A. Cottrell.

Truss Bridge.

No. 2,334. Patented Nov. 10, 1841.

Fig. 1.

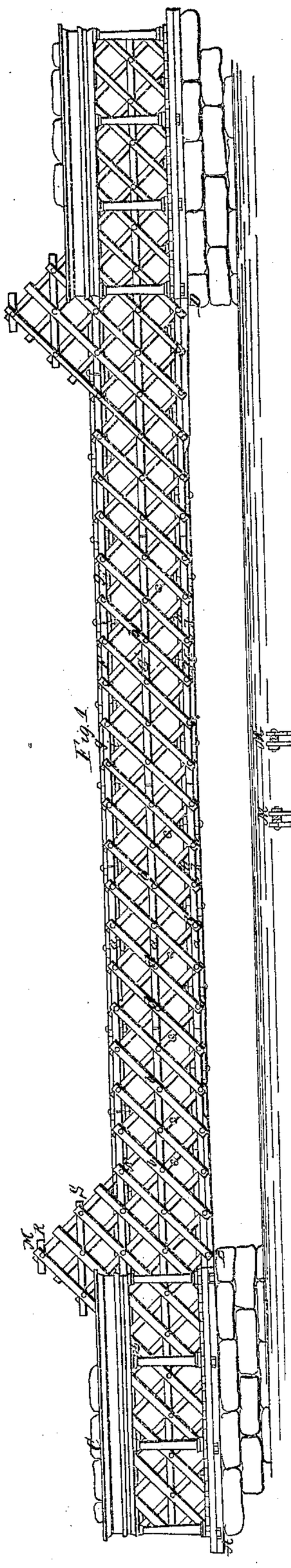


Fig. 4.

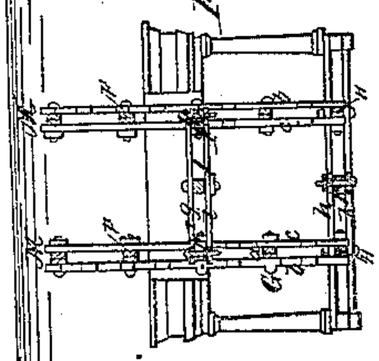


Fig. 2.

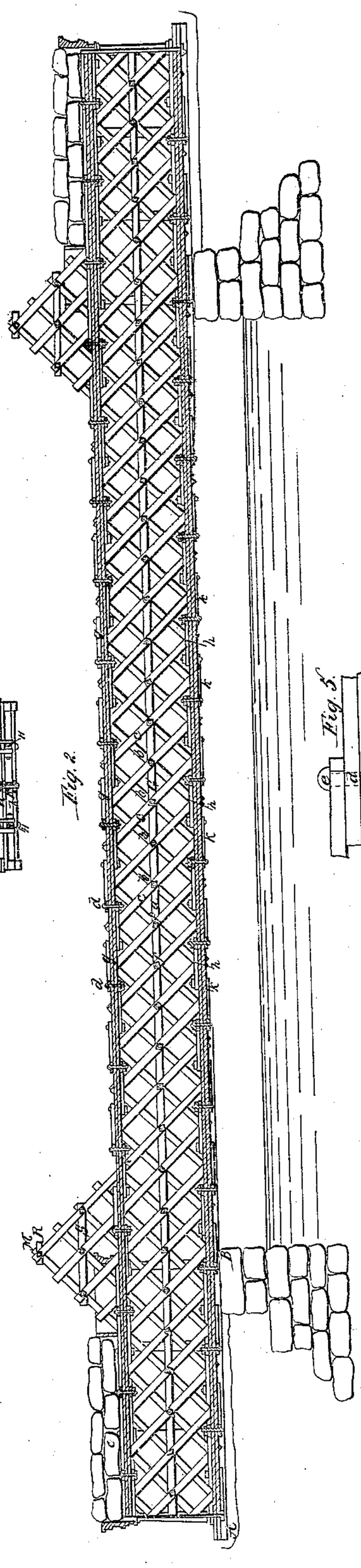


Fig. 5.

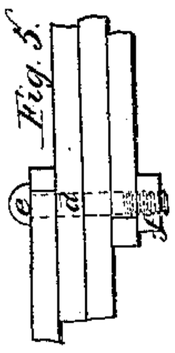
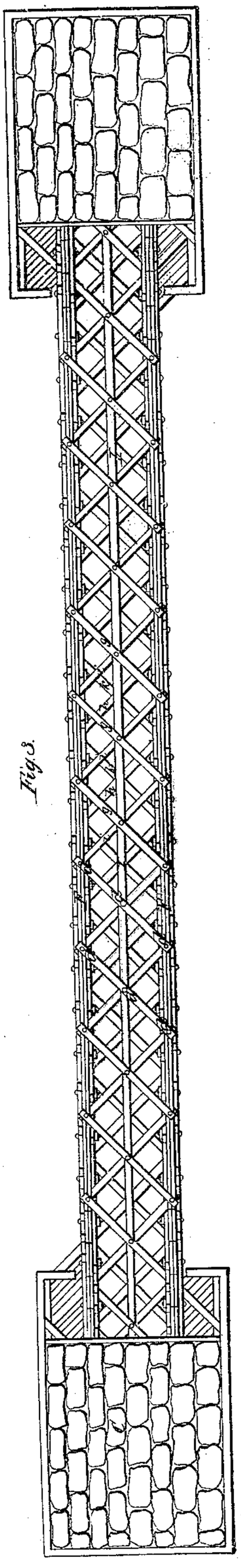


Fig. 3.



UNITED STATES PATENT OFFICE.

ALBERT COTTRELL, OF NEWPORT, RHODE ISLAND.

METHOD OF BUILDING BRIDGES.

Specification of Letters Patent No. 2,334, dated November 10, 1841.

To all whom it may concern:

Be it known that I, ALBERT COTTRELL, of Newport, in the county of Newport and State of Rhode Island, have invented a new, useful, and improved method of building bridges whereby the same may be erected or projected over a river or stream without the aid of centering and by a very simple, efficient, and substantial system of truck-work or framing, and that the following is a full and exact description of the same, reference being had to the accompanying drawings, which taken in connection herewith form my specification.

In said specification, I have set forth the principles of my invention by which it may be distinguished from others of a like character, together with such parts or combinations as I claim, and for which I solicit an exclusive property to be secured to me for fourteen years by Letters Patent.

The nature of my invention, and the distinguishing feature of the same, consists in supporting the bridge during the process of construction, as well as after completion, by the application of a counterbalancing power, which, as will be hereafter explained, consists of stone laid upon a part of each end of the bridge, projecting in rear of its abutment, thus preventing a depression or sag of the bridge, as is the case with all wooden structures of this kind, and at the same time giving to the bridge the appearance of a very flat segment or arch. On my plan a bridge may be erected of any required span, without sustaining piers between the abutments, and consequently as I shall hereinafter explain, I can commence the bridge on one side of the river, and by a continual addition to the balancing power, I can project the bridge across the stream, without the use of centering, and when continued a sufficient length, on removing a suitable quantity of the balancing material, the opposite or projected end of the bridge, may be lowered upon the abutment on the other side of the river, and when this end is properly weighted, the operation is completed.

In the drawings above mentioned, Figure 1, represents a side elevation of a bridge, constructed on my improved plan. Fig. 2, is a vertical longitudinal and central section of the same. Fig. 3 is a top view, and Fig. 4, is a vertical cross section of it.

In order to construct this bridge after preparing the abutments, it becomes necessary to commence it at a point, siutated some distance back from the front face of the abutment, or at a point A, Fig. 1, at a distance A B, from the point B. The bridge is then built from this point, (on a small inclination above the horizontal line of the top of the abutments), toward the opposite side of the river. As the length of the structure beyond the first abutment is increased, it becomes necessary to place or pile stone C, Figs. 2, 3, on the top of that portion of the bridge in rear of the abutment—thus balancing and sustaining the bridge so built, until it reaches the opposite side of the river, and is of sufficient length to extend over the other abutment or from D to E as seen in Fig. 1. The end of the bridge over the second abutment is then to be weighted with stone, in a similar manner to that first described. The extremities of the bridge being thus depressed, lift the central part of it, thereby giving the structure the appearance of a very flat arch or curve. Thus it will be perceived that the gravitating power or weight of the bridge, between the abutments, is counteracted by the stone laid on the top of those portions of the truck extending in rear of them.

Having thus explained the general principle, on which the bridge is thrown over a river, I shall now proceed to describe the system on which the same is constructed.

The two side trusses are composed of planks, generally about one foot wide and six inches in thickness. In the bridge represented by the drawings it will be seen, that each side truss consists of three string pieces or beams F, G, H, each formed of planks *a*, *a*, Figs. 1, 2, 3, 4, laid side by side and so arranged as to break joints over each other. They are connected together on their exterior and interior sides by diagonal braces *b*, *b*, *b*, &c., *c*, *c*, *c*, &c., crossing each other at right angles, as seen in Figs. 1, 2, lying flat against the sides, and confined to, the stringers at each of their extremities and centers in apposition, by a turned, cylindrical, wooden screw bolt *d*, (Figs. 1, 2, 3, 4, and more particularly denoted in Fig. 5), passing through the braces and stringers from the exterior toward the interior of the bridge. The diameter of this bolt is one third of the width of the brace and depth of the stringer, a cylindrical hole of corresponding size, to receive the bolt, being bored through the two braces and string piece at

their common intersection or crossing of each other. The screw bolt should have a strong head *e* turned on one end and a stout threaded screw cut on the other, and may be formed of hickory, oak or other suitable hard wood. A square or other proper shaped wooden nut *f*, is to be screwed on the screw of the bolt *d*, so that when the bolt is passed through the braces and stringers, they may be drawn closely and firmly together by screwing up the nut.

The side trusses, so constructed, are connected together at top and bottom, by diagonal braces *g*, *g*, *g*, *h*, *h*, *h*, and counter braces *i*, *i*, *i*, *k*, *k*, *k*, as seen in the figure. These braces and counter braces are confined to the top and bottom string pieces of each truss, and also to a central and longitudinal streamer or beam I or K, (formed of planks like the stringers, but with the planks laid upon each other horizontally instead of vertically, as in the string pieces, by screw bolts, passing through them and the stringers and each streamer, at their lapping, exactly similar to those before described. The ends of the braces and counter braces are lapped upon the string pieces, midway between the diagonal side braces and extend across, from one truss to the opposite, in diagonal directions so as to cross each other at right angles as seen in Fig. 3. It will thus be seen that regular system of bracing and counter bracing, in vertical and horizontal directions is adopted. All the braces and counter braces should be formed by one pattern and of exactly the same dimensions, that is to say, the distances between the centers of the holes in their extremities, and the center hole of each should be equal. The planks forming the stringers and streamers, should also be alike in their lengths and other dimensions, and should have cylindrical holes bored through them at such distances apart as will permit the disposition of the braces and counter braces, and connection of the same thereto by the wooden screw bolts. When the timbers are thus previously prepared, the bridge may be commenced on the abutment, and carried back therefrom, a sufficient distance, to admit a quantity of stone or other heavy material to be placed on the top of this part of the bridge, as was hereinbefore described. The planks, forming the string pieces, are then applied to those portions of the same, projecting over the river from the front of the abutment. The succeeding braces and counter-braces are then arranged in position, and the screw bolts passed through them and the stringers thus securing the whole together. This operation is thus carried on, until the trusses are completed and reach over and extend beyond the opposite abutment. Stone or balancing weight is then deposited on the projected end, to such an extent as may be deemed necessary to compete with the weight of the trusses and prevent any sagging arising from the same or from the travel which may at any time, pass over the bridge.

In order to strengthen the side trusses of the bridge, at the fulcra or bearing parts over the front wall of the abutments, several of the braces on each side of the truss, may be continued of greater length than the others, thus making a triangular addition to each truss as represented at L, M, N, O, P, Q, Fig. 1. The braces so lengthened, are to be bolted by wooden screw bolts, as was before described, to string pieces R, S, constructed similar to the lower stringers, but shorter as represented in the drawings. It is evident that any number of the braces may be thus arranged and bolted to the string pieces, so as to increase the height of each trap above its points of support, to any extent that may be deemed desirable, to insure the proper degree of strength and stiffness to the bridge at the above mentioned points. It is only a continuation of my system of bracing in equal squares. For bridges of different spans and widths, the number of trusses, stringers, braces and streamers must vary according to circumstances. Where two carriage tracks are required, three trusses will in general be necessary, placed vertically and parallel with each other, and connected together at top and bottom, by braces and counter braces extending diagonally across from one outside truss to the other on the top and bottom sides of each top and bottom stringer of each truss, those, on the upper sides of each stringer crossing those on the lower, at right angles as before described, and the whole being secured to the trusses by wooden screw bolts.

The above constitutes the method of constructing the trusses. The timbers or planks, composing the following, may be applied to the tops of the lower stringers and streamers, in any convenient manner, but generally speaking, I prefer that the planks should be of the same thickness, as the braces extending diagonally across on the tops of the lower stringers of the trusses, and be laid upon the lower stringers, parallel with, and between the said braces, so as to form, in connection with them, the flooring. The horizontal braces and counter braces of the lower stringers may be extended beyond the stringers on one or both sides of the bridge, and connected by wooden screw bolts, with an exterior streamer at their intersections, over and under which they lap. This extension of the braces and counter braces, will admit of a sidewalk being formed thereon on the exterior of the bridge. The upper horizontal braces and counter braces may be similarly

extended over the sides, as represented in Figs. 3, 4 at the ends of the bridge in rear of the abutments, for the purpose of receiving thereon a portion of the balancing material, thereby rendering it unnecessary to construct those parts in rear of the abutments so long as would be otherwise requisite.

The above geometrical arrangement and disposition of the timbers of the trusses, and horizontal top and bottom diagonal braces and counter braces, in equal squares, secured by the wooden screw bolts and wooden nuts, admits the construction of a bridge of any desirable proportions, as will be readily understood by bridge builders, and also produces a structure, where the top and bottom timbers, by being thus connected with the side trusses, greatly contribute to the strength of the same and render a bridge, generally speaking, less liable to be affected by violent winds and floods than when built according to other modes.

The substitution of one cylindrical wooden screw bolt, at the junction of the braces and stringers, for treenails, as used in lattice bridges is a great improvement for the great strain, brought on the treenails, from various causes, almost invariably, sooner or later, splits the plank and endangers the stability of the bridge, while the single cylindrical bolt permits an equalization of the strain, and an easy accommodation of the parts to each other as the work progresses, as well during the process of construction as when completed.

Having thus described my invention I shall claim—

Projecting a bridge over a river, without the aid of centering, staying or supports, as required by ordinary bridges, by the application of stone or other suitable counter balancing material, on the top of a portion of the same, and in rear of the front wall of one abutment, thus supporting and securing the bridge on the abutment, as its parts are progressively combined together, and built over the stream toward the opposite side thereof; also preventing the bridge from sagging in the center and giving a flat curve to the same, by loading both sides thereof with stone, the whole process being substantially as hereinbefore described.

In testimony that the foregoing is a true description of my said invention and improvements I have hereto set my signature this sixteenth day of August in the year eighteen hundred and forty one.

ALBERT COTTRELL.

Witnesses:

HENRY V. BOWEN,

SETH HOWARD.