D. C. Mc Callum.

Truss Bridge.

No. 16,446. Patented Jan. 20, 1857.

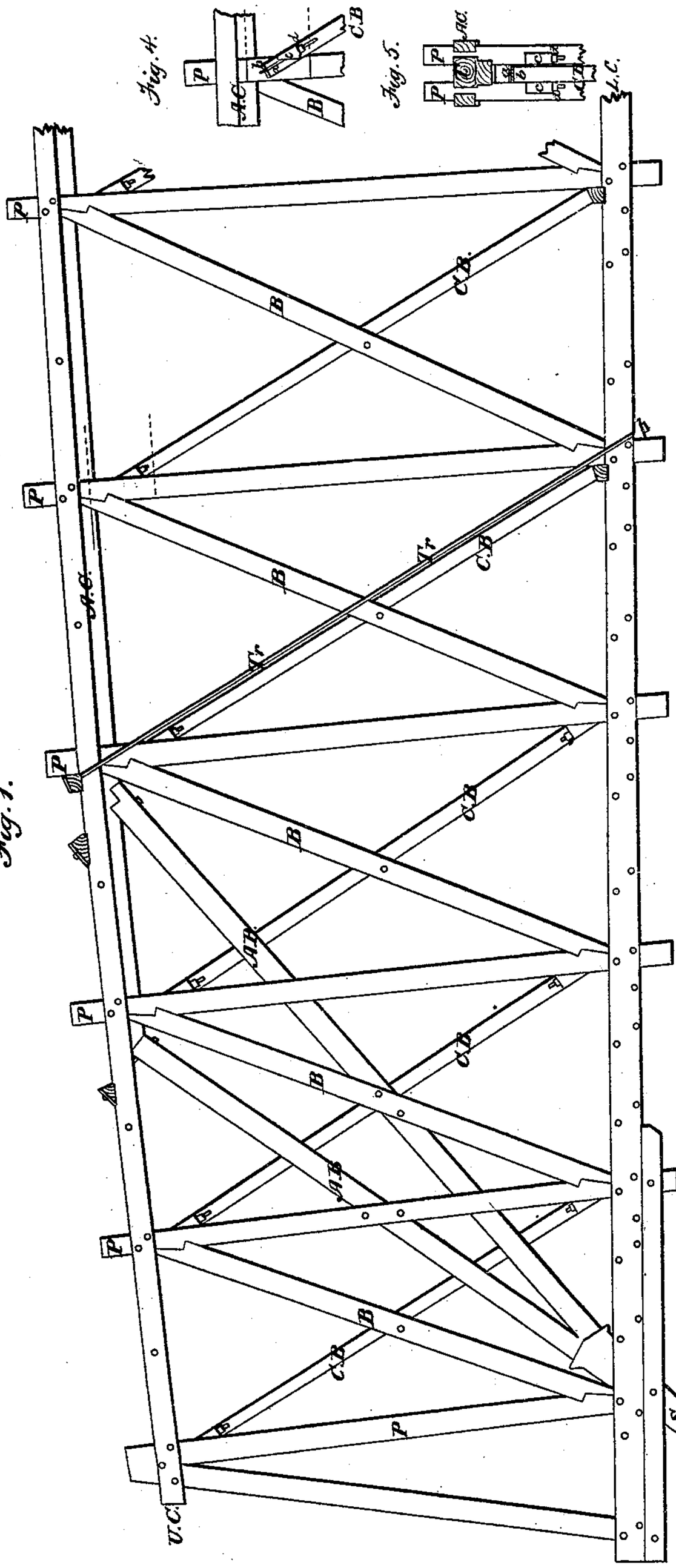

Fig. 1.

Fig. 4.

Fig. 5.

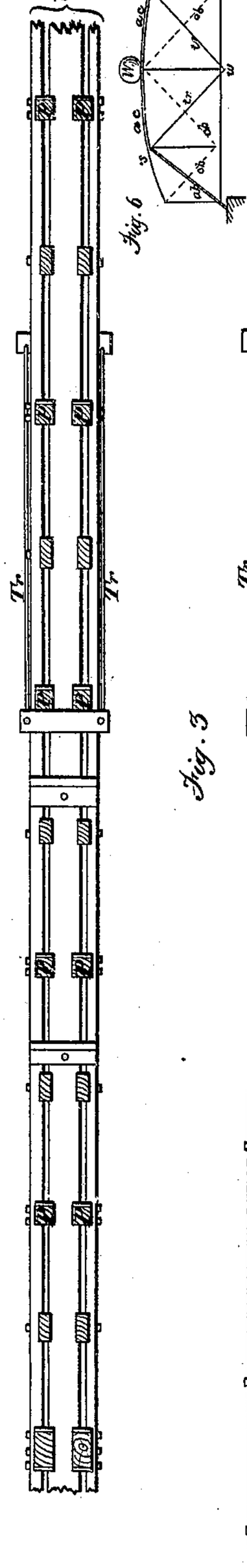

Fig. 2.

Fig. 3

Fig. 6

UNITED STATES PATENT OFFICE.

D. C. McCALLUM, OF OWEGO, NEW YORK.

BRIDGE.

Specification forming part of Letters Patent No. 16,446, dated January 20, 1857; Reissued June 21, 1859, No. 231.

To all whom it may concern:

Be it known that I, D. C. McCALLUM, of Owego, in the county of Tioga and State of New York, have invented an improvement in the method of constructing bridges whereby greater strength and stiffness is insured than by any other method now known or practiced; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawing, making a part of this specification.

The nature of my invention consists, in combining the arch-braces, with the arched chord or beam—the top horizontal surface of the abutment or pier, and the lower chord or tie, by means of a cast iron shoe and the tension rods, whereby the thrust of the arched chord is thrown down upon the abutment; and any deflection in the lower chord is conteracted by an upward force at each end of the tension rods. And also, in the method of lengthening or shortening the braces of a bridge truss or girder, by which the truss may be elevated or compressed as required.

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.

Figure 1, in the accompanying drawings shows a side elevation of my bridge truss, or such portion of it from the abutment, as is essential to explain its character and action. Fig. 2, a plan of the upper or arched chord. Fig. 3, a plan taken below the bottom chord of the bridge. Figs. 4 and 5, sections, showing the arched chord, and connections whereby the counter braces are shortened or lengthened viz: an iron yoke *a;* an iron plate *b*, on the end of the counter brace, and the iron straining pieces *c*, *c*, and nuts *d d*.

P, P, P, posts of the bridge in pairs, let in between the timbers of both upper and lower chords as represented, and radiating from a common center or nearly so. U, C, and A, C, upper or arched chord, in four or any other desirable number of pieces, bolted together in the plan Fig. 2, and in the section Fig. 5. L, C, lower chord, in four or any other suitable number of pieces, bolted together as shown in the plan Fig. 3. B, B, B, main braces, which are double in each panel, and notched into the head and foot of each alternate post as shown in Fig. 1. CB, CB, CB, counter braces, which are in each panel, susceptible of adjustment, by the action of the nuts *d*, *d* (on the yoke *a*) against the straining pieces *c*, *c*, let into the posts. AB, AB, arch braces, abutting against the arch chord A, C, and united in one cast iron shoe *s*, which bears against the top of the abutment or pier, passing between the timber of the lower chord without being secured to them in any way. A, C, the arched chord. T, *r*, tension rods, of wrought iron, furnished at each end with clamp pieces of wood and iron as represented.

The advantage of my improved arrangement of bridge timbers may be stated as follows: It is customary to introduce an arch-rib in bridges, and which in ordinary cases, fails to act in unison with the truss, hence there are two systems—the truss proper, and the arch rib. And as it is extremely difficult, if not impossible, so to adjust the two systems, that they shall act in perfect unison, the result must of necessity be a partial failing or yielding of one; before the efficient action of the other can be brought into play. In my bridge a contrary effect is produced: The arched upper chord is a component part of the truss, and so far from its action being independent of the remaining timbers which go to make up the frame, its proper action is essential to the integrity of the truss itself, as may be illustrated by reference to the sketch numbered 6, in the accompanying drawings, and which it might be proper to state is merely shown for illustration. Let *a*, *c*, represent the arched upper chord; *t*, *r*, the tension rods, tying the extremity of the arched chord to a point on the lower chord; *a*, *b*, arch braces, abutting against the ends of the arched chord, and resting on the top of the abutment.

It is obvious that, in resisting the action of the weight W, before the upper chord can be depressed in its center, the points *s*, *s′*, must move horizontally outward from the center, bringing an upward action on the tension rods in the direction *w*, *s*, and *w*, *s′*, and at the same time communicating a thrust by means of the arch braces *a*, *b*, to the abutment or pier; while in this condition under the action of a great weight, if the heads of the counter-braces be wedged against the

upper or lower chord, the bridge frame cannot return to its original position, but subjects the counter braces to a strain when the weight is removed, equal to that weight, and the only effect of an equal, or less weight on the bridge thereafter will be to relieve the strain from the counter brace. If instead of wedges, which (besides tending when driven, to split the tenons) are liable to shrink and become loose, the heads of the counter braces be covered by an iron plate *b*, Figs. 4 and 5, and an iron yoke *a*, with threads cut at its ends, be passed over the plate, and through straining pieces, of metal, *c*, which with a square bearing shoulder are let into each post; by screwing the nuts *d*, any desirable amount of strain may be brought against the ends of the counter braces, thus, acting as wedges are designed to act, preserving a strain of deflection on the bridge while unloaded, which the action of the passing load transfers to the braces, or rather does not augment.

In all bridges, which I have examined, which have failed to sustain the passing weight, I find that the point of greatest curvature, or the point which suffers the greatest strain from a change of shape in the framing, is not at the center of the truss, but at a point much nearer the abutment or pier. And the increased deflection at this point bringing an increased strain on this part of the chord, in many cases produces fracture at this point. In fact, all ruptured chords, in my experience, have parted at a point much nearer to the abutment than to the center of the span. By my method of construction I entirely avoid this local strain, and have proved by the most severe practical tests, that I have produced a bridge efficacious beyond precedent, in sustaining heavy burdens, and recovering its proper shape after the strain or weight has been removed from it. In the construction of bridges heretofore, so self evident has been the fact that the weak point of the truss is at a point nearer the ends than the middle, that it has been an almost universal custom to introduce spur-braces, resting against the face of the abutment, and bearing against the under part of the lower chord. The action of these braces sometimes cripple the bridge; but they are themselves so exposed to injury from their position, that if essential to the strength of the bridge, the latter is endangered by their liability to be carried away by drift or otherwise.

When arches are introduced into the framing of a bridge, they are frequently carried through or by, the lower chord, and resting or abutting against the face of the abutment, serve as spur-braces, and are liable to all the objections incident to their use. The action of my improved combination, on the contrary, tends to support and sustain this hitherto weak point, and with my improved method of adjusting the counter braces as described, constitutes as I maintain, an essential improvement in bridge framing and building.

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

1. So combining the arch-brace, with the arched chord or beam, the top horizontal surface of the abutment or pier, and the lower chord or tie, by means of the iron shoe, and tension rods, as that the thrust of the arched chord shall be thrown down upon the abutment, and any deflection in the lower chord be counteracted by an upward force, at each end of the tension rods, substantially as described.

2. I also claim the method of lengthening or shortening the braces of a bridge truss or girder, by which the truss may be elevated or depressed as required, by means of the yoke *a*, the plate *b* on the end of the brace, and the straining pieces *c*, *c*, with their nuts *d*, substantially in the manner herein described.

D. C. McCALLUM.

Witnesses:
L. G. Tillotson,
Chas. E. McCluer,
M. S. Andrews.

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