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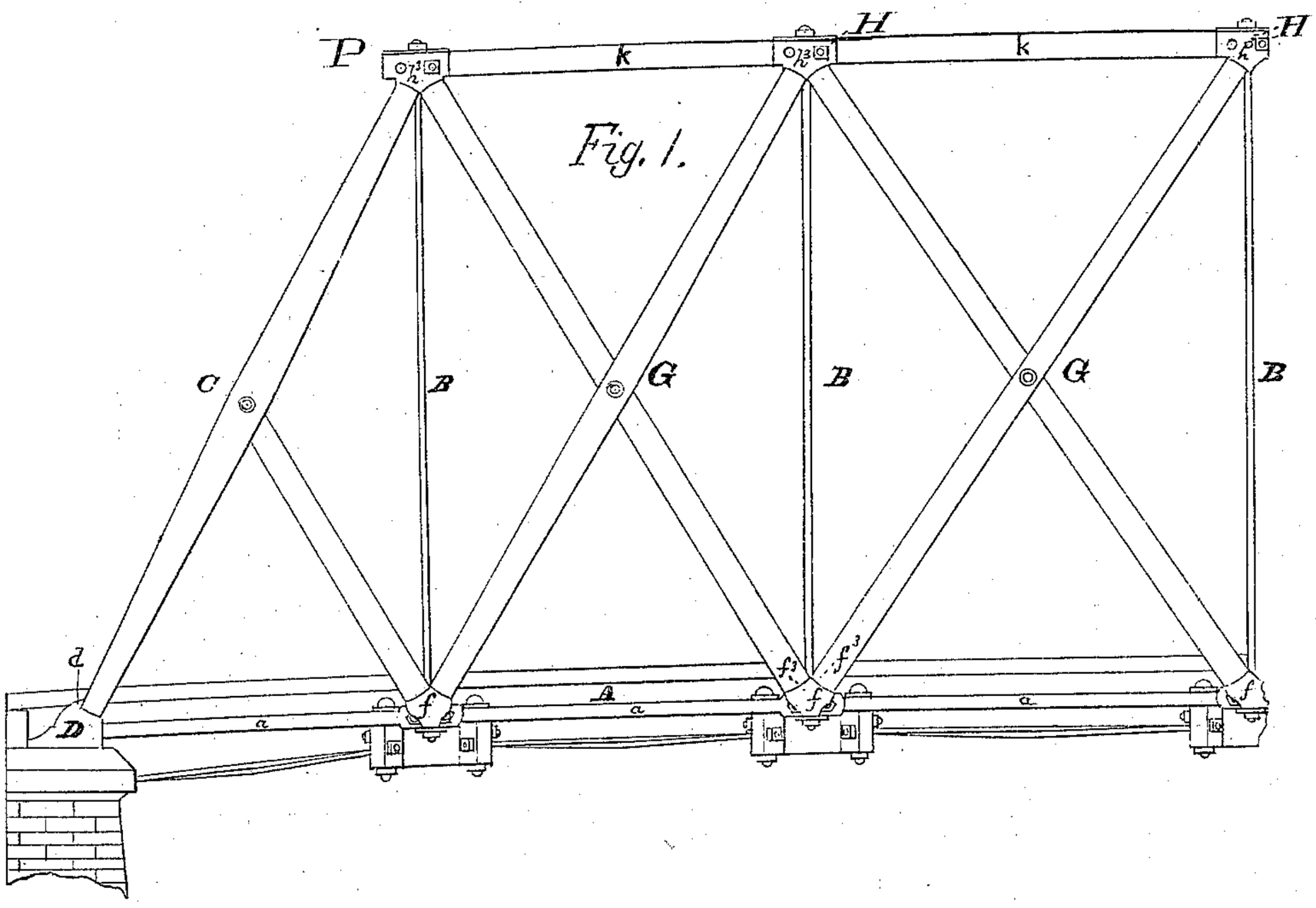

Fig. 1.

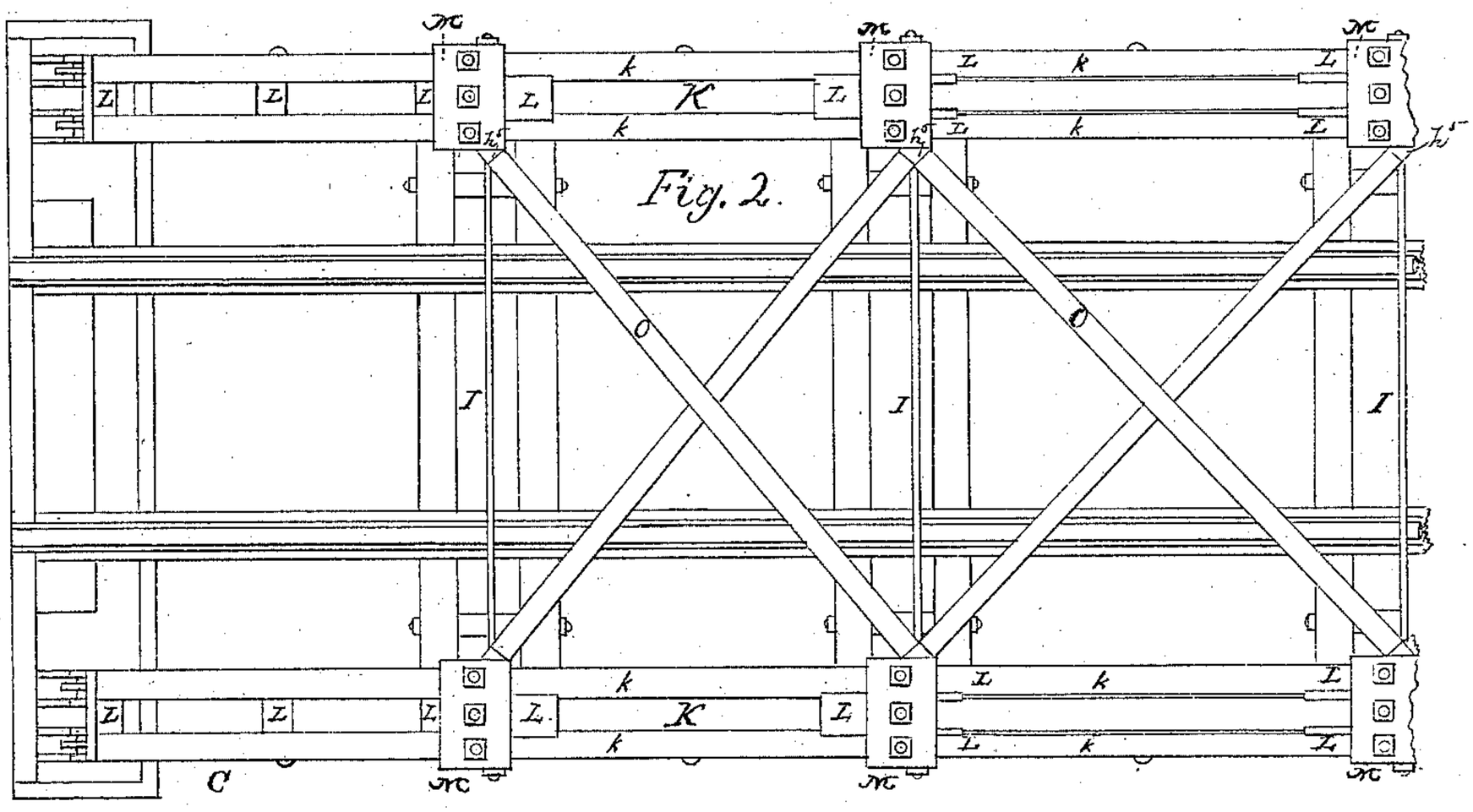

Fig. 2.

Witnesses

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Fig. 3.

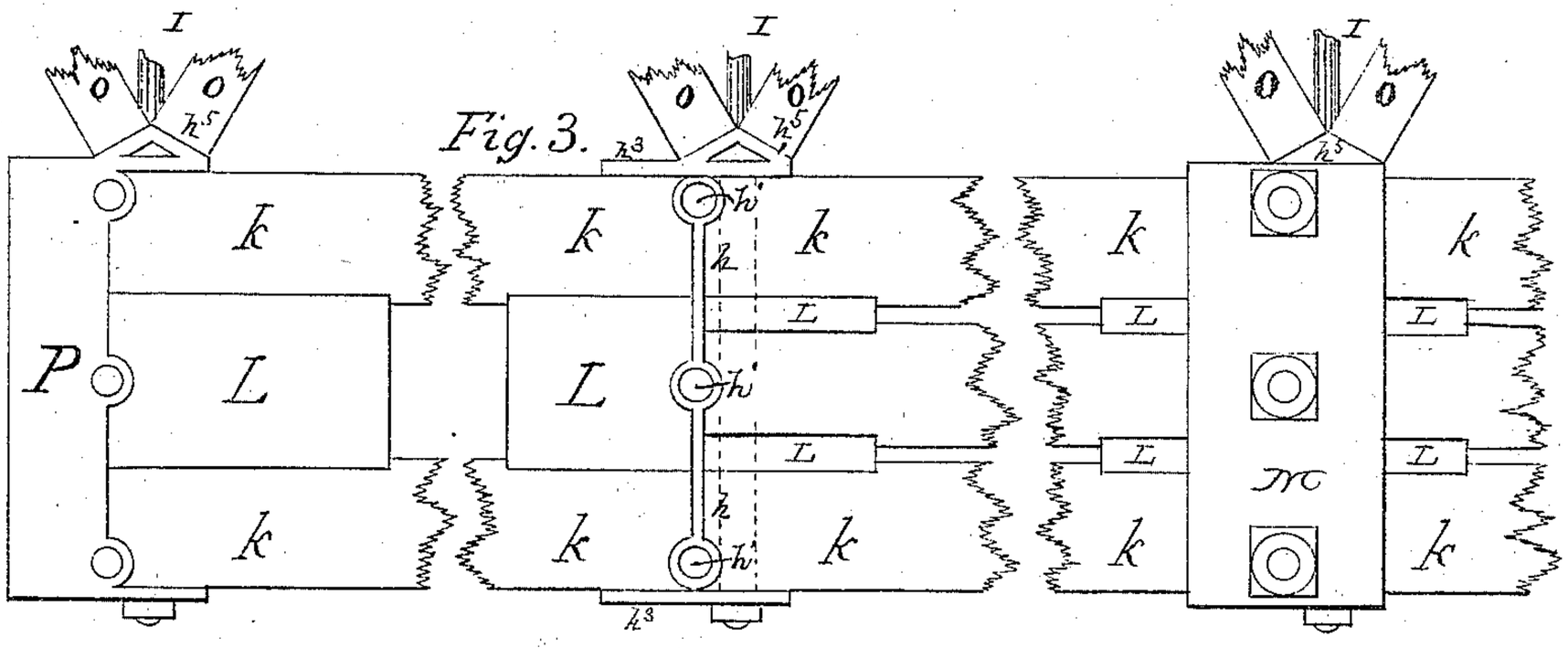


Fig. 4.

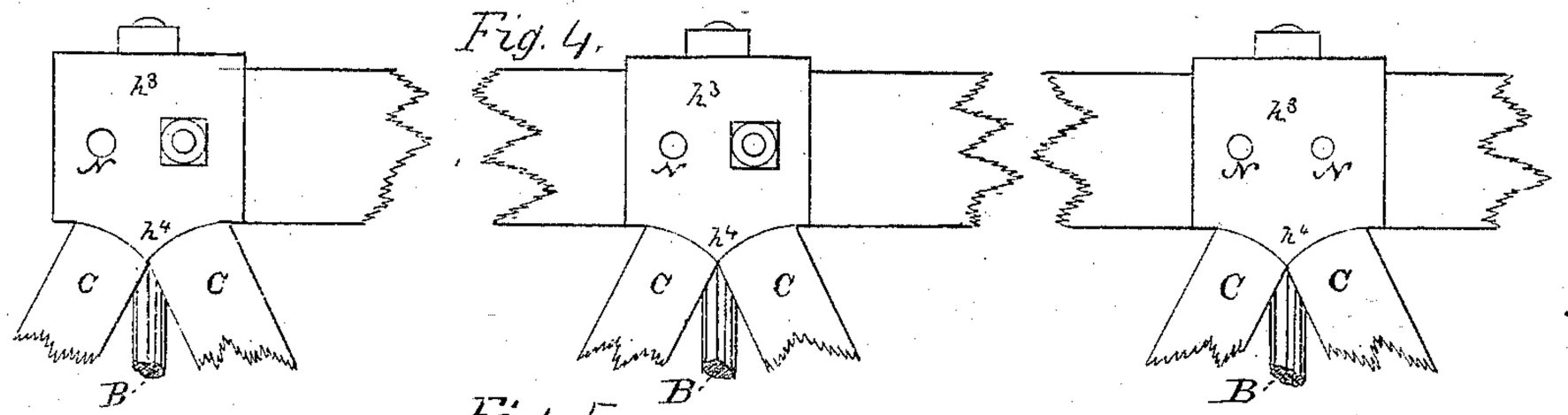


Fig. 5.

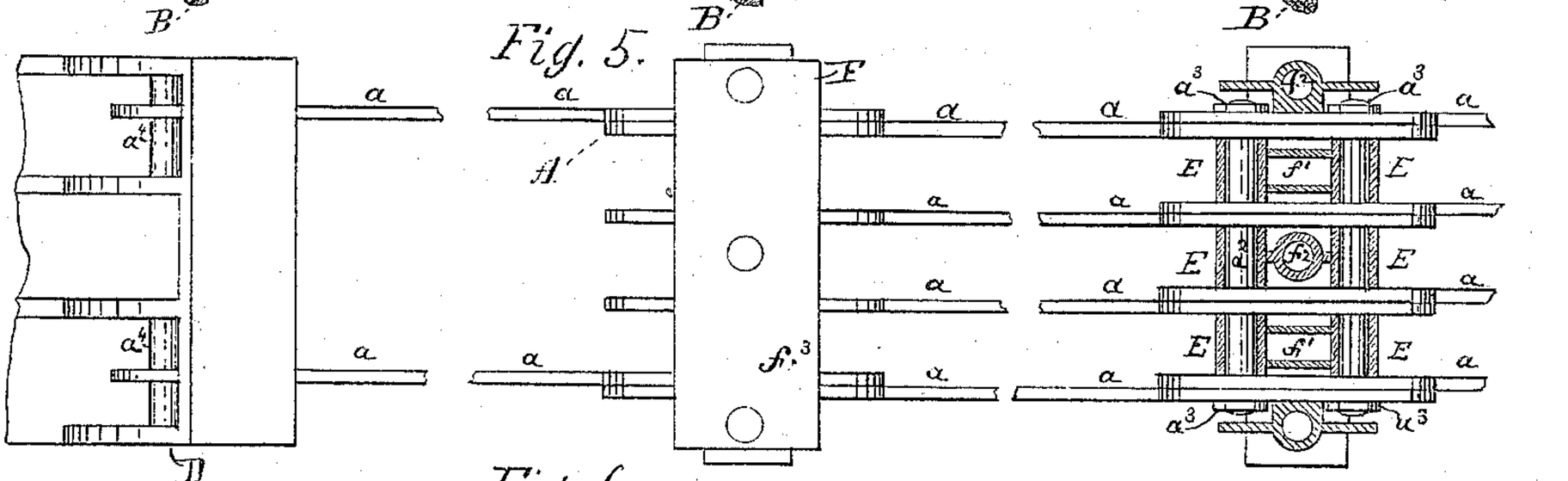
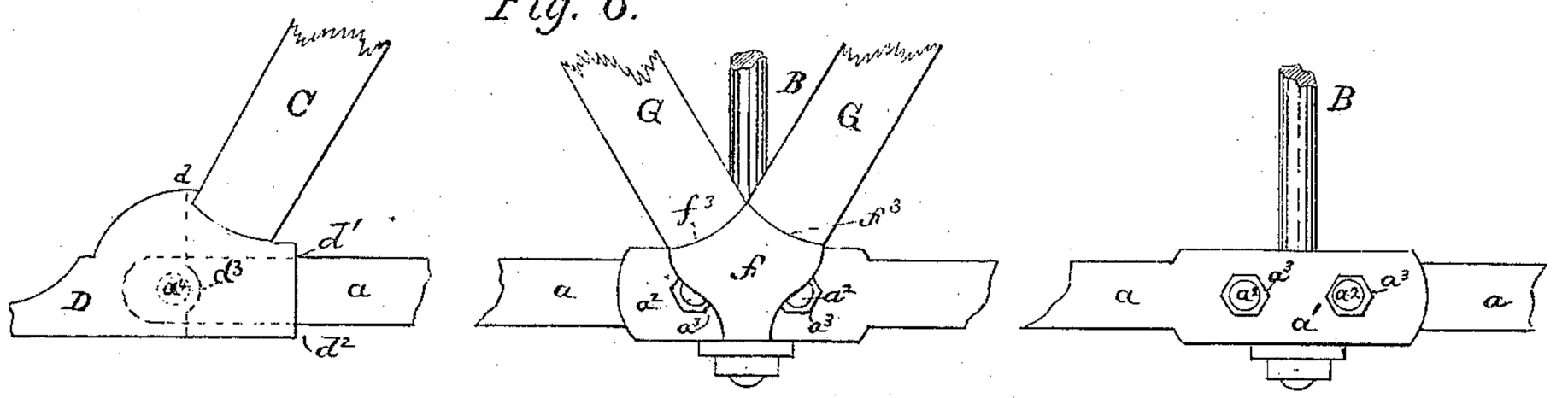


Fig. 6.



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Bridges.

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Fig. 7.

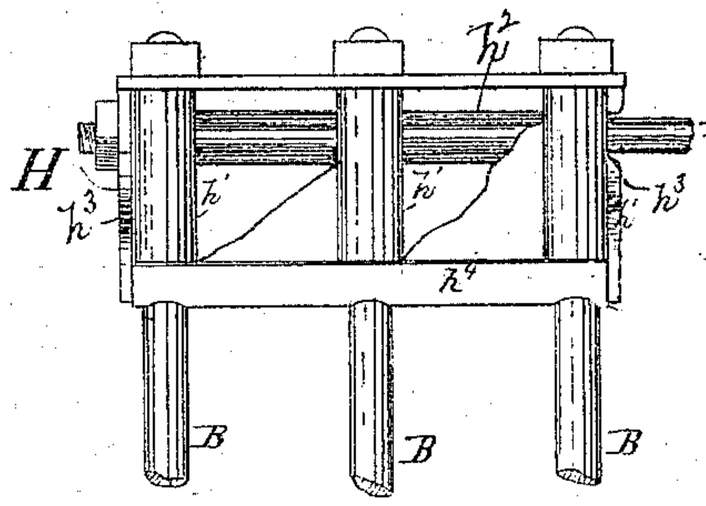


Fig. 8.

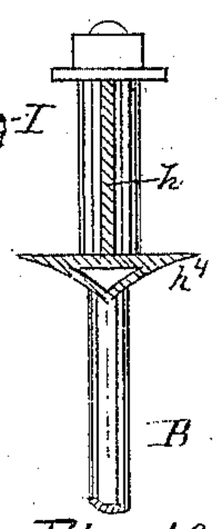


Fig. 9.

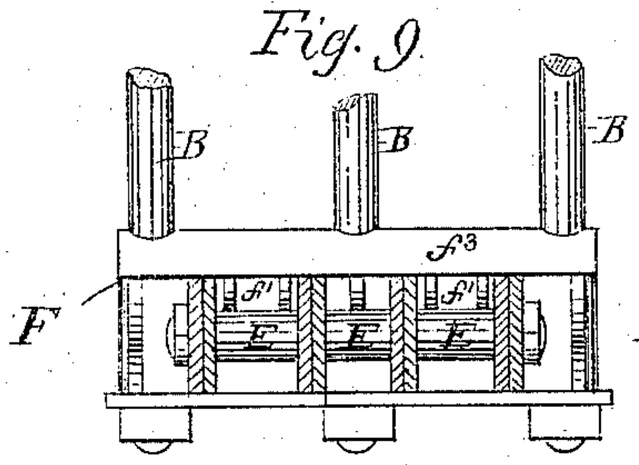


Fig. 10.

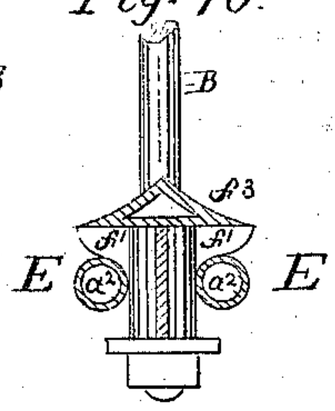
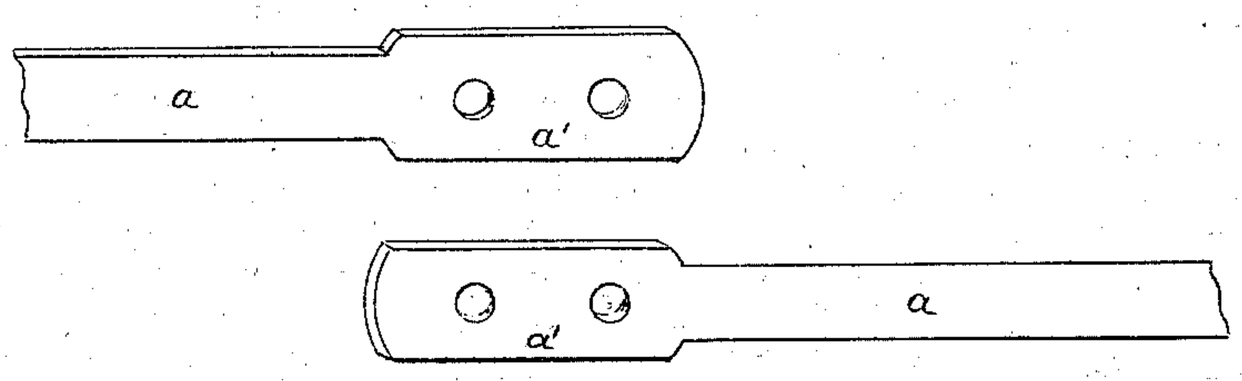


Fig. 11.



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UNITED STATES PATENT OFFICE.

JAMES GATES, OF ST. LOUIS, MISSOURI.

IMPROVEMENT IN BRIDGES.

Specification forming part of Letters Patent No. **135,705**, dated February 11, 1873.

To all whom it may concern:

Be it known that I, JAMES GATES, of St. Louis, in the county of St. Louis and State of Missouri, have invented a new and useful Improvement in Bridge Construction; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawing and to the letters of reference marked thereon, in which—

Figure 1 is a side elevation of a portion of the truss. Fig. 2 is a top view of a portion of the bridge. Fig. 3 is a plan of a portion of the upper chord, showing two of the top plates removed. Fig. 4 is a side elevation of the same. Fig. 5 is a top view of a portion of the lower chord, showing one of the angle-blocks in section. Fig. 6 is a side elevation of the same. Fig. 7 is a side elevation of an angle-block in the upper chord, showing the vertical rods attached. Fig. 8 is an end view of the same. Fig. 9 is a side elevation of an angle-block in the lower chord, showing the vertical rods and lateral pin. Fig. 10 is an end view of the same. Fig. 11 is a perspective view of the ends of two tension-bars.

Like letters of like kind refer to like parts.

The invention relates to improvements in bridge construction, the advantages of which are greater strength, integrity, and simplicity, and economy in material, construction, erection, and repair. It consists, first, in the peculiar construction of the lower chord; second, in the employment of an angle-block of peculiar construction; third, in the employment of packing-blocks with the pins connecting the tension-bars; fourth, in the peculiar joints formed by the tension-bars, pins, and packing-blocks; fifth, in the peculiar construction of the bridge-seat; sixth, in the peculiar construction of the upper chord; seventh, in the peculiar construction of the angle-blocks of the upper chord and the combination of certain elements with them, as will be hereinafter described.

The lower chord A of my bridge is composed of tension-bars *a a a a*, which are made as follows, viz: A bar of suitable width and thickness, and of a length nearly that of a panel, is rolled. Then two other pieces, a^1 a^1, Fig. 11, of about the same thickness, but somewhat wider, and of a length rather more than the width of the angle-block, are constructed. These last-described pieces are then securely welded under a heavy hammer onto the ends of the first-described piece. The tension-bar is then at its ends properly drilled to receive two steel pins that pass laterally through the chord. By using two pins, a^2 a^2, Fig. 6, instead of one, and an angle-block constructed as is hereinafter described, the chord can be put together without first inserting the vertical rods B B that connect the upper and lower chords, which would not be practicable were a single pin only used. Further, by using two pins, as described, the chord is laterally materially stiffened. The pins a^2 a^2 pass laterally through the ends of all the tension-bars in the panel, and are held in place, and in turn serve to hold the tension-bars securely together, by means of nuts a^3 a^3, Figs. 5 and 6, screwed onto the ends. The tension-bars at the ends of the chord pass through slots in the bridge-seats, and are attached thereto by pins a^4 a^4, Figs. 5 and 6, that pass through their ends and bear against a concave surface, d^3, in the bridge-seat. To prevent the end brace C from slipping from its position the bridge-seat D is provided at its top with a shoulder, *d*. It is also provided with slots d^1 d^1, Fig. 6, through which the end tension-bars are inserted. The half-block d^2, Fig. 6, and bridge-seat are cast in one piece. E E E represent the packing-blocks in the lower chord, which are constructed by cutting gas or steam tubing (the diameter of which corresponds to that of the pins a^2 a^2) into lengths equal to the distances between the tension-rods, to keep them apart. There are two sets of packing-blocks at each joint, respectively, placed on the two pins a^2 a^2. The lower chord being erected, the angle-blocks F F, Figs. 5 and 9, are placed in position. These are provided at their ends with flanges *f f f*, shown in Figs. 1 and 6, which extend down even with the lower edge and outside of the chord. They are also provided with flanges f^1 f^1 f^1, of shape shown in Figs. 5, 9, and 10, which extend downward between the tension-bars and fit closely around the packing-blocks E, which encircle the lateral pins a^2 a^2. They are further provided with tubular-shaped projections f^2 f^2 f^2, extending downward for the purpose of receiving the vertical rods B B. These projections

are shown in horizontal cross-section in Fig. 5. The flanges f^1 f^1 f^1, arranged as described, provide a firm support, laterally and longitudinally, for the angle-block. The upper faces f^3 f^3 f^3 of the angle-blocks, instead of being a plain bevel, or a bevel provided with a lip at the lower edge, as is customary, are made slightly concave, as shown, Figs. 1 and 6, to secure a solid bearing for the vertical braces G G, when there is a tendency to displacement from their original position by the expansion and contraction of the lower chord, or other cause. The ends of the braces G G are shaped to conform to this concavity.

Heretofore, in the construction of the upper chord of bridges of the Howe truss and similar patterns, it has been customary to use pieces of timber of a length sufficient to extend over two, three, or more panels, and arranged in such a way as to bring the joints midway or thereabout in a panel.

By my improvements I am enabled to use timber the length of the panel only, and arranged so that the joints in the chord will coincide with the panels. This construction secures several important advantages: First, in using short pieces of timber, less expense is incurred, as the prices of timber in short dimensions are less than that of a similar quantity in longer form; second, it is easier and cheaper to obtain sound timber in shorter lengths; third, the proportions of the pieces of timber composing the chord can be readily and exactly adjusted to the strain that each panel is respectively required to meet, thus avoiding any useless expenditure of material and any undue excess of weight; fourth, any piece can be readily replaced without disturbing the position of the remainder; fifth, the system of lateral bracing can be more readily arranged and connected at the joints of the chord, and thus secure a simpler and firmer structure.

The advantages above set forth are mainly obtained by the peculiar construction of the angle-block H, Figs. 7 and 8, which, instead of extending partially into the upper chord, as has heretofore been customary, is made to extend entirely through the chord, both laterally and vertically. The angle-block H, which is cast in one piece, consists principally of a web, h, Figs. 3 and 8, the length and height of which are equal to the width and thickness of the chord. The web has tubes h^1 h^1 running vertically through it to receive the vertical rods B B B, and it is also provided with a lateral tube, h^2, to receive the lateral tie-rod I. The web is further provided at its ends with flanges h^3, Figs. 3, 4, and 7, which inclose the sides of the chord K. Attached to the lower edge is a piece, h^4, triangular in cross-section, and shown in Figs. 7 and 8, which corresponds to the upper angle-block generally in use in the upper chords of truss-bridges. The ends of the chord-pieces rest upon this last-described piece. The angle-block is further provided at its inner end with a triangular half-block, h^5, Fig. 3, against which the lateral top braces abut. It also may prove desirable to attach a roof to the block to protect the parts from the weather. This may be cast in one piece with the rest. k k k k represent the pieces composing the upper chord. L L L represent keys let into the sides for the purpose of keeping the chord-pieces the proper distance apart. Through these keys and chord-pieces bolts pass to hold the parts together laterally. It will be seen from the nature of the construction that the chord can be prepared in panel sections at any desirable place, and in that shape easily transported to the locality of the bridge. The chord-pieces k k k at their ends are framed to fit round the lateral and vertical tube projections in the web of the angle-block. After the chord has been erected the top plates m m, which extend over the ends of the chord-pieces k, and aid in holding them in place, are put on, the vertical and lateral bracing are inserted, and the lateral and vertical rods screwed up.

The angle-blocks and joints last described afford a solid, continuous iron bearing, both vertically and laterally, throughout the truss. In consequence of this arrangement the shrinking of the wood in the top chord will not affect the integrity of the structure. Further, by arranging the lateral bracing at the panel-joints, the truss is strengthened laterally at the points most needing support.

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

1. The lower chord, consisting of the tension-bars a a a, the pins a^2 a^2 the packing-blocks E E E, the bridge-seat D, and the pins a^4 a^4, constructed and arranged substantially as described and shown.

2. The angle-block F, provided with the flanges f f, the flanges f^1 f^1 f^1, and the tubular projections f^2 f^2 f^2, substantially as described and shown.

3. The packing-blocks E, in combination with the pins a^2 a^2, constructed and arranged substantially as described and shown.

4. The joints in the lower chord, formed by the tension-bars a a a, the pins a^2, and the packing-blocks E E E, constructed and arranged substantially as described and shown.

5. The bridge-seat D, provided with the shoulder d, the slots d^1 d^1, and the half-block d^2, constructed substantially as described and shown.

6. The upper chord K, consisting of the end angle-block P, the chord-pieces k, the angle-blocks H H, the keys L, and the pins N, constructed and arranged substantially as described and shown.

7. The angle-block H, consisting of the web h, provided with the vertical tubes h^1, the flanges h^3, and the piece h^4, substantially as described and shown.

8. In combination with the elements of the angle-block H, constructed as described, the half-block h^5, arranged as described.

9. In combination with the elements of the angle-block H, constructed as described, the short chord-pieces K K, as described.

10. The lateral braces O and rods I I, in combination with the angle-block H, constructed and arranged substantially as described and shown.

11. In an angle-block for a truss-bridge, the concave upper surfaces f^3 f^3, substantially as described.

This specification signed and witnessed this 15th day of May, 1872.

JAMES GATES.

Witnesses:

CHAS. D. MOODY,

F. S. DAVENPORT.