

UNITED STATES PATENT OFFICE.

LUTHER PULLIAM, OF ST. LOUIS, MISSOURI, ASSIGNOR TO RICHARD M. SCRUGGS, OF SAME PLACE.

BRIDGE.

SPECIFICATION forming part of Letters Patent No. 495,005, dated April 4, 1893.

Application filed June 10, 1892. Serial No. 436,253. (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 improvement relates more especially to truss-bridges, and it consists mainly in certain structural features of the trusses, substantially as is hereinafter set forth 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 of the bridge; Fig. 3 an end elevation of the bridge; Fig. 4 a vertical cross-section of a portion of one of the trusses, the section being on the line 4—4 of Fig. 1; Fig. 5 a side elevation, partly in section, of a portion of one of the trusses; Fig. 6 a view in perspective of one of the truss-straps; Fig. 7 a detail, partly in elevation and partly in section, showing the end of one of the cross-braces and the member of the truss against which the brace abuts; Fig. 8 a view in perspective showing an end of the lower portion of one of the trusses, but omitting the straps and ties; and Fig. 9 a view analogous to that of Fig. 8, but showing a modification in respect to the relative arrangement of the upright and horizontal members of the truss.

The same letters of reference denote the same parts.

A and A' represent the trusses of the bridge. They are suitably united by means of the inclined cross-braces, B, and the horizontal braces C. The floor timbers, D, may also serve to connect the trusses. Each truss, considered generally comprises a lower member E, and an upper member F. The lower member is mainly in tension, and the upper member in compression. The lower member is of a composite nature, consisting substantially of horizontal chords e , e' , e^2 , uprights, e^3 , and ties e^4 . The chords, in one form of the construction, are used in pairs, and the uprights are arranged between them—substantially as shown in Figs. 1, 5 and 8, and in another form of the construction the uprights are used in pairs, and the chords are between them, substantially as shown in Fig. 9. In either case the chords and uprights are suitably fastened

together (fastenings not shown) to enable the uprights to serve both as ties and as posts in connecting the chords to form the member E. The ties e^4 , are a valuable auxiliary in uniting the chords in a vertical direction. They are preferably in the form of a band e^5 , shaped to pass around the combined parts, e , e' , &c., and to be secured thereto by means of suitable plates e^6 , and nuts e^7 , substantially as shown.

An additional feature of the member E is the inclined braces or ties G. They are introduced into the member E usually in the same plane, or planes, with that or those of the uprights, and they extend, as shown more distinctly in Fig. 5, from one upright to another, and like the uprights they are suitably fastened to the chords and thus serve as braces between the uprights and also as ties to connect the chords.

I desire not to be restricted to a certain number of chords in the construction of the member E; three are shown, but two, three, or more may be used. The uprights, straps, and inclined braces are adapted to the number of chords used and their relative arrangement. Suitable spacing blocks, H, are used between the chords, substantially as described.

The above described method of constructing the member E is a desirable one irrespective of the remaining features of the truss to be described. The member in itself constitutes a bridge-truss, and it can be used as such. I prefer, however, to employ in conjunction therewith the upper member F, and also an underneath truss I, and to connect the two members and the last named part substantially as follows: The member F is angled, crowned, or bowed to act substantially as an arch; that is, the member, from the ends respectively of the truss, inclines upward, and its highest point is midway in the length of the truss. It may be a single piece, but it is generally of a composite nature. It is connected with the lower member by means of suitable ties, such for instance as the straps J, and in addition thereto the uprights of the lower member may be extended upward to be connected with the upper member, substan-

tially as shown at e^3 , Fig. 1. Said extended uprights may be used as the only connections with the lower member.

In addition to ties extending vertically, or in lieu of them, inclined ties, such for instance as the straps K, may be used to connect the upper and lower members of the truss. Although but two such inclined ties are represented in the drawings, and which are arranged respectively toward the ends of the truss, others can be employed of a similar nature and arranged at suitable intervals throughout the length of the truss. There may, for instance, be one for each panel of the truss. As represented they pass around the upper member and also around the lower member, but I desire not to be restricted to this form of tie, as obviously other forms can be used. These inclined ties as stated may be the sole means for connecting the members E, F, but I preferably employ the two forms, namely, the vertical and the inclined in conjunction. The underneath truss I, is a leading feature of the construction. It is composed mainly of three parts; a horizontal part, i , arranged beneath the central portion of the member E, and two inclined parts i' , i' , arranged respectively at the ends of the truss and connected with said central part i , and the remainder of the construction as follows: the parts i' , i' , at their outer ends respectively are secured to the end-ports respectively of the truss, and preferably at the ends of the upper member F, as shown, and thence they extend downward and inward to meet the horizontal part i , and to connect therewith in any desirable manner. In the drawings the connection with the horizontal part i , is by means of the shoulders i^2 , around which the ties i' , i' , respectively pass. But any other mode of connecting the parts i , i' , i' , may be employed, and the parts i , i' , i' , may be of any shapes adapted to the purpose in question. That is to say, the horizontal part i serves to increase the depth of the truss at its central portion, and to that end the part i is connected with the member E, by means of the straps and the uprights substantially as shown, or by other equivalent means, and also preferably with the member F by means of the extended straps and uprights, substantially as shown, or other equivalent means, and also

suitably spaced apart from the member E. Thus it will be seen the truss is materially strengthened at its central portion, and the underneath truss serves not only to increase the tensile strength of the lower member of the truss but also to act as a truss for the overhead member F, as well as to bind the two members E, F, together. In carrying out this last mentioned feature of the construction I desire not to be confined to the single underneath truss, as additional ones of a similar nature may be employed. That is, there may be additional parts similar to the part i , arranged either successively beneath each other or side by side, and each, by means of ties, such as the ties i' , connected with the structure above, and at the ends of the truss as are the parts i' , i' , or at other suitable points.

In carrying out the present improvement the upper and lower members, E, F, may be connected at or toward their ends only and the advantages of the improvement in a measure thereby be obtained. I prefer however to connect said members not only at their ends but also at various points between their ends substantially as is represented. I desire not to be restricted to any special means in connecting said members at the points named, but prefer the means exhibited. It will be seen that the elements E, F, and K, in combination form in substance a structure analogous to a bowstring truss whose horizontal member in itself is a truss, and which is preferably connected with the overhead member. This is also substantially the case however the upper and lower members are united at the ends thereof.

I claim—

In a truss the combination of the lower member, the upper member, and the underneath truss, said lower member having a vertical series of horizontal chords spaced apart from each other, said upper member being arched, and said members and said underneath truss being connected at the ends and the central portion of the truss, substantially as described.

Witness my hand this 6th day of June, 1892.

LUTHER PULLIAM.

Witnesses:

C. D. MOODY,
A. BONVILLE.