C. Bender.

Wire-Truss Bridge.

No 76041 Patented Mar. 31, 1868

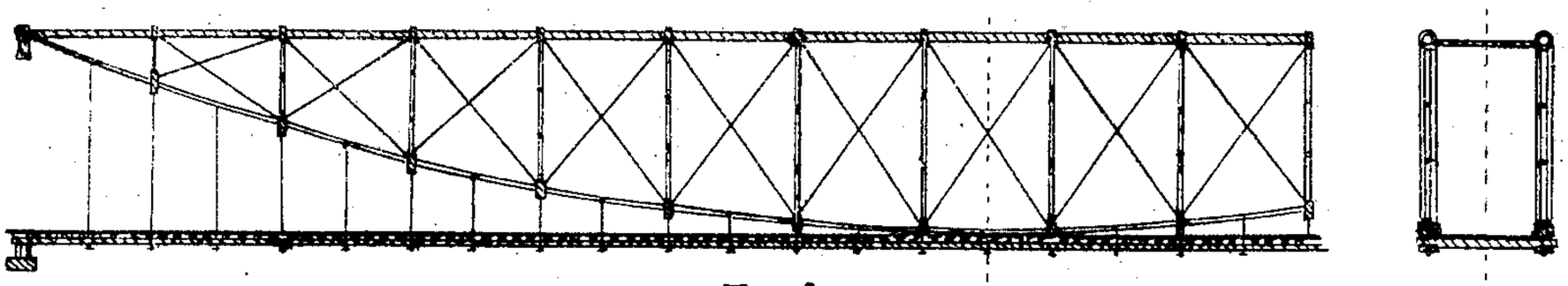


Fig. 1.

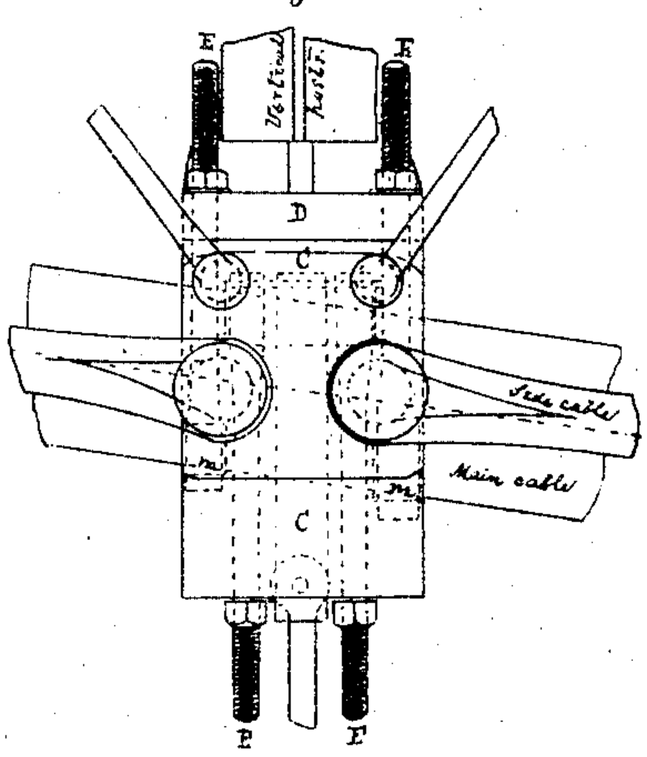


Fig. 2.

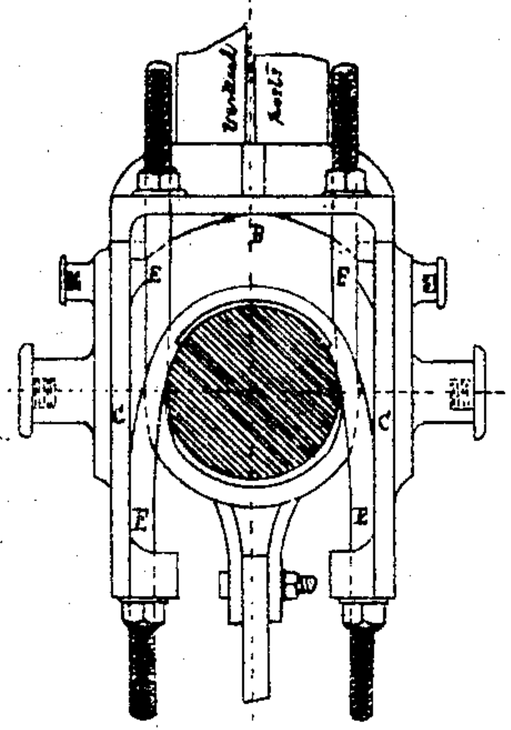


Fig. 4

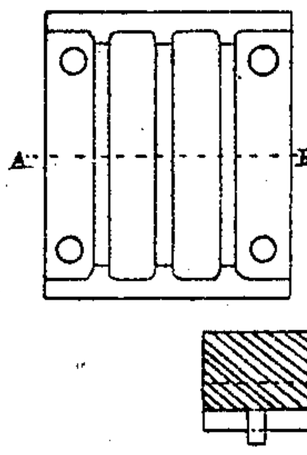


Fig. 5.

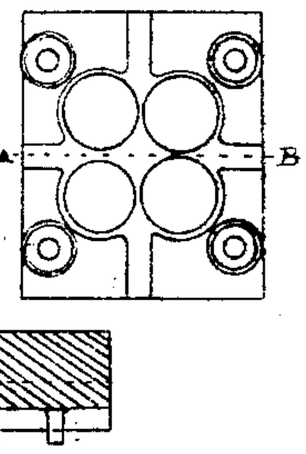
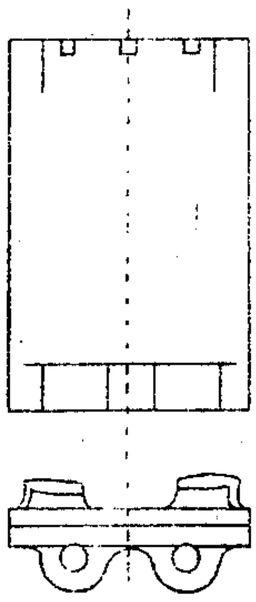


Fig. 3



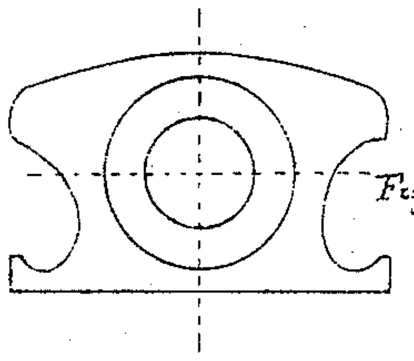


Fig. 6

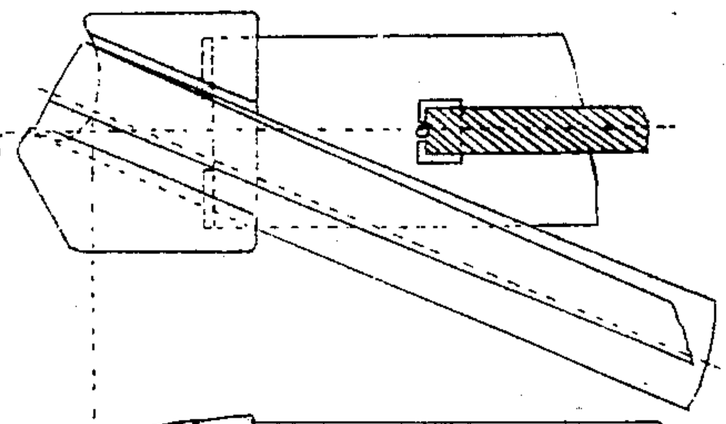
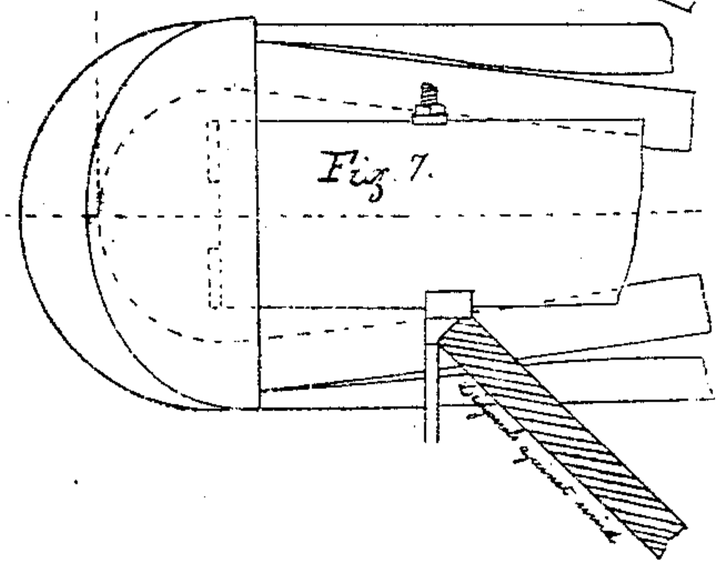


Fig. 7.



Witnesses:
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Karl Bender

United States Patent Office.

CHARLES BENDER, OF HESSE DARMSTADT, GERMANY.

Letters Patent No. 76,041, *dated March* 31, 1868.

IMPROVED WIRE-TRUSS 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, CHARLES BENDER, citizen of the Grand Duchy of Hesse Darmstadt, in Germany, now resident of the city of New York, in the county of New York, in the State of New York, have invented a new Construction of a Wire-Truss Bridge; and I do hereby declare that the following is a full and exact description of the same.

The nature of my bridge consists in the application of wire cables for truss-bridges, to gain the advantages of the cheapness, homogeneousness, and strength of wire, as well as to secure that cheap method of putting up the bridges, as used for suspension-bridges, which is dispensing with expensive pile-driving and scaffold-work in the currents of the rivers.

To gain all said advantages in the cheapest and least complicated manner, I divide each of the lower chords or cables of the bridge in three pieces, one unbroken main cable and two smaller side cables, the latter consisting of as many pieces as there are panels; further, I construct adjustable joints to connect the main and side cables with the uprights and diagonals; and lastly, I apply a suitable saddle to support the forces acting in the cables, and to connect the upper and lower chords in the very simplest way.

My bridge consists of a straight or curved upper chord of wood, iron or steel; of a bottom chord, made of iron wire, in form of a curve; of vertical posts, and diagonal ties.

My bottom chord is constructed in such a way that the strains in all the cross-sections are equal when the bridge is uniformly loaded; the greatest savings of material are consequently made possible, the cross-sections being, according to the nature of wire, the same.

The lower chord, if not uniformly loaded, shows different strains in its different points. The greatest difference of the strains is observed when the heaviest possible load is brought on one side of the bridge, the other half of the same being unloaded. In these cases the diagonals are exerted in their maximum, and their strains are necessary to restore the equilibrium at each knot of the lower chord. To transfer these strains to the lower chord, I separate such a part of its whole cross-section as to stand the greatest difference of the cable strains. I divide the separated amount of the lower chord in two ropes of equal cross-section, each of those ropes consisting of as many single cables as there are panels. Each of these cables is provided with coaches on both ends, by which arrangement the connection with uprights and diagonals is made possible. Hereby the cross-section of the lower chord is not enlarged, the sum of the cross-sections of all three cables being exactly the same as is necessary to stand the highest possible strain by loading the whole bridge.

If these smaller cables or side cables, calculated according to the considerations above mentioned, might not be separated, it would be required to stiffen the bridge by another separate truss, so as to transfer perfectly the weights from the points of loading to the supports of the bridge.

By applying the different short cables, it is possible to connect the lower chord with the diagonals; another method of connecting the latter, as by friction, &c., not being secure enough for the use of bridges.

By the unbroken main cable, the advantage is secured of putting up the bridge in that manner used on suspension-bridges, dispensing with pile-driving and scaffold-work in the current of the river. I lay the middle lines of main and side cables in the same horizontal cylindrical surface, and place the main cable between the side cables. By this arrangement, I facilitate the calculation, and avoid difficulties arising from unequal expansion in the case that the curves of the cables might not be of similar form.

To fasten the pieces of side cables, as well as the diagonals and vertical posts, to the main cable, and to correct the position of the latter, I have invented castings, the construction of which I will proceed to describe: They consist of two iron plates, C, between which runs the main cable. Each of these plates is provided with four pegs—two to fasten the side cables, and two to fasten the diagonals.

At the lower part of the inside, each plate is provided with two ears, through which pass iron bolts E. At the upper ends of the inside, each plate is provided with several teeth, fitting exactly in respective holes of the covering-plate which serves to fasten the vertical posts.

Pieces of wrought iron, bent according to the shape of the cable, and provided with screw-bolts on both ends, as shown by Figures 1, 2, E, serve to change and correct the position of the cable, and by creating fric-

tion, help to join the whole casting with the cable. Two of these iron pieces are hanging on the cable, and the descending bolts are passing through the ears above mentioned, fastened by nuts, and thus preventing the rising of the cable. Two other iron pieces of this kind embrace the cable from below. Their four screw-bolts are passing through four holes of the covering-plate, and are fastened by nuts. These bolts prevent a slipping down of the cable. Thin wedges of iron, bent around the cable, are applied beneath these bolts to secure their vertical position, as shown by figs. 1, 2, *m m*. Where bottom and upper chords join, a casting has been used in form of a saddle, offering to the cable a large, broad bed, as shown in Figures 6, 7.

According to the nature of the valley or the river, across which the bridge is to be built, the floor may be laid on the upper chord or suspended on the cable by iron rods.

What I claim as my invention, and desire to secure by Letters Patent, is the following:

1. I claim a bottom chord, consisting of an unbroken main cable and side cables, the latter consisting of as many pieces as there are panels, substantially as and for the purpose specified.

2. I claim the joints of the bottom chord, consisting of two side plates and a covering-plate, as shown in figs. 1, 2, 3, 4, 5, the several parts being constructed and used as and for the purpose herein specified.

3. I claim the saddle joining the bottom and upper chords, in connection with bottom chords of truss-bridges constructed of wire cables, substantially as set forth.

New York, November 3, 1867.

CHARLES BENDER.

Witnesses:

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GEO. W. SACKETT.