(No Model.) 2 Sheets—Sheet 1.

L. PULLIAM.

BRIDGE.

No. 457,291. Patented Aug. 4, 1891.

Fig. 1.

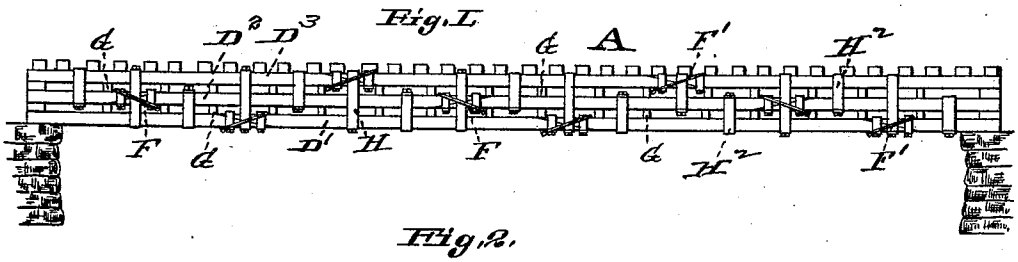


Fig. 2.

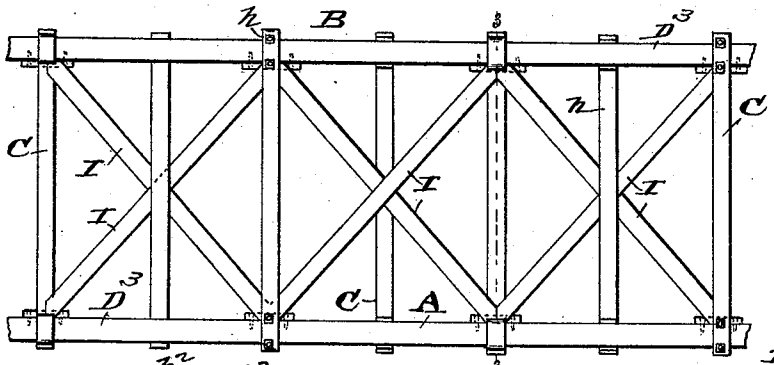


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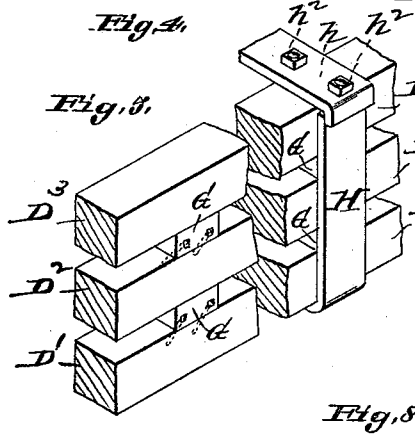


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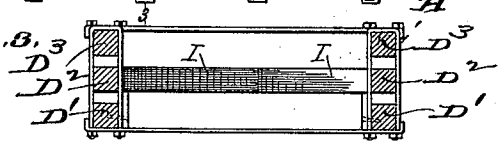


Fig. 5.

Fig. 6.

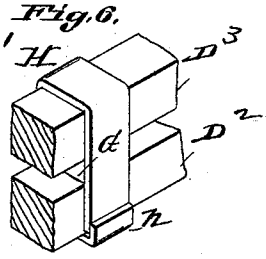


Fig. 7.

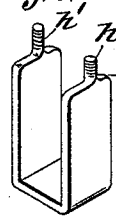


Fig. 11.

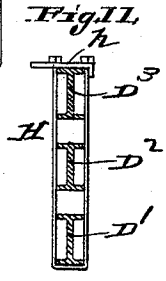


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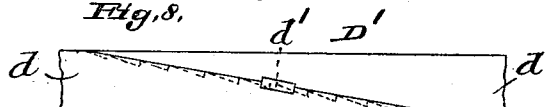


Fig. 9.

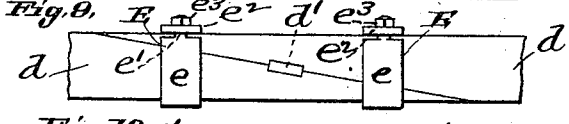
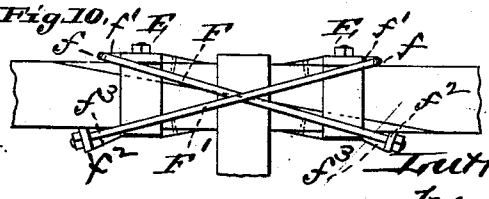


Fig. 10.



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BRIDGE.

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Fig. 12.



Fig. 13.

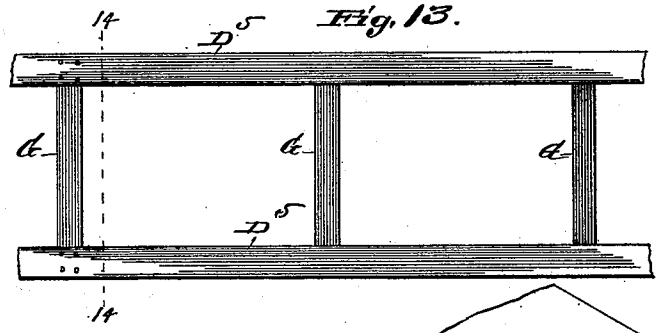


Fig. 14.



Fig. 15.

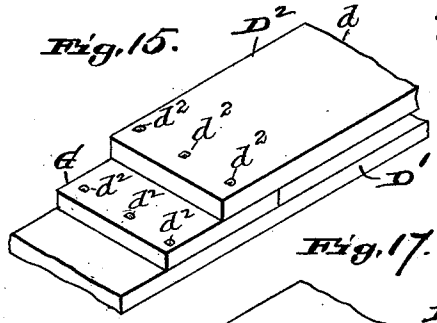


Fig. 16.

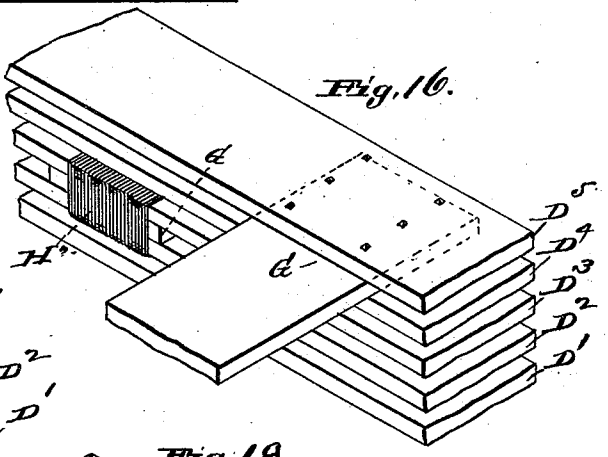


Fig. 17.

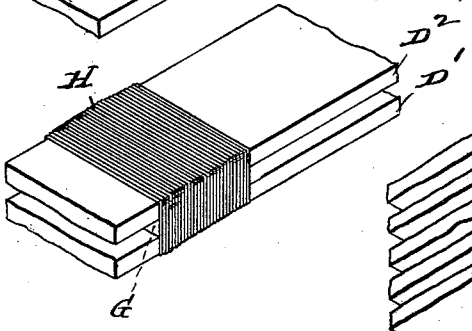
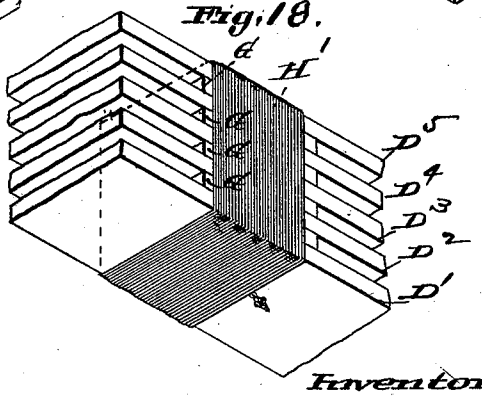


Fig. 18.



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his atty

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UNITED STATES PATENT OFFICE.

LUTHER PULLIAM, OF ST. LOUIS, MISSOURI, ASSIGNOR TO OSWALD PULLIAM AND WILLIAM H. WELLER, BOTH OF SAME PLACE.

BRIDGE.

SPECIFICATION forming part of Letters Patent No. 457,291, dated August 4, 1891.

Application filed February 18, 1891. Serial No. 381,905. (No model.)

To all whom it may concern:

Be it known that I, LUTHER PULLIAM, of St. Louis, Missouri, have made a new and useful Improvement in Bridges, of which the following is a full, clear, and exact description.

The present improvement is designed more especially, but not exclusively, for bridges having short spans. The bridge in question can be readily and economically constructed and by persons of ordinary skill, and it is well adapted to districts remote from manufacturing centers and where an inexpensive bridge is in demand. Its leading feature is the mode of constructing and uniting the trusses of the bridge.

The improvement is adapted to horizontal spans; but it can be embodied in arched spans, and it can be used in roofs and architectural work as well as in bridges, all substantially as is hereinafter described and claimed, aided by the annexed drawings, making part of this specification, in which—

Figure 1 is a side elevation of the improved bridge; Fig. 2, a plan, upon an enlarged scale, of a portion of the span shown in Fig. 1; Fig. 3, a vertical cross-section on the line 3 3 of Fig. 2; Fig. 4, a view in perspective showing a portion of one of the trusses and being a portion with which one of the cross-tie rods is immediately connected; Fig. 5, a view in perspective showing a portion of the truss at a point between the points at which said tie-rods are applied; Fig. 6, a view in perspective illustrating the mode of connecting two adjacent chords in the truss; Fig. 7, a view in perspective of one of the truss-clamps; Fig. 8, a side elevation of a chord-splice. The broken lines indicate another mode of scarfing the joint, adapted to the pulling strain. To resist a compressive strain the scarfs are inclined in the opposite direction to that shown. Fig. 9 is a side elevation of the splice having the clamps applied thereto; Fig. 10, a side elevation of the splice having, in addition to the clamps, a pair of ties to resist a tensile strain; Fig. 11, a vertical cross-section of one of the trusses, the chords being of iron; and Figs. 12 to 18 views illustrating a modification of the improved construction, Fig. 12 being a side elevation similar to that of Fig. 1; Fig. 13, a plan of a portion of the span; Fig. 14, a vertical cross-section on the line 14 14 of Fig. 13; Fig. 15, a view in perspective illustrating a mode of splicing the chord-bars; Fig. 16, a view in perspective illustrating a mode of connecting a lateral tie with a truss; Fig. 17, a view in perspective illustrating a mode of uniting adjacent chords of a truss, and Fig. 18 a view in perspective illustrating a mode of uniting several chords in a truss.

The same letters of reference denote the same parts. The views are upon various scales.

The improved bridge, generally speaking, consists of the trusses A and B and the lateral ties C. The trusses are each composed of a vertical series of chords D' D^2, &c. At least two chords are used in a truss, and as many more as may be desired in longer spans using more chords. Although the chords may be composed of metal, they usually are of wood, and the several pieces or chord-bars *d d* composing a chord are united endwise to form a continuous chord of a sufficient length to reach across the span. Any suitable method of uniting the chord-bars can be adopted. One such method is exhibited in Figs. 8 and 9, in which the bars *d d* are scarfed and united by means of a key *d'*, and another method is exhibited in Fig. 15, in which the bars are united by means of nails d^2, substantially as shown. When the bars are united, as shown in Fig. 8, their scarfed ends are united by means of clamps E E, Figs. 9 and 10. These clamps serve to bind the scarfed ends laterally, and to unite them more effectually in a longitudinal direction means—such as the tie-stirrups F F', Figs. 1 and 10, are employed and applied, as shown. The clamps E consist each of a clip *e*, which passes around three sides of the chord and is provided with threaded ends *e' e'*, to which a cross-plate e^2 is applied and secured thereon by means of the nuts e^3.

The stirrups F F' are applied as follows: The bight *f* of the stirrup comes against one of the clamps E or against an interposed block *f'*, and the stirrup extends thence diagonally across the chord, and its cross-plate f^2 comes against the other of the clamps E or against an interposed block f^3. The other stirrup F' is applied to the chord in an analo-

gous but reversed manner, crossing the stirrup F, substantially as shown. A single stirrup F can be used, as illustrated in Fig. 1. When the bars are united, as in Fig. 15, the clamps and stirrups may be omitted; but however formed, and whether in the form of timbers, as illustrated in Figs. 1, 2, 3, 4, 5, and 6, or in the form of iron beams, as shown in Fig. 11, or in the form of boards, as shown in Figs. 12, 16, 17, and 18, the chords are arranged one above another—two, three, four, or more, as desired—and are united by means of clamps and interposed spacing-blocks G, substantially as shown—that is, the spacing-blocks and the chords are arranged alternately—and after the requisite number of blocks and chords are in position they are clamped firmly together in a vertical direction, so as to form the truss.

The means used for clamping the chords and blocks can be of the form indicated in Figs. 1, 2, 3, and 4, in which the clamp takes the form of a clip H, Fig. 7, which embraces the assembled chords and blocks and is fastened thereto by means of a cross-plate *h*, applied to the clip ends *h' h'*, and secured thereon by means of the nuts h^2 h^2, or it may be in the form of wire H', Figs. 12 and 18, which is wound several times (more or less) around the assembled chords and blocks and secured at its ends in any suitable manner. The last-described method is in some respects preferable to the first. The wire can be drawn very tightly around the chords and blocks and the entire strength of the metal of which the wire is composed can be utilized. The wire is also readily obtainable and can be applied with ordinary skill only. When the truss contains but two chords and interposed blocks, the clamp is applied to unite those two chords and blocks, as indicated in Figs. 6 and 17. When the truss contains more than two chords, the described clamps are applied not only to the entire lot, as in Figs. 4 and 18, but additional clamps H^2 are applied to each set of two chords, as illustrated in Figs. 1, 12, and 16. As the truss in practice is composed generally of more than two chords, this auxiliary clamping becomes of material value in strengthening the truss—that is, in a truss composed of three chords, as in Fig. 1, the two lower chords are united by means of the described clamps H^2, and the two upper chords are also similarly united, and at the same time all three chords are united by means of the clamps H. In Fig. 12 the truss contains five chords, and the lower two are united in the manner described. Then the second and third are similarly united. Then the third and fourth, and then the fourth and fifth, and then, in addition, all five chords are directly united, substantially as described.

Any system of lateral bracing suitable to the described trusses may be adopted. One method is illustrated in Figs. 2, 3, and 4, in which the cross-plates *h* are extended across the bridge from truss to truss, substantially as shown. Another method is shown in Figs. 13, 14, and 16, in which the spacing-blocks G are extended in the form of boards or joists from truss to truss, substantially as shown. In Figs. 2 and 3 additional lateral braces I are shown. They may or may not be used, as desired.

All things considered, the form of construction shown in Figs. 12 to 18 is preferable in many places, for the trusses and lateral braces can be formed of boards only, and with the aid of nails and wire the entire bridge can be substantially constructed. When the trusses assume the form of arches or are used in architectural work, their various parts are suitably modified and relatively combined to suit the particular form in question.

I claim—

1. The herein-described bridge having the trusses and lateral connections, said trusses each composed of a vertical series of chords and spacing-blocks, said chords and blocks throughout the height of the truss being alternately arranged and assembled and clamped, substantially as described.

2. A bridge-truss composed of a vertical series of three or more chords and interposed spacing-blocks, said chords being clamped in twos to each other and the entire series also being clamped, and said chords and blocks being alternately arranged throughout the height of the truss, substantially as described.

3. A bridge-truss composed of a vertical series of chords and interposed blocks, said series being clamped by means of wire wrapped around it, substantially as described.

4. The combination of the trusses and the lateral connections, said trusses each composed of a vertical series of chords and interposed spacing-blocks united by means of a wrapping of wire, and said spacing-blocks being secured to said chords and being extended to form said lateral connections, substantially as described.

Witness my hand this 12th day of February, 1891.

LUTHER PULLIAM.

Witnesses:
C. D. MOODY,
B. F. RUE.