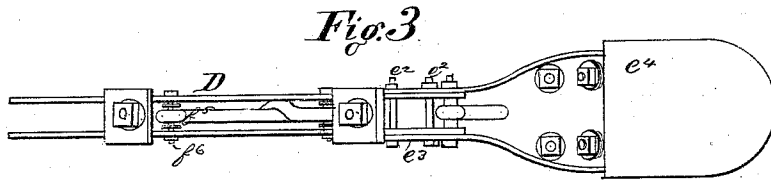
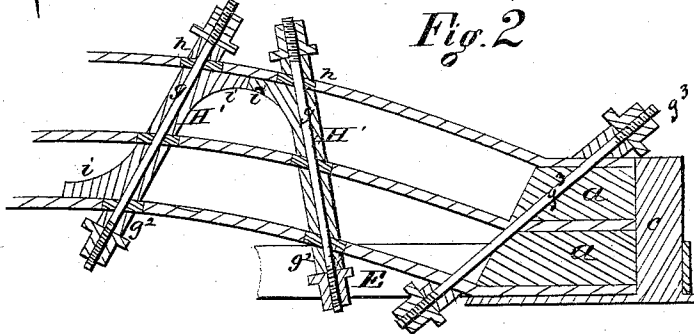
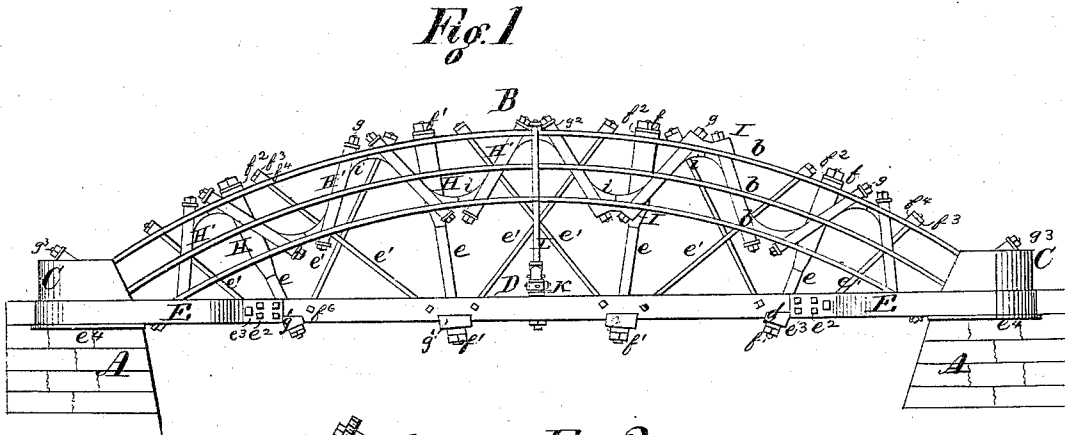


J. & Z. WALL.
Iron Bridges.

No. 148,010.

Patented Feb. 24, 1874.



WITNESSES
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By

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UNITED STATES PATENT OFFICE.

JONATHAN WALL AND ZIMRI WALL, OF WILMINGTON, OHIO.

IMPROVEMENT IN IRON BRIDGES.

Specification forming part of Letters Patent No. 148,010, dated February 24, 1874; application filed December 1, 1873.

To all whom it may concern:

Be it known that we, J. WALL and Z. WALL, of Wilmington, in the county of Clinton and State of Ohio, have invented certain new and useful Improvements in Bridges; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification, in which—

Figure 1 is a side view of main arch. Fig. 2 is a vertical longitudinal section of part of main arch. Fig. 3 is an under-side view of chord and clevis.

This invention has relation to certain improvements in wrought-iron arched bridges; and it consists in the construction and combination of parts, including the arches, brace-rods, gas-pipe casing to brace-rods, fastenings, shoes, and chords, all as hereinafter described.

Referring to the accompanying drawings, A designate the abutments, supporting the side arches B. The latter describe true segments of a circle, and are each composed of three concentrically-arranged plates, *b*, of wrought-iron, bent to a horizontal position at their ends to fit the shoes C. The spaces at the end of the arch, between the horizontal portions of the plates *b*, are filled with iron in the form of blocks *a*, having sides and ends rectangular, so as to fill the cavities of the shoes. The outer ends of the shoes are of semicircular form, and the spaces between said ends and the blocks *a* suitably filled, as shown at *c*, Fig. 2. D designates the arch ties or chords, consisting, for each arch B, of two parallel plates of wrought-iron, placed sufficiently distant apart for the passage of the braces *e e'*. These plates terminate at a short distance from the ends of the arches, and are connected to the loops or clevises E E by means of transverse bolts *e''*. By means of said loops the ties D are connected to the shoes, the loops, which are formed each of a single plate of wrought-iron, of the width and thickness of the tie-plates, being bent around the shoes at their bases, and converged toward their inner ends, which terminate in parallel extensions *e''*, embracing the tie-plates, as shown. The loops rest upon the projecting edges of the shoe-

bases *e'*. *e e'* designate the braces, through which the body of the bridge is supported by the arches. *g* designates the braces of the arch-plates. The braces *e* are radial, and pass through the arch-plates *b* and between the tie-plates D, and also through flanged blocks *g'*, arranged below and embracing the tie-plates D. The ends of said braces *e* are threaded to receive the nuts *f f'*, the former resting upon the collars or washers *f''*. The braces *e'* are diagonally arranged. They pass through the arch-plates, and are fastened at their upper ends by nuts *f''*, resting on beveled collars or washers *f''*. The lower ends of the braces *e'* are bent to form loops or eyes *f''*, through which pass transverse bolts *f''*, securing them between the plates of the ties, close to and on either side of the braces *e*. The braces *e e'* pass through the arch-plates midway between their sides. The braces *g* are designed to strengthen the arch proper. They are arranged in two sets, one at each side of the arch, forming a double truss-support. Said braces pass through the arch-plates, and are arranged in the zigzag relation shown in the drawings, and secured by means of nuts on their ends resting against collars or washers *g''*. H H' designate tubular casings, embracing the rods *e g* between the plates of the arch. These casings are each formed in two sections, the ends of which rest against the two arch-plates, between which they are, respectively, arranged. The object of the casing is to strengthen the arch, and keep the arch-plates in the proper relations to each other. These casings are formed from gas-pipe, cut to the proper size, an item constituting an important feature of this invention, said pipe being available at comparatively slight cost, considering the advantage obtained. The collars or washers on the ends of the brace-rods may be also made from gas-pipe. Each section of the casing inclosing the braces *g* has a footing, *i*, at one end, projecting from the side toward the adjacent section (similarly constructed) of the next rod-casing. The footings of the lower sections rest upon the lower plate of the arch, and those of the upper sections against the upper plate on the under side thereof. The upper and lower footings bear, respectively, against each other, thus preventing the rods

from coming nearer together than necessary, and increasing the effectiveness of the braces. Instead of the collars upon the ends of said braces *g*, double washers I may be substituted, consisting of blocks of metal, concave on their under sides for the upper plate, and convex for the lower, and beveled inwardly from each end on their outer sides for the reception of the nuts, as shown. These double washers are designed to resist or counteract the effect of strain tending to separate the brace-rods *g*.

The plate-braces at the ends of the arch, marked *g*³, may be radial, or approximately so, as shown. These braces pass through the filling-blocks, holding the same in place.

To obviate the difficulty of boring oblique holes in the plates for the passage of the plate-braces, we employ the means shown at *h*, Fig. 2, consisting of the beveled filling or bushing, made of malleable iron, and of such a form that when inserted in holes bored straight through the plates, oblique apertures will be obtained for the passage of the brace-rods. The filling or bushing is held in place by the ends of the casing and the washers on the ends of the rods.

The zigzag arch-braces and the tubular casing inclosing the same are combined, as shown, so as to resist both compressive and tensile strain, the compressive strain being received by the casing, which is located in the line of said strain and between the plates, while the tensile strain acts upon the braces through the nuts *f*³, which are fastened thereon outside the arch.

Having fully described our invention, what we claim as new is—

1. The improved wrought-iron arched bridge, having the arched plates *b*, zigzag plate-braces *g*, radial and diagonal braces *e e*¹, chords *D*, and shoes *C*, combined substantially as specified and shown.

2. The combination of the arch-plates, braces *g*, and tubular casing, the latter being included between the arched plates, and said braces, with tubular casing, being arranged to resist both compressive and tensile strains, substantially as shown and described.

3. The tubular casing *H*¹, having the footings *i*, as and for the purpose described.

4. The filling-blocks *a a*, in combination with the arch-plates *b b b*, substantially as shown and described.

5. The shoes *C*, constructed and arranged as shown and described, to receive the horizontal extensions of the arch-plates and support the bent plates or clevises *E*.

6. The filling *h*, in combination with the arch-plates *b* and zigzag arch-braces *g*, substantially as and for the purpose described.

In testimony that we claim the foregoing we have hereunto set our hands this 30th day of August, 1873.

JONATHAN WALL.
ZIMRI WALL.

Witnesses:

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W. W. COLLINS.