E. WILLIAMS.

Construction of Bridges.

No. 213,154 Patented Mar. 11, 1879.

Fig. 1.

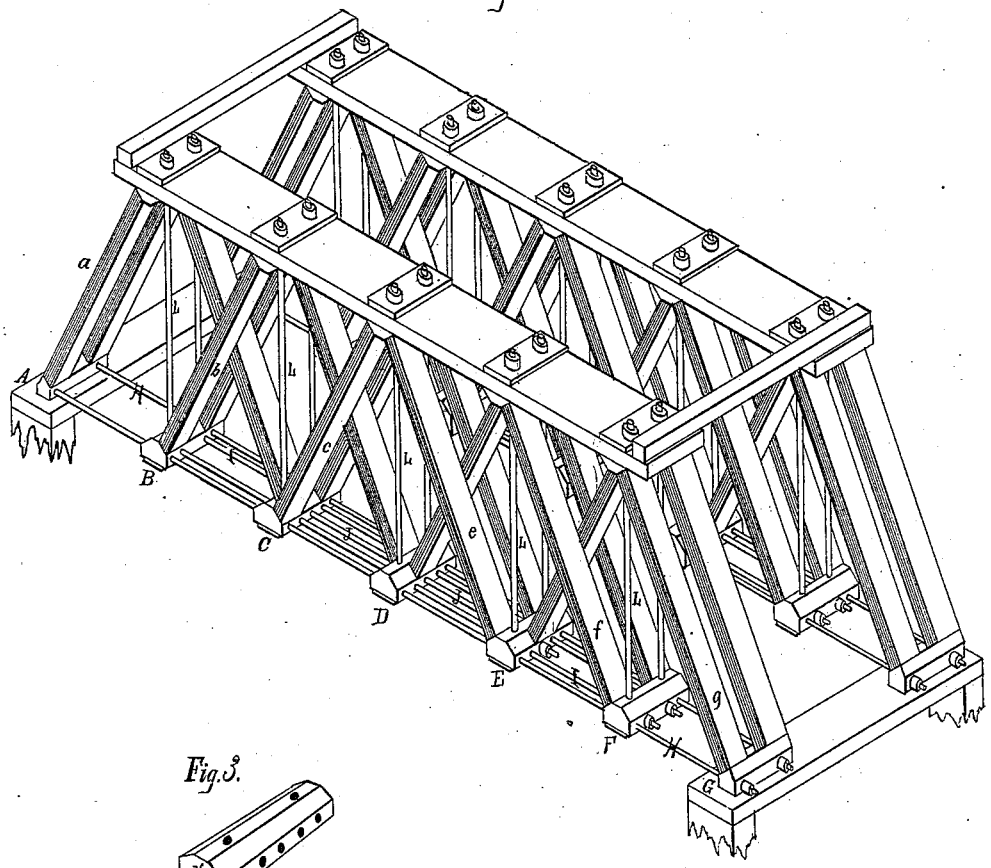


Fig. 3.

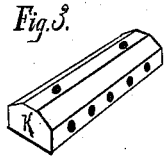
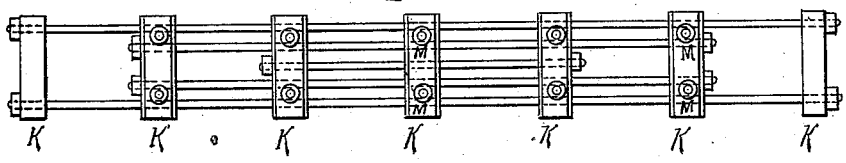


Fig. 2.



Witnesses.

Geo. H. Strong.

Frank A. Brooks

Inventor.

Edgar Williams

by Dewey & Co. Attys

UNITED STATES PATENT OFFICE.

EDGAR WILLIAMS, OF SAN FRANCISCO, CALIFORNIA.

IMPROVEMENT IN CONSTRUCTION OF BRIDGES.

Specification forming part of Letters Patent No. **213,154**, dated March 11, 1879; application filed December 2, 1878.

To all whom it may concern:

Be it known that I, EDGAR WILLIAMS, of the city and county of San Francisco, and State of California, have invented an Improvement in the Construction of Bridges; and I hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings.

My invention relates to certain improvements in the construction of bridges; and it consists in a novel combination or arrangement of the different chord bars or rods of the lower chords of truss-bridges having four or more panels in each truss, as will be more fully described by referring to the accompanying drawings, in which—

Figure 1 is a view of my bridge. Fig. 2 is a bottom view. Fig. 3 is a view of one panel-joint.

My invention consists in the combination and arrangement of distinct and separate chord bars or rods, or sets of chord bars or rods, which extend between corresponding lower panel-joint blocks upon each side of the center, or toward either end of the bridge, so that each chord-bar, or set of chord-bars, will resist the tension which is produced by the maximum strain on the rods, struts, or braces which act within such joints.

In the present case I have shown a bridge consisting of six panels, which may be considered to act in pairs upon each side of the center.

In the drawings, a distinct and separate chord bar or rod, or set of chord bars or rods, H, extend from A to G, being connected and fastened at the joints A and G by head, nut, pin, or other connection, as shown. These bars or rods resist wholly the tension produced by the maximum strains of the braces or struts *a* or *g*, acting upon the joints A or G, and they act independently of the intermediate joints, thus avoiding the necessity of connecting each and every chord bar or rod with each and every lower panel-joint.

A second distinct and separate chord bar or rod, or set of chord bars or rods, I, extend from B to F, being connected in the same manner as described for those uniting A and G, and these chord bars or rods will resist wholly the tension produced by the strains of the braces or struts *b* and *f*, acting in these joints, independently of the panels first mentioned.

In the same manner a distinct and separate chord bar or rod, or set of chord bars or rods, J, unite the joints C and E. These chord bars or rods pass under or through the intermediate joint-blocks, so that chords of any suitable length may be used, and each set of joints will be independent of all the others.

The lower panel-joint blocks K upon either side of the bridge consist of blocks of a length sufficient to extend over or take in all the chords or sets of chords, and they are formed as shown in Fig. 3. These joints have their upper surfaces beveled or inclined to receive the struts and support them squarely, and they are preferably drilled through, so as to admit the chords or rods which pass through them. Holes are also drilled through them, to allow the suspension-rods L to pass through and be secured by nuts M at the bottom.

In this class of bridges, when the link-and-pin connections are employed, it is necessary to use great exactness in boring the pin-holes, in order to prevent any undue strains upon the pins, and variations in temperature will lengthen or shorten these links, so that the pins are liable to fracture unless made very large. By my method the continuous chords, bars, or rods, or sets of chords, bars, or rods, act directly upon the panels which they unite, are not influenced by strains which act upon the other panels, the rods may be made of any length, and are entirely independent of the intermediate panel-joints.

In the present case I have shown my invention as applied to the Howe-truss combination-bridge; but it will be readily seen that it is applicable to the members of the lower chord, in the manner above specified, in all truss-bridges of iron, steel, or combination-bridges, with head, nut, pin, or other connection, and it is also manifest that any number of panels may be employed.

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

1. The improvement in bridges consisting of distinct and separate chords, bars, or rods, or sets of the same, extending between corre-

sponding panel-joint blocks upon each side of the center, and acting to resist the tension within said panels independently of any other set of chords, substantially as herein described.

2. The continuous chords, bars, or rods H I J, each set extending between a pair of joint-blocks, one on each side of the center, and passing through or under the intermediate joint-blocks, so as to act independently of them, substantially as herein described.

In witness whereof I have hereunto set my hand.

EDGAR WILLIAMS.

Witnesses:

GEO. H. STRONG,

FRANK A. BROOKS.