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LEVI KITTINGER.

Improvement in Iron Arch Bridges.

No. 119,466. Patented Oct. 3, 1871.

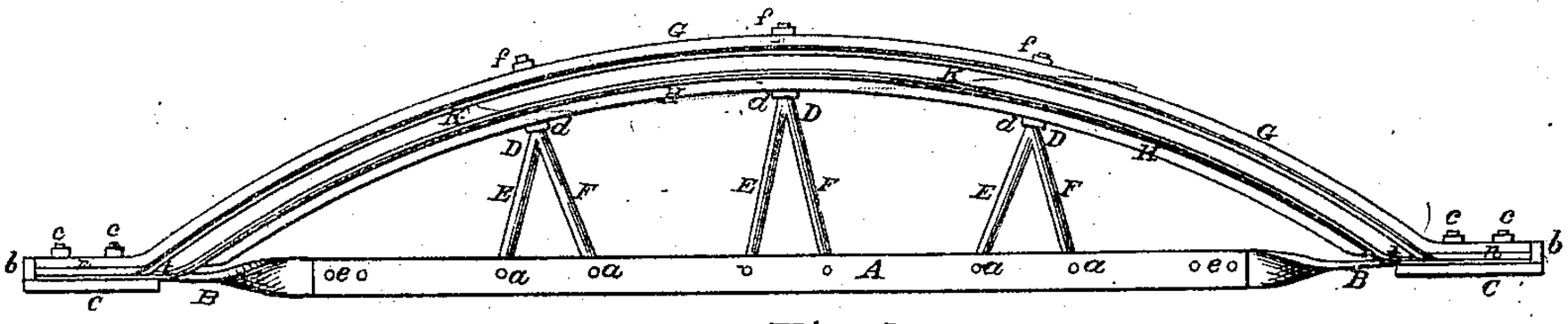

Fig. 1.

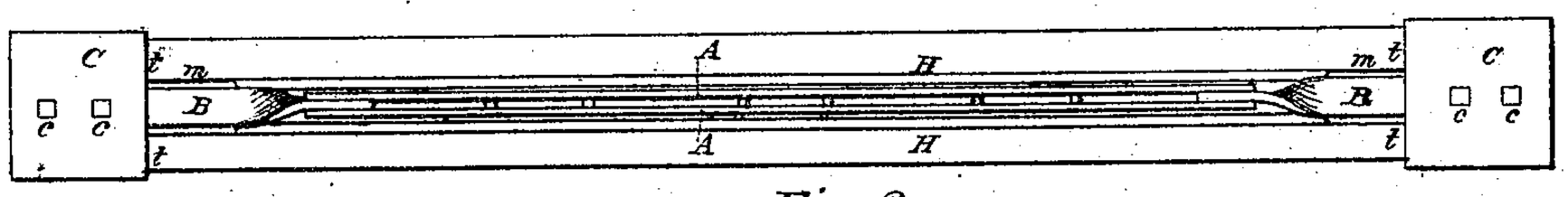

Fig. 2.

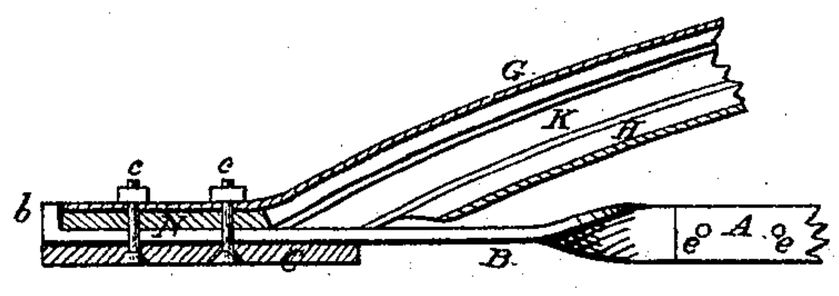

Fig. 3.

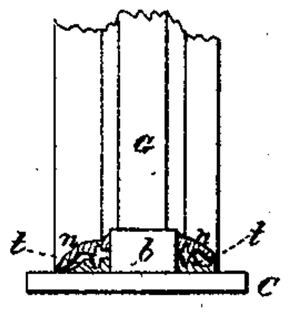

Fig. 4.

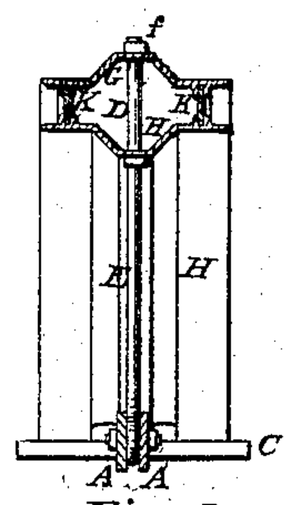

Fig. 5.

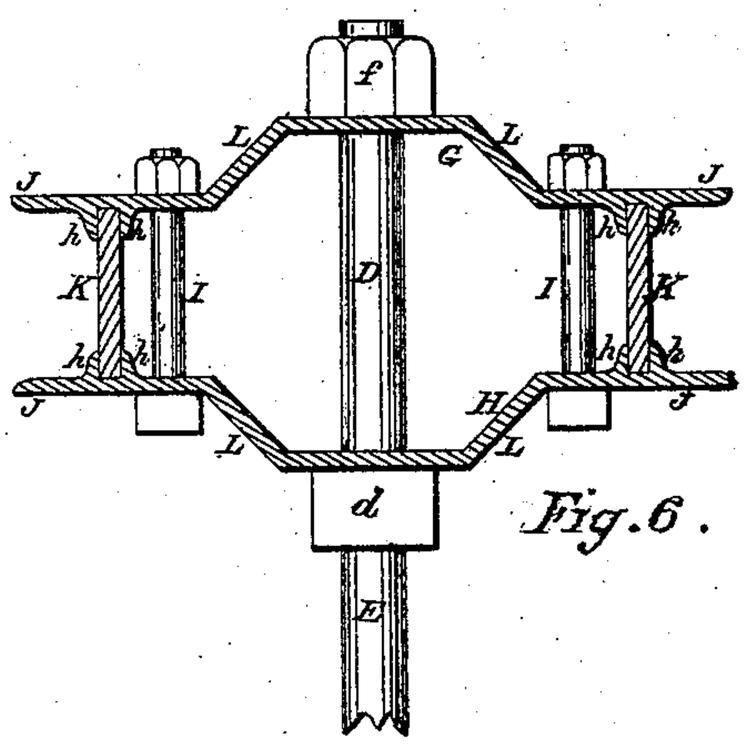

Fig. 6.

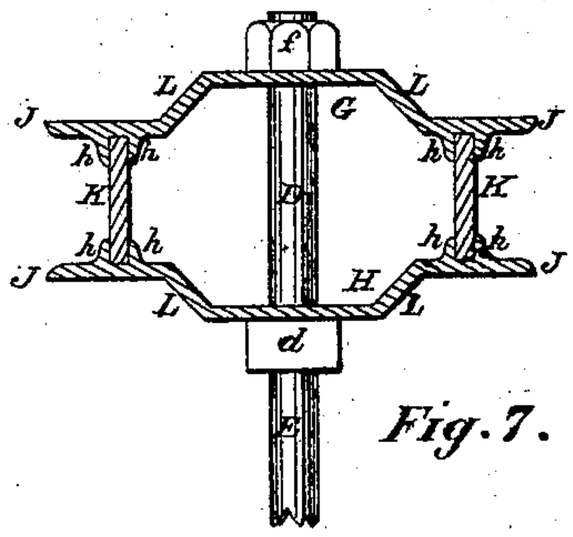

Fig. 7.

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by Jos. Abbott, Attorney

UNITED STATES PATENT OFFICE.

LEVI KITTINGER, OF MASSILLON, OHIO.

IMPROVEMENT IN IRON-ARCH BRIDGES.

Specification forming part of Letters Patent No. 119,466, dated October 3, 1871.

To all whom it may concern:

Be it known that I, LEVI KITTINGER, of Massillon, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Iron-Arch Bridges; and that the following is a full, clear, and exact specification thereof, which will enable others skilled in the art to make and use the said invention.

My invention relates to an improved construction of arched or bow-string girders for bridges, roofs, and other structures; and it consists principally in the construction of the arch, which is made of a top and a bottom plate, each of rolled iron, and each having raised centers and rolled flanges, between which to place the side pieces, and of two rolled-iron side plates, which are placed between the top and bottom plates, and in the grooves formed by the flanges on said plates, the several parts being clamped together by nuts on the suspension-rods, which are run through the top and bottom plates, aided by outside and intervening bolts when found desirable, and the whole forming an arch of great compressive capacity and lateral stability, and of an ornamental appearance, in which the expense of riveting, which forms an important item in the cost of most of the old forms of wrought-iron arches, is wholly avoided, and this without materially affecting the unity of action between the several parts of the arch, on which its stability and capacity largely depend.

In the accompanying drawing, Figure 1 is a side view of a bridge-girder embodying my invention. Fig. 2 is an inverted plan of the same. Fig. 3 is a sectional view of the arch-and-chord connection. Fig. 4 is an end view of a portion of the girder. Fig. 5 is a cross-section of the girder. Figs. 6 and 7 are cross-sections of the arch as adapted to different lengths of span.

The top and bottom plates G and H are made of the same cross-section, so as to be rolled with the same set of rolls, and each is made of the general form shown, the central portion L L being raised in the center of the plate with its sides at an angle of about forty-five degrees, and with its corners rounded off on the inside and outside, if found desirable, in order to prevent cracking at those points, and the top of these raised parts being usually made flat, as shown, in order to afford a fair bearing for the nuts and collars on the suspension-rods. The flanges *h h* are rolled on one side of these plates G H, as shown, and the plates extend beyond these flanges on each side, and are molded in the form of the ordinary ogee-molding, so as to form a kind of cornice or finish along the upper and lower sides of the arch, as shown at J in Figs. 6 and 7. The side plates K K are usually made of ordinary plate-iron, although they can be made of a curved cross-section, if preferred; and they are curved edgewise to the required form of the arch, and are placed between the top and bottom plates G H with their edges fitting in the grooves formed by the flanges *h h*, as shown in Figs. 5 to 7. These parts of the arch are held together by the suspension-rods D, which run through the top and bottom plates G H, and have a jam-nut or collar, *d*, below and a clamping-nut, *f*, above the arch, as shown in Figs. 1, 5, and 7. Where the arch is of considerable breadth, so as as to render the plates G H liable to be crushed down in the center by the clamping action of the bolts D, the outside bolts I I can be introduced between the raised parts L L and the outside plates K K, as shown in Fig. 6, said bolts being placed at intervals of from two to five feet, as may be found desirable. The lower chord-and-arch connection is made by cutting away the central part L L of the bottom plate H at the ends, so as to leave a slot, *m*, (see Fig. 2,) for the passage of the chord-plate B, which is made with an upturned end, *b*, against which the top plate G abuts. The ends *t t* of the bottom plate H rest on the shoe-plate C, and the chord-plate B rests on said shoe-plate between said ends. The filling block N rests on the chord-plate B, and fits in the raised part L L at the ends of the top plate G, and the bolts *c c* bind the parts firmly together, as shown in Fig. 3. The ends *n n* of the top plate G are bent down, as shown in Fig. 4, so as to fit over the ends of the bottom plate H and make a neat and substantial appearance. The chords A A are two in number, placed edgewise and abreast, and are secured by bolts or rivets *e* to the ends of the chord-plates B, which have a quarter turn made at their ends to bring them into the proper position. The ordinary plan of suspension-rod posts and diagonal ties may be used to unite the lower chord to the arch; but a more economical plan, especially for moderate spans, is shown in Fig. 1, where E and F are two rods, which are secured between the chords A A by bolts or riv-

ets *a a*, and which are welded together and united by a collar, *d*, at the arch, where they form or are welded to a rod or bolt, D, which runs up through the arch. These branched posts form, with the portions of chords between their lower ends, trussed triangles, which are practically inflexible in a vertical direction; and by placing them at such distances apart as will secure a practical vertical inflexibility in the parts of the lower chords between the adjacent posts, it is seen that the arch will be fully braced against vertical deflection, while its great breadth prevents danger of any lateral deflection.

I am aware that attempts have been heretofore made to construct an iron arch of four plates united by clamping-bolts without riveting; but such arches have not been practically successful, for the reason that the top and bottom plates did not possess sufficient vertical stiffness to clamp the side plates with any considerable force, except at or near the clamping-bolts, and this made it necessary to introduce clamping-bolts at such short intervals as to defeat the saving proposed by dispensing with riveting. This objection I have overcome by rolling the raised centers L L on one side of the top and bottom plates, and the flanges *h h* on the other side, thus giving these plates a vertical depth equal to the vertical distance between the ends of the flanges *h* and the top of the raised centers L L, instead of a vertical depth only equal to the thickness of the plates alone, or of the plates and flanges, as in former constructions. I have also added to the compactness and lateral stability as well as to the compressive capacity of the arch by carrying the edges J J out beyond the side plates K K for a considerable distance, as in this way I have obtained an arch of great breadth without moving out the side plates so as to make it difficult to clamp them firmly between the top and bottom plates by the center suspension-rods, or without moving them so far out as to materially affect the general elliptical form of the arch section, by which the greatest economy in compressive capacity is preserved.

I do not claim, broadly, the plan of constructing an iron arch of four plates, placed two edgewise and abreast and one above and below, and united by clamping-bolts run through the top and bottom plates, but confining myself to the general form and construction herein shown.

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

1. The rolled-iron arch-plate G, having the raised center L L on one side and the flanges *h h* on the other side, and with the molded edges J J outside the flanges *h h*, substantially as and for the purpose herein specified.

2. The herein-described arch G K H K, consisting of the top and bottom plates G H, each having the raised centers L L, opposing flanges *h h*, and projecting edges J J, and of the side plates K K fitting between the plates G H and in the grooves formed by the flanges *h h*, the said posts being united by the suspension-rods D or equivalent clamping-bolts, substantially as is herein specified.

3. The combination of the shoe-plate C, bottom arch-plate H with divided ends *t t*, chord-plate B with upturned end *b*, filling-block N, top arch-plate G with turned-down edges *n n*, and clamping-bolts *c c*, the several parts being arranged as and for the purpose specified.

4. The branched post E F D, having its legs E F secured at considerable distances from each other between the chords A A, and welded together with a collar *d* to the arch-bolt D, substantially as and for the purpose herein specified.

5. The combination of the arch G K H K, constructed as described, branched posts E F D, chords A A, chord-plates B B, shoe-plates C C, and filling-blocks N N, the several parts being united as shown, and the whole forming a bowstring girder, substantially as is herein specified.

LEVI KITTINGER.

Witnesses:
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EDWIN JARVIS.

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