D. H. MORRISON.

Bridge Truss.

No. 70,245. Patented Oct. 29, 1867.

Fig. 2

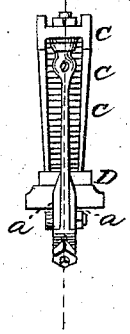

Fig. 1

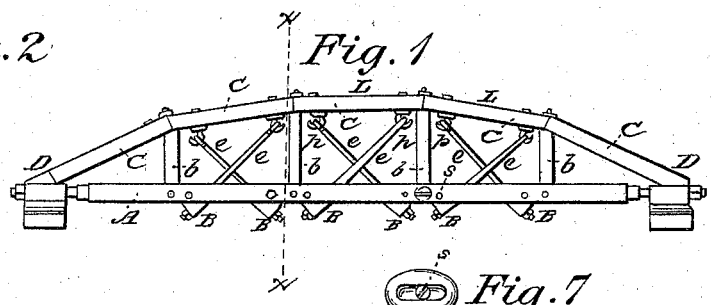

Fig. 7

Fig. 4

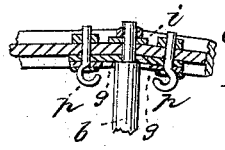

Fig. 3

Fig. 6

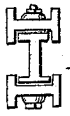

Fig. 5

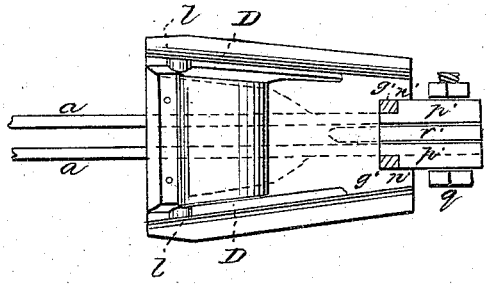

Fig. 8

Witnesses:

R. P. K. Peck

Jos. B. Broock.

Inventor:

D. H. Morrison

by his atty H. P. K. Peck

United States Patent Office.

DAVID H. MORRISON, OF DAYTON, OHIO.

Letters Patent No. 70,245, *dated October* 29, 1867.

IMPROVED IRON BRIDGE.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, DAVID H. MORRISON, of Dayton, in Montgomery county, in the State of Ohio, have invented a new and useful Improvement in Iron Bridges; and I do hereby declare that the following is an exact and full description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

Figure 1 is a side elevation of a truss of my improved bridge.

Figure 2 is a transverse sectional view of the same taken at the line *x x* of fig. 1.

Figure 3 is a portion of the arch and one of the posts, with the arch-joint washer, and the arch-joint plate, the flanges at one side of the arch-rail being broken away to exhibit the parts, including the concave washers for supporting the diagonal brace-hooks. This figure is a longitudinal section of that portion of fig. 1 between the red lines *z z*.

Figure 4 represents the universal washer.

Figure 5 represents a modification of the arch in section.

Figure 6 represents the hook-bolt supporting washer.

Figure 7 represents the eye-bolt supporting washer, and

Figure 8 represents the skew-back detached.

My invention relates to the method of jointing and arranging I-shaped wrought-iron beams or channel-bars in a bridge-truss, and to the devices by which the bridge structure is connected and supported.

The arch represented in fig. 1 is what is denominated a "broken-line arch," all the joints of which are true radial lines of the arch.

In the accompanying drawings, A denotes the chord, which is constructed of two flat bars of iron, seen at *a a* in fig. 2, which are placed parallel to each other, about one and a quarter inch apart, to allow sufficient space for splicing-pieces, the ends of the posts *b*, the diagonal trussing eye-bolts *e e*, and the lugs *f* of the universal washer B. The posts *b* have holes through their lower ends, through which eye-bolts *s* are inserted, which secure the posts between the flat bars *a a*. But one of the eye-bolts with its washer is represented in fig. 1 of the drawings. The eye-bolts *s* serve for fastenings for horizontal diagonal brace-rods, which would occupy a position under the bridge-floor. The beams C of the arch are of equal length, and they are jointed or bevelled uniformly at the same angle at their ends, excepting the ends of the pieces which rest against the skew-backs D D, and consequently these beams will fit any position in the arch by bringing the bevelled jointed ends together, as represented in fig. 1. The beams C are arranged with their double flanges in vertical planes, which will cause the web of the beams to be in a position at right angles to a vertical plane. In other words, the transverse direction or line of the web will be at right angles to the vertical plane occupied by the flanges of the beams. At each joint of the arch the washers *i i* are placed upon the webs of the beams, the upper ends of the posts *b* passing through them, and nuts on the ends of posts *b* hold these washers firmly down upon the joint of the arch. The posts are bent slightly near their upper ends, where they pass through the arch-joints, so as to bisect them and form a secure fastening; and underneath each joint of the arch, and resting upon the shoulders of the posts, there are placed arch-joint plates *g g*, to strengthen the arch-joints, and the hook-bolts *p p* pass through the plates *g*, and the web of the arch-beams, as represented in fig. 3. The hook-bolts are provided with a supporting washer, (fig. 6,) so formed with a concave depression as to form a seat or rest for the shoulder of the hook, and prevent sudden strain upon the diagonals *b b* from bending or breaking off the hooks. The washer represented in fig. 7 is similarly formed, with a depression corresponding with the shape of the shoulders of the eye-bolt *s*, and for the same purpose that the hook-bolt washer is made. The universal washer B is provided with the longitudinal opening through its centre, indicated by dotted lines, for the diagonal brace-rods *b b* to pass through, and the lug *f* is inserted between the chord-bars *a a*, and a bolt secures the washer in place. These washers being made with an enlarged opening for the diagonal rods, and with the curved faces for the nuts, it will be apparent that the nuts, and the diagonal braces upon which the nuts are screwed, will both adjust themselves in proper relation to the line of the connections between the arch and chord, whatever may be the angle which they occupy. Therefore I denominate the washer represented in fig. 4 as a universal washer. In forming the arch or post of three I beams, they will be connected together, as represented in sectional fig. 5. The cen-

tral beam forms the web, which will, like the web of the arch-beams, in fig. 1 have its cross-section at right angles to a vertical plane. This construction will afford great strength, and prevent any liability of the arch becoming "kinked" or swayed laterally. The bulk of the metal forming the arch, in either of the modifications represented, being in the flanges, and lateral to the web, and at the same time at the greatest distance from the axis, or central longitudinal line of the arch, the greatest resistance will be exerted against any tendency of the arch to sway laterally; the great object being to so dispose the material as to secure the greatest strength with the least weight of metal, which can best be accomplished by an arrangement which shall insure the truss against lateral inclination, as herein described. One of the advantages of my improved construction of bridges is in the method of fitting the joints of the arch-beams which are bevelled at their ends uniformly, and being of the same length, they will fit accurately and form perfect joints in any portion of the arch, and therefore all the beams composing the arches of a bridge may be constructed by the same uniform rule. The universal washer is equally adaptable to use in any position in the chord, without regard to the length of the span of the bridge, or to the angle which the diagonal brace-rod which connects the arch with the chord occupies.

The chord-bars *a a*, represented in fig. 8, extend through the eye of the skew-back, as indicated in dotted lines, and being doubled over at their ends and welded, are of the double thickness represented at *p' p'*, and a metal block, *r'*, is inserted between them, which forces them laterally against the sides of the square enlargement *n'*, in the end of the skew-back D, which enlargement forms shoulders *o'*, against which the shoulder on the chord-bars would rest. Wedges *s' s'* may be inserted between the returned ends of the chord-bars and the shoulders of the enlargement of the skew-back, by which means the chord may be tightened or strained longitudinally. After the chord-bars *a a* are inserted in the opening in the skew-back, the block *r'* will be inserted, and a bolt, *q*, may be employed to secure the chord-bars and block *r'* together. *z z* indicates the seat of the skew-back, against which the end of the I-shaped arch-beam or channel-bar will rest. The chord-bars may be tightened by means of a nut, as seen in fig. 1, or by means of the wedges, as represented in fig. 8.

Having fully described my improvements in iron bridges, what I claim, and desire to secure by Letters Patent, is—

1. The universal washer B *f*, constructed and applied in the manner and for the purpose specified.

2. The combination and arrangement of the arch-beams C, arch-joint plates *g*, and universal washer B *f*, when constructed, connected, and operating conjointly in the manner and for the purpose described.

In testimony whereof I have hereto set my hand this 19th day of April, 1867.

D. H. MORRISON.

Witnesses:

H. P. K. PECK,

A. L. PECK.