

W. R. LAIRD.  
Wrought-Iron Bridges.

No. 146,916.

Patented Jan. 27, 1874.

Fig. 1.

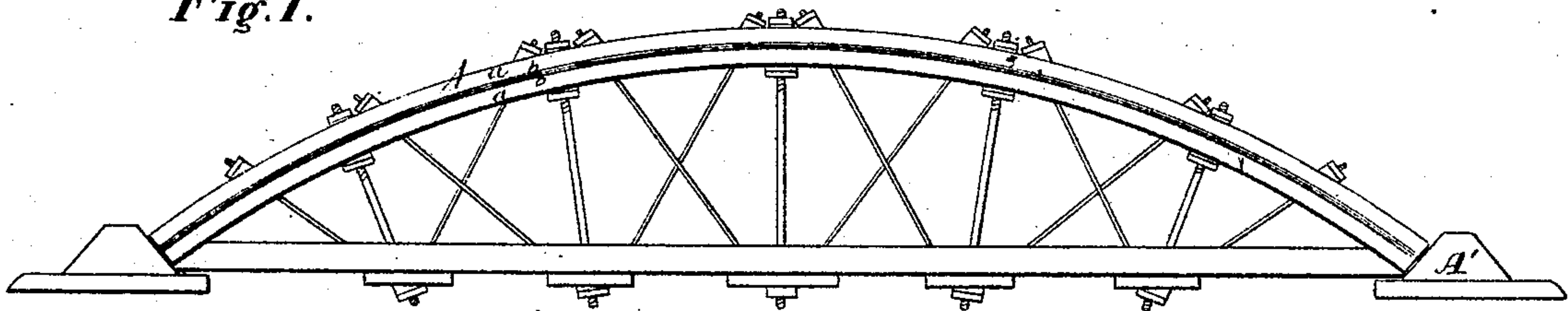


Fig. 2.

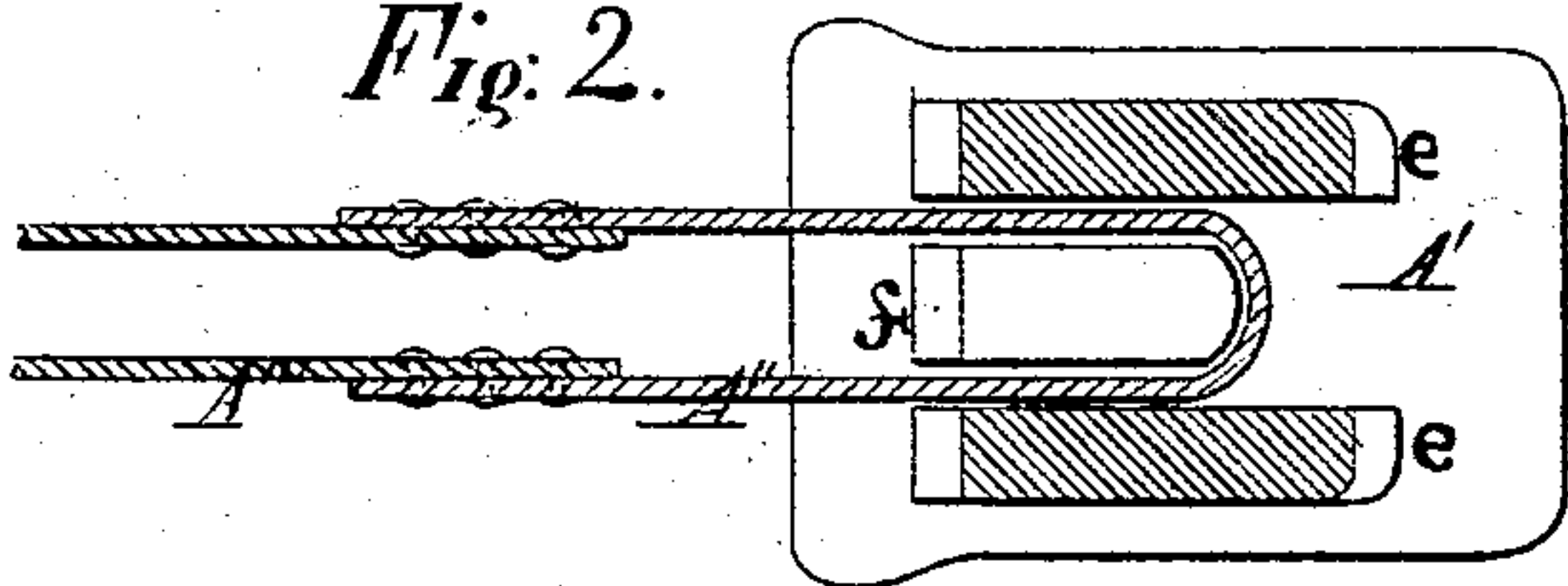


Fig. 3.

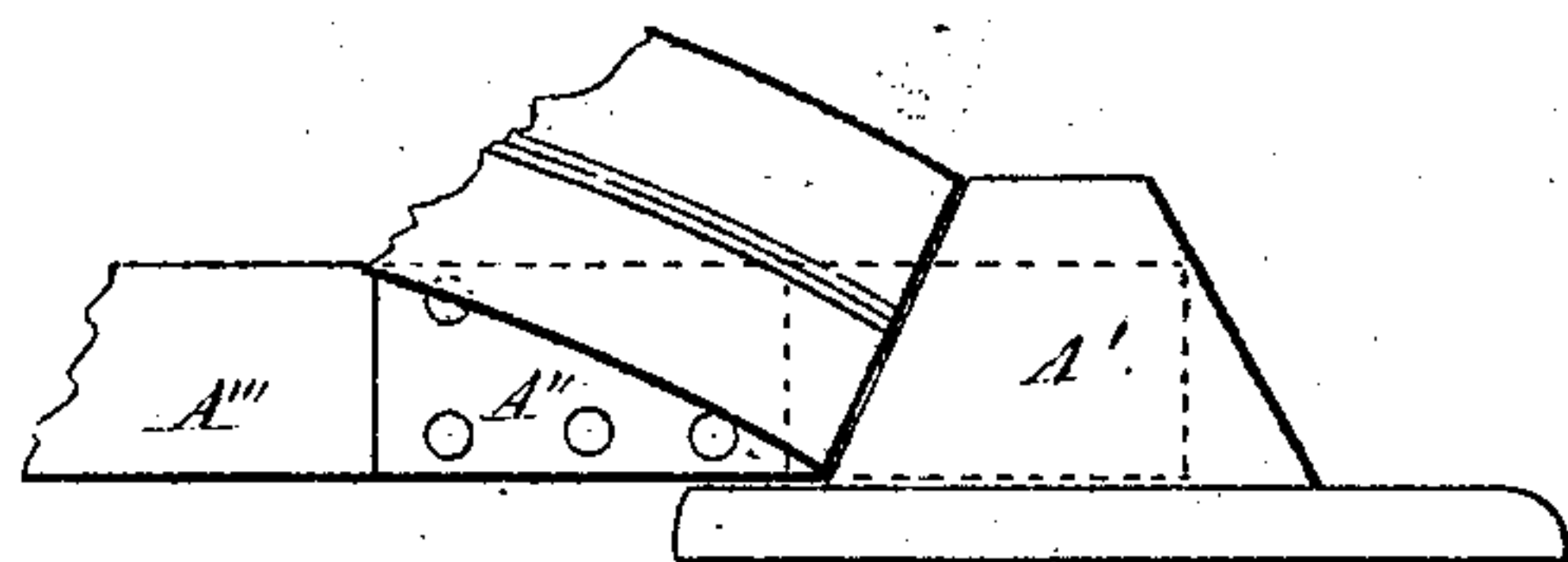


Fig. 4.

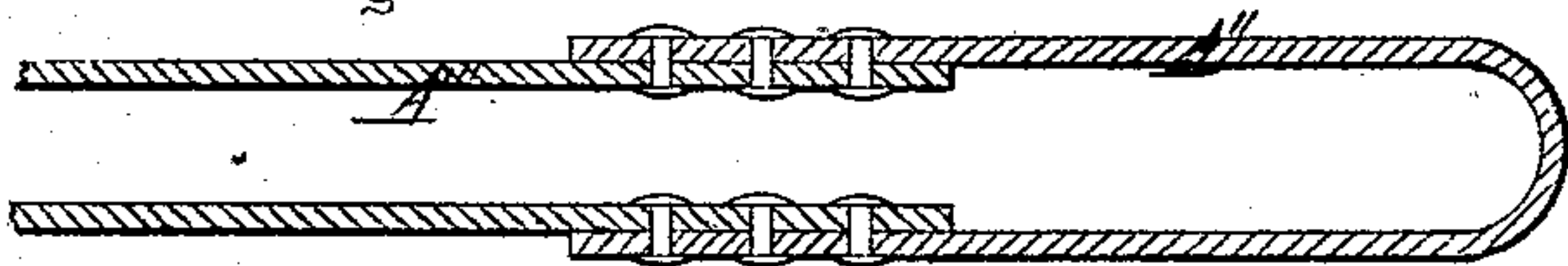


Fig. 5.

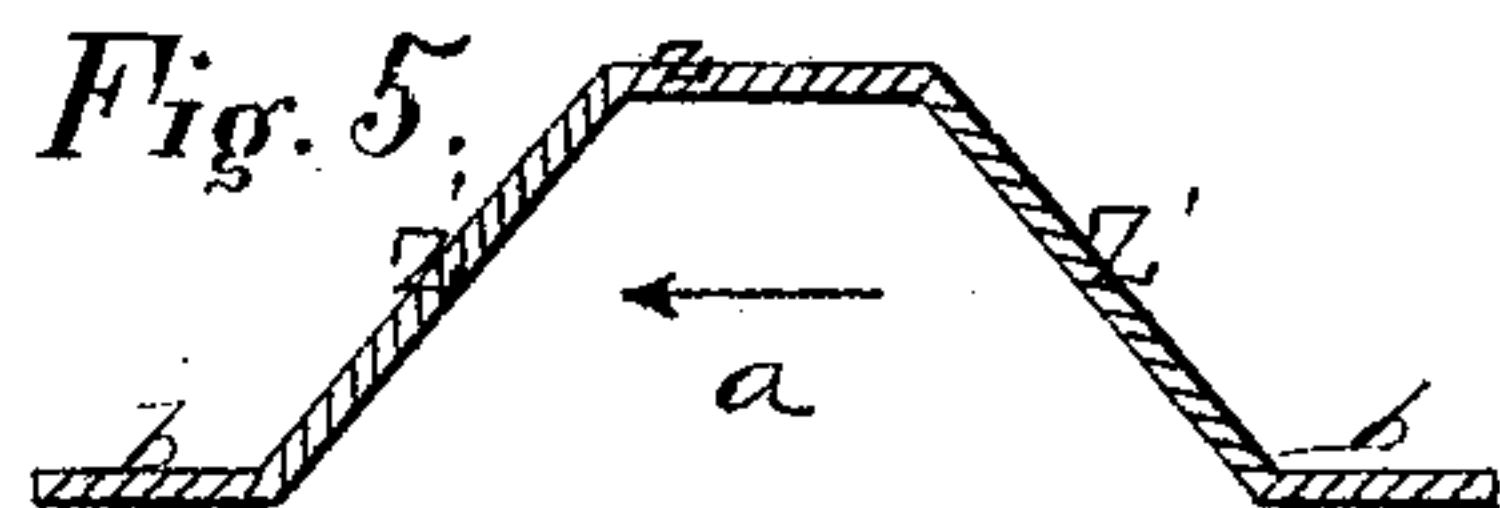


Fig. 7.

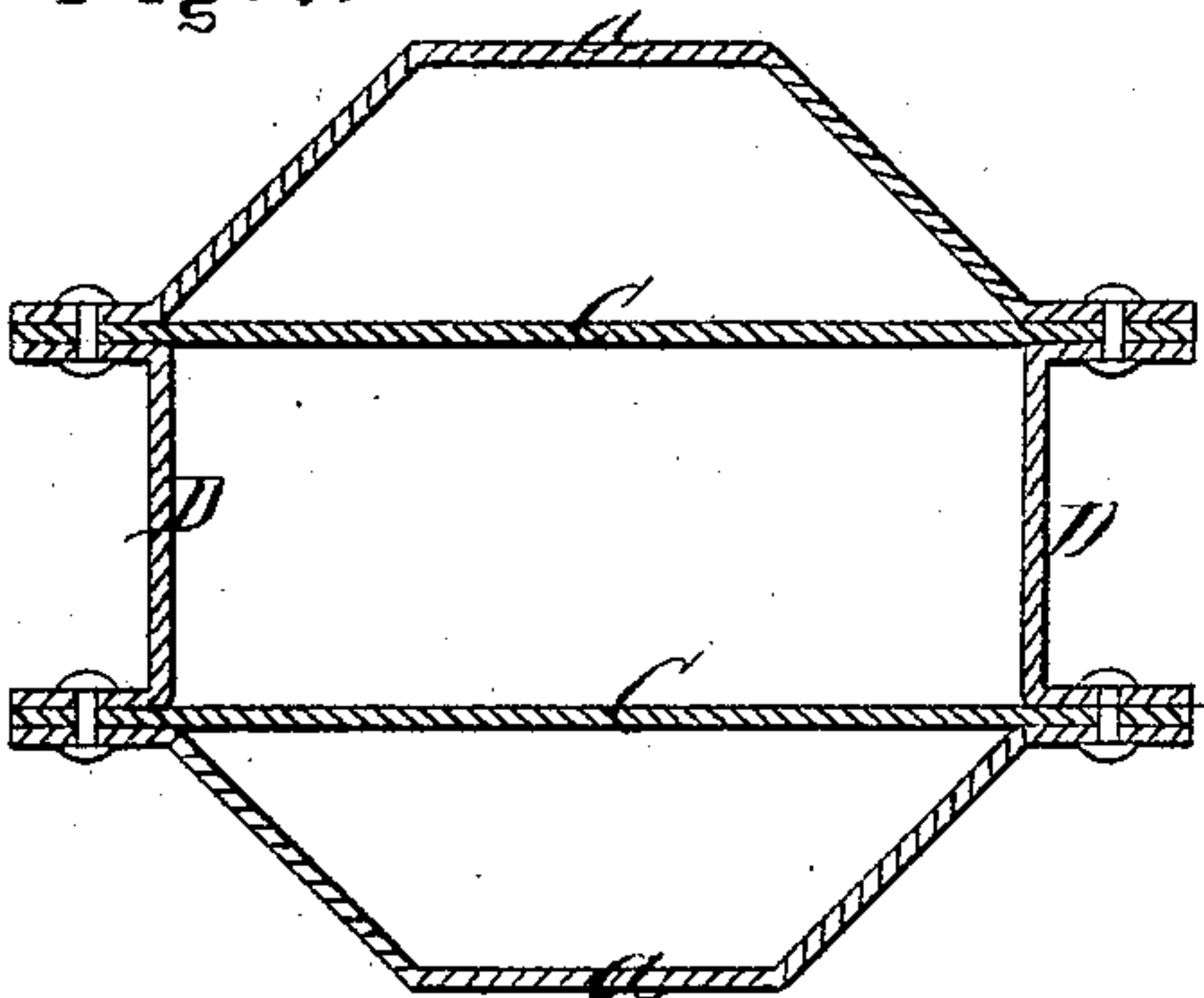
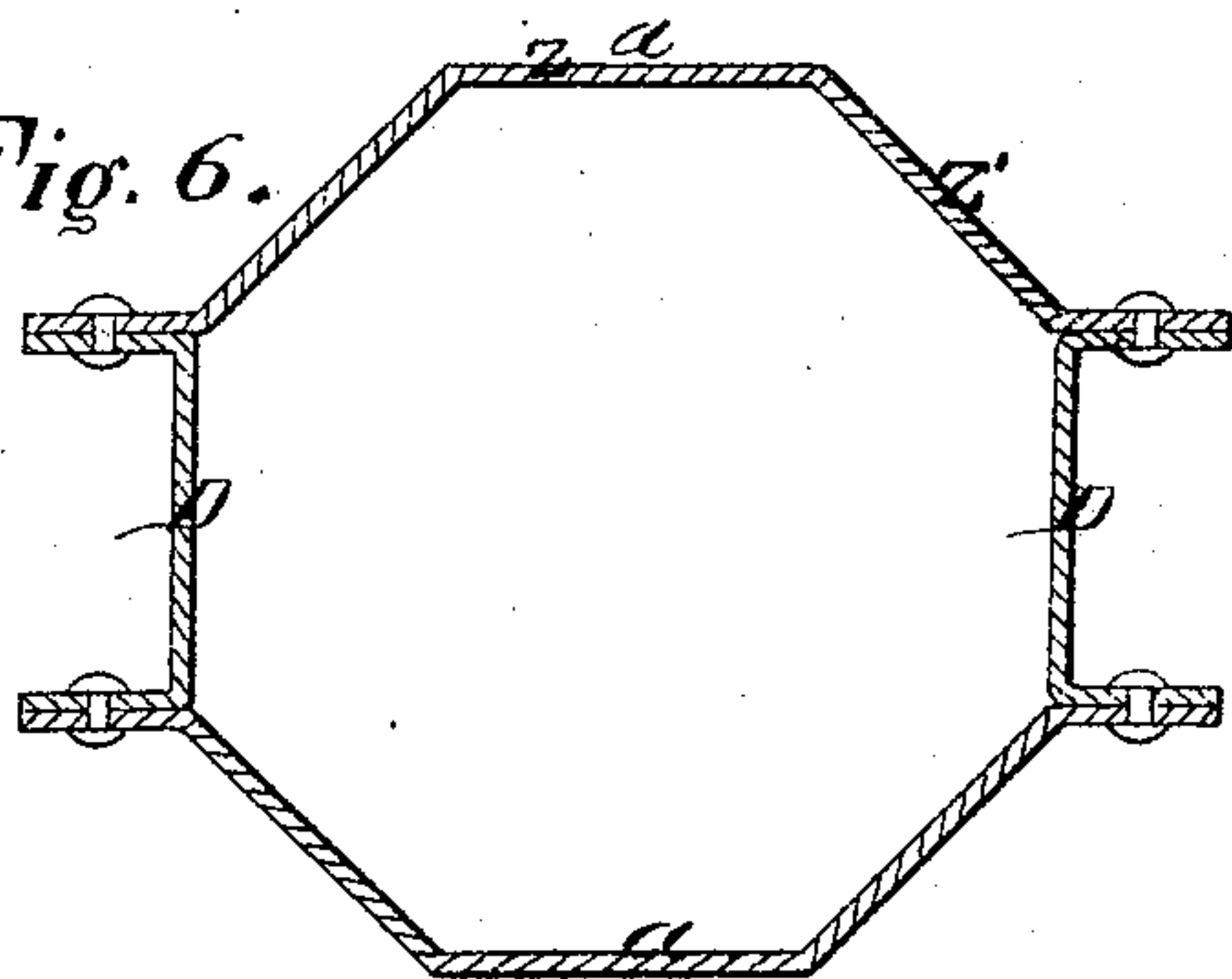


Fig. 6.



Witnesses.

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Attys



# UNITED STATES PATENT OFFICE.

WILLIAM R. LAIRD, OF CANTON, OHIO.

## IMPROVEMENT IN WROUGHT-IRON BRIDGES.

Specification forming part of Letters Patent No. **146,916**, dated January 27, 1874; application filed May 11, 1871.

*To all whom it may concern:*

Be it known that I, WILLIAM R. LAIRD, of Canton, in the county of Stark and State of Ohio, have invented a new and valuable Improvement in Wrought-Iron Bridges; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings making a part of this specification, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a representation of a side elevation of a bridge, showing part of my invention. Figs. 2, 3, and 4 are details of the devices for securing the girders. Figs. 5, 6, and 7 are details of the tubular beam or column.

My invention has relation to certain improvements in the construction of wrought-iron bridges; and it consists, first, in the peculiar form of the bars designed for use in the construction of hollow or tubular arches, girders, braces, posts, columns, &c.; and, secondly, in the novel mode of fastening the chord at the intersection of the arch.

In the accompanying drawings, the letter *a* designates the rolled corrugated plate or bar, which is designed to form that portion of a beam or arch which opposes the chief resistance to the downward strain. The form of this plate is clearly indicated in the sectional view, Fig. 5. It consists of three walls and two flanges. The middle wall *z* is made parallel with the flanges *b b*, to which it is connected by the oblique walls *z' z'*. These oblique walls are usually inclined at about an angle of forty-five degrees, and therefore the bend or corner by which they are joined with the adjacent flanges *b b*, or with the middle wall *z*, is always greater than a right angle.

This peculiar form of corrugated or ribbed bar is thought to possess great strength and to be especially adapted to resist the transverse strain to which it is subjected in bridges. If the angle be less, as if the oblique walls *b b* were brought together and the middle wall *z* dispensed with, a transverse strain, acting in the direction of the arrow in the drawings,

would easily overcome the resistance of the small mass of metal in the corner.

The broad wall *z* provides a mass of metal which is abundantly able to sustain the compressing force of a transverse strain on the beam.

For bridges where a greater weight of metal is required to resist strain, the double flange-plate *D* is employed. This plate is bolted by its flanges to the flanges of the corrugated plates *a*, forming a beam of great strength, as shown at Fig. 6; and, by the introduction of the binding or partition plates *C C*, this form is further strengthened in a very great degree. This is illustrated in Fig. 7.

These tubes may be used either for the arches, girders, posts, or other parts of the bridge, the oblique sides *z'* being placed at an angle of about forty-five degrees with a prolongation of the central wall *z*. Through this wall *z* the bracing rods or ties are passed, and the surface of the wall is such as to provide an even and broad foundation for the washers or nuts of the braces, as indicated in Fig. 1.

In Figs. 2 and 3 of the drawings is illustrated the method of securing the girder at the intersection of an arch.

Fig. 2 represents a horizontal section of a slotted cap, or shoe, *A'*, which is to be laid on the pier or abutment, and is provided with the parallel upright walls *e* and the upright stud *f*, lying between said walls, as shown in Fig. 2, and holds a horizontal loop, *A''*, to the arms of which the bars of the girder *A'''* are bolted or riveted.

Fig. 3 is a side elevation of the end of a bridge, showing the mode of securing the cap, girder, and arch together, the end of the arch being abutted against the beveled front of the shoe squarely, the inclined front of the shoe being regulated according to the spring of the arch, and the plane of the inclined front being perpendicular to a line tangent to the curve of the arch at this point.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, in a tubular metallic column, of two bars having parallel flanges

upon their edges and two convex plates, each rolled in one piece, these members being united by bolts or rivets to form a column of substantially polygonal cross-section, with plane bearing-surfaces for the attachment of pins or tension-bars at right angles to the two flanged bars, substantially as set forth.

2. The anchoring devices, consisting of the shoe A' having the parallel upright walls, the upright stud lying between said walls, and

the loop A'', in connection with the beam A''', substantially as specified.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

WILLIAM R. LAIRD.

Witnesses:

HARRY LAIRD,  
GEO. W. RAFF.