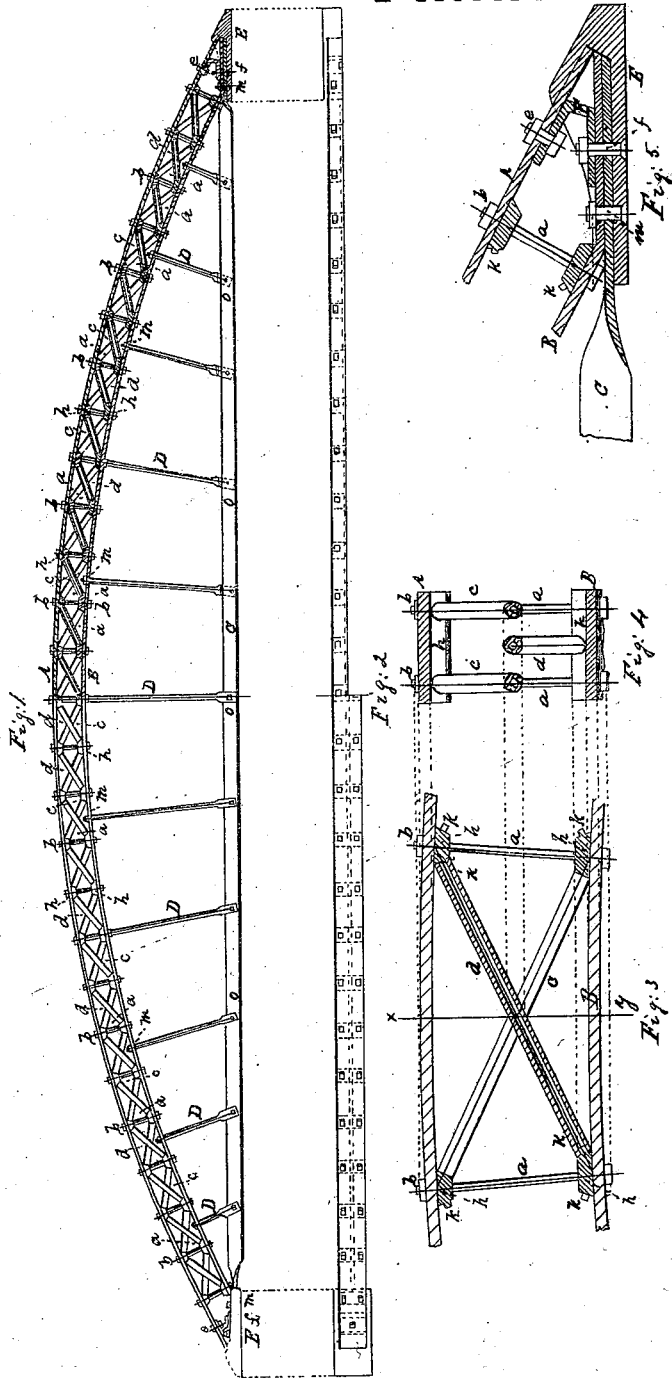


J. Davenport.
Bridge-Girder.

N^o 72611

Patented Dec. 24, 1867.



Witnesses.

Chas. S. Manderson
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United States Patent Office.

JOSEPH DAVENPORT, OF MASSILLON, OHIO.

Letters Patent No. 72,311, dated December 24, 1867.

IMPROVEMENT IN BRIDGE-GIRDERS.

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, JOSEPH DAVENPORT, of Massillon, in the county of Stark, and State of Ohio, have invented a new and useful Form of Girder for Bridges and other structures; and I do hereby declare that the following is a full, clear, and exact description of my invention, reference being had to the accompanying drawings, and to the letters of reference marked thereon, of which drawings—

Figure 1 is a side view of my girder, one half being shown in full, and the other half in section.

Figure 2 is a plan of my girder, corresponding to the view shown in fig. 1.

Figure 3 is an enlarged sectional view of a portion of the same girder.

Figure 4 is a view of section made by plane *xy* in fig. 3, the other half of the arch being restored.

Figure 5 is an enlarged sectional view of the arch-shoe and its connections.

The nature of my invention consists in the construction of an arch, composed of upper and lower string-pieces, which are connected together by posts, rods, or bolts, and are kept apart and strengthened by braces, which abut against shoes placed against the arch-string pieces, said shoes being arranged so that connecting-posts or bolts pass through them, thus making an arched truss where each part bears such strain as it is best adapted to bear, and the ends of the arch, being connected by a chord or chords, which chord or chords are supported between the ends of the arch by suspension-rods, a girder of great strength and stability is formed, and which is suitable for bridge-girders, and any other structure requiring a like form of girder.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

The arch is composed of the two string-pieces A and B, the bolts *a a*, main braces *c c*, counter-braces *d d*, and shoes *h h*. The main braces and counter-braces abut squarely against the side faces of the shoes *h h*, each brace being placed between the face of one shoe and the adjoining face of the next shoe on the opposite string-piece. The bolts *a a* pass through the string-piece B, then through the shoes *h h*, and through the string-piece A, being secured by nuts *b b* on the top of the string-piece A. Through each set of shoes pass two or more bolts *a a*. The main braces *c c* are placed in pairs, while the counter-braces *b* pass between them, as fully shown in fig. 4. The string-pieces A and B are made of common boiler-plate iron, and the bolts *a a* are common cylindrical iron bolts. The main braces and counter-braces are hollow cylinders, either of cast or wrought iron, and are easily made by taking extra heavy gas-pipe and sawing it off into pieces of the proper length. The shoes *h h* are of cast iron, and have the pins *k k* cast on the faces of the shoes, against which the braces bear. These pins *k k* are cast about an inch in length, and of a diameter about the same as the inner diameters of the braces *c c* and *d d*, and serve to hold said braces in position, the braces being placed over said pins, as fully seen in fig. 3. The arch-shoes E E are of cast iron, made as shown. The chord C is a continuous piece of plate-iron, set up edgewise under the arch, the ends being bent a quarter turn, so as to lie flat on the bed of the arch-shoe E. The end of the lower string-piece B is laid on the end of the chord C, and a bolt, *m*, or several bolts *m*, if desirable, pass through the bed of the arch-shoe E, the end of the chord C, and the end of the lower string-piece B, thus firmly connecting them together. An angle-iron, F, is bolted on the end of the string-piece B by means of one or more bolts, *f*, which pass through the bed of the shoe and the ends of the chord and lower string-piece, and to this angle-iron F the upper string-piece A is bolted by means of the bolt *e*, the end of said upper string-piece abutting against the back of the arch-shoe E. This arrangement of the arch-shoe and its several connections, whereby the ends of the arch and chord are firmly connected, is fully shown in fig. 5. The suspension-rods D D are bolted through the lower string-piece B, or through both string-pieces if desirable, and are secured by nuts *n*, as shown in fig. 1. The lower ends of these suspension-rods D are bolted to the chord C by means of the bolts *o o*, which pass through the chord and ends of suspension-rods.

The mode of constructing the arch is very simple.

The proper distance between the holes for the bolts *b b*, and the various bolts *e e*, *m m*, and *f f*, and suspension-rods D D, in the string-pieces A and B, being calculated and marked on said plates, the plates are run under the punch, and the holes punched. The length of one of the braces being calculated, they are all cut off to that length, being all of the same length. Then, commencing at the centre of the arch, two shoes, *h h*, and the corresponding bolts *a a*, are put in position. The braces *c c* and *d d*, and the next set of

shoes *h h*, with their bolts *a a*, are put in position, when, on tightening the nuts *δ δ*, the necessary camber for the arch is produced. This operation is continued till one half of the arch is completed, when the other part is completed in a similar manner.

It is readily seen that the braces sustain only a compressive strain, to which their form is specially adapted, while the bolts *a a* sustain a tensile strain, the shoes *h h* a compressive strain, and the string-pieces A and B compressive and tensile strains, so that each part is subjected to the strain to which it is best adapted, and thus a girder of great strength and rigidity is obtained.

I do not claim as my invention the shoes *h h*, arch-shoes E E, angle-irons F F, suspension-rods D D, chords C, nor any of the bolts taken separately, as all these have been before used; but

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

1. The arch, composed of the string-pieces A and B, shoes *h h*, tension-bolts *a a*, main braces *c c*, and counter-braces *d d*, the several parts being arranged in the manner and for the purpose herein specified.

2. The hollow cylindrical tubes for braces in the construction of a truss, when said braces are so arranged as to take only a compressive strain, and cannot be subjected to a tensile strain, substantially as herein shown.

3. The peculiar arrangement and combination of the arch-shoes E, chord C, lower string-piece B, angle-iron F, bolts *m* and *f*, upper string-piece A, and bolts *c*, the whole being arranged as shown, and for the purpose specified.

As evidence that I claim the foregoing, I have hereunto set my hand, in presence of two witnesses.

JOSEPH DAVENPORT.

Witnesses:

FREDK. TUCKER,
TH. H. WILLIAMS.