

Be it known that I, STEPHEN H. LONG, U. S. Army, residing in Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in Compound Suspension-Bridges; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1, represents a side view of the bridge, the portion to the left of the figure representing an entire span with inverted or suspension arches, and the portion on the right thereof, a half span with arch-stays. Fig. 2, represents a top plan, the portion to the left showing the lower, or floor part, and that to the right, the upper part of the truss. Fig. 3, represents a transverse section through the truss. Fig. 4, represents a side view of a panel of the truss, on an enlarged scale. Fig. 5, represents an end view of a truss-frame. Fig. 6, represents a modification of the truss-frame as shown in Fig. 4, and is represented more particularly, to show a new method of trussing the spans of the bridge.

Similar letters of reference where they occur in the several figures denote like parts of the bridge in all of them.

The object of my invention is, to insure coincidence and concert of action between the truss-frames, and arch bracing of a bridge, whether by means of inverted arches, or by arch stays, which object cannot be effected, by means of either brace, or suspension truss-frame, combined with thrust arches, or thrust arch braces, without a degree of nicety in their construction and connections that is scarcely attainable in bridge building. In the one case, the slightest yielding in any part of the bridge, is and must be, from the nature of the case, counteracted by the joint action of the truss-frames and arching, whether by inverted arches, or by tension arch stays, while in the other case, the defects or imperfections either in the truss-frame or arching must operate in a manner to overstrain or overload the one or the other, and have a tendency to derange and impair the structure, not only at the points where such defects occur, but in other parts of the bridge. Hence, in the former case the joints in all parts of the bridge continue staunch and firm, while in

the latter they become loose and rickety by continued use.

The principle involved in my present improvement is embraced in my patent originally granted to me, on the 7th November 1839, and subsequently extended for seven years from and after the expiration of the first term. But the improvements which I have made, add very materially to the value of my original plan, as heretofore patented, by affording that additional strength, stiffness, and durability, which the present increased weight of passing burthens demand. And, the nature of my invention, consists first, in the combination of the suspension truss frame, with an inverted suspension arch or arches, or with suspension arch stays, and secondly, the introduction into the truss, of the auxiliary stays, as a means of strengthening and fortifying the truss frames of the bridge.

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.

The truss-frames consist respectively, of an upper string a, a , and a lower one a', a' , each composed of one, two, or more pieces, of strut posts p, p , and counter wedges x, x , of main stays q, q , and counter stays s, s , and of splittings, &c., the same as, or similar to those embraced in the suspension bridge patented to me in 1839, and above referred to. To this I have added or combined, two or more auxiliary stays or braces r, r , in connection with each truss post p , of the frame, throughout the entire span of the bridge.

The suspension arches d, e, d , or their substitutes—the suspension arch stays B, d', g, g, h, h, i, i —may be applied to both sides of each truss frame, or may occupy positions between the sides, and within the parts of the truss frame. The arches d, e, d , must be firmly attached to the upper string a, a , at or near both ends of the latter, and to the lower string a', a' , at or near its center, and also to all the posts, and other parts with which they come into contact. In like manner the arch stays may be firmly attached to the upper and lower strings in the following order, beginning at either end of the span or truss frame, to wit: at the head of the first or pier post, and at the foot of the second post; at the head of the second, and at the foot of the fourth post; at the head of the fourth, and at the foot of the seventh

post; at the head of the seventh, and at the foot of the eleventh post—or in such other order as the structure may require, provided, all the stays are made to act with their tensile instead of their compressible force. The auxiliary stays r, r , must also, be firmly attached to the upper and lower strings, a little in rear of the posts with which they are connected at its head, and a little in advance of the same post at its foot, having an inclination in the same direction, as the main stays, though in an angle far less considerable. These stays should also be firmly attached to the posts p , with which they are connected.

The attachments and connections of the several parts of the structure, splicings included, are effected by means of screw bolts, and round or square tree nails, spikes, &c., of suitable dimensions—the former of iron, and the latter also of iron, or part of wood, and part of iron, if preferred.

The arrangement and relative position of the several parts of the compound suspension bridge are clearly shown in the accompanying drawings, wherein A, B, C, D, is a suspension truss-frame for one entire span. B, B', D, D' is a similar suspension frame for a half span. G, a key, or center panel of a span. a, a , main upper, and a', a' , main lower strings.

b, b , are extra upper and b', b' , extra lower strings.

c, c , are string caps or plates at the abutments and piers.

d, e, d , is the inverted or suspension arch or arches, and B, d', g, g, h, h, i, i , arch stays substituted instead of the arches, when preferred.

k, k , are bolsters resting on the piers or abutments, for the strings to rest on.

l, l , flooring joists or timbers. m, m lateral stay braces. n, n tie-beams above the roadway. p, p posts or struts, and p', p' , pivot bolts passing through the post and auxiliary stay. q, q main stays or suspension braces, and r, r , auxiliary stays or braces. s, s , counter stays, or counter suspension braces. x, x counter wedges or keys, for trussing the bridge. y, y , transverse stays or braces at the abutments or piers.

z, z , are the abutment and pier, for the support of the bridge.

It is proper to observe that, in connection with the suspension arches, I sometimes employ arch stays depending from the top of the abutment or pier panel, and attached to the lower strings at or near the foot of the first, first and second, or the first, second and third posts, counting from the pier or abutment, as represented by certain red lines in the drawing Fig. 2. And, I sometimes ap-

ply to each side of the truss frame, thrust arches, for the purpose of counteracting in part the thrust to which the upper strings are necessarily subjected at all points intermediate to the abutments of single span bridges, or intermediate to the quarters of the spans of bridges of many spans. These arches are also indicated on the drawing by the curved red lines, Fig. 2. And, I sometimes employ arch braces, rising from a bench or step of the abutment or pier, crossing the arch stays, and the suspension arches, and abutting against the latter, at or near the extremities of the thrust arches for the purpose of communicating their action, and serving as abutments to, the thrust arches. These arch braces are also indicated in the drawings by right lines in red in the position just indicated, and secured like other parts of the frame.

I have heretofore mentioned the counter wedges or keys x, x , for trussing the frame, which when driven together have the effect of widening the space between the upper and lower strings, and thus accomplishing that end. But without varying the general result, other means may be essayed which attains the same end, by substantially the same lengthening or spreading effect, as follows: Instead of vertical posts with keys or wedges at their extremities, I can give the struts or posts the same obliquity, inversely, as that of the auxiliary stays, by means of which inclined struts the trussing of the bridge can be effected, by driving or forcing the ends of said struts, and consequently the struts themselves into positions more nearly perpendicular to the strings than those of the auxiliary stays, thereby widening in a small degree, the space between the upper and lower strings, and producing results similar to those produced by the keys or wedges more commonly used. In trussing, the ends of the posts are to be forced or driven in the direction indicated by the small arrows in Fig. 6.

Having thus fully described my invention what I claim therein as new and desire to secure by Letters Patent is—

1. The combination of the suspension truss frame, with the inverted suspension arch or arches, or the arch stays, substantially in the manner, and for the purpose set forth.

2. I also claim in combination with the truss frame, the auxiliary stays, arranged therein as a means of strengthening and fortifying said truss frame, as stated.

STEPHEN H. LONG.

Witnesses:

HENRY C. LONG,
S. W. BUCKLEY.