No. 609,001. Patented Aug. 16, 1898.

W. BEER.

CONSTRUCTION OF METAL BRIDGES.

(Application filed Sept. 22, 1897.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.

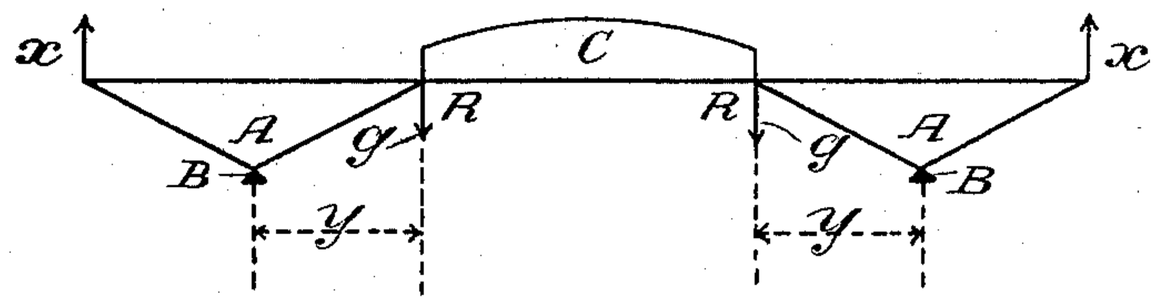


FIG. 2.

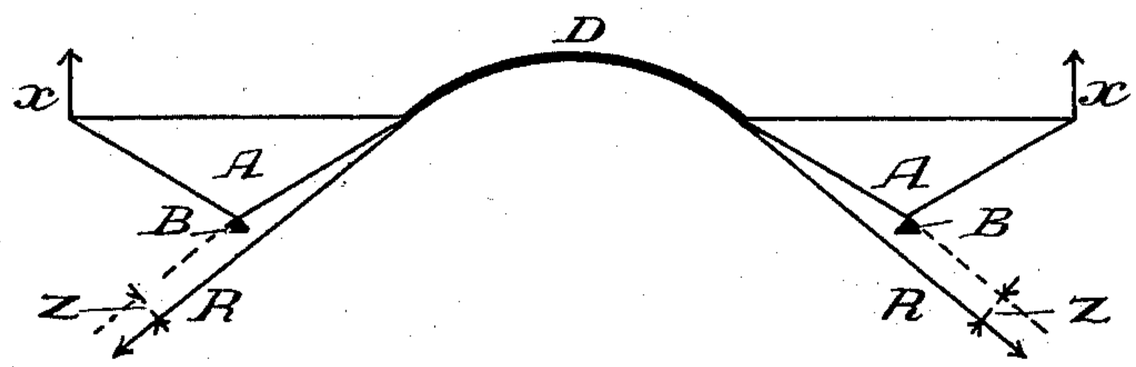


FIG. 3.

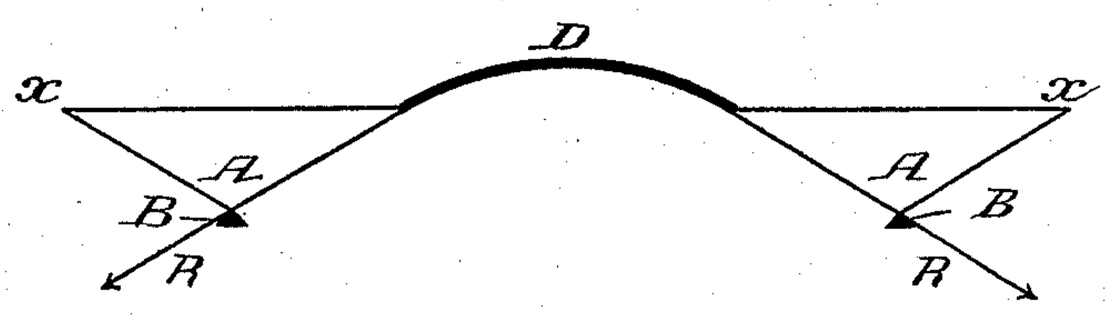
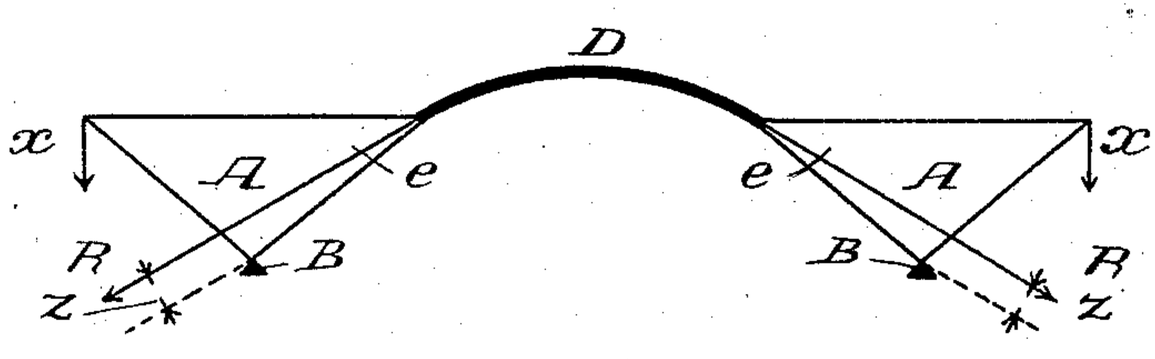


FIG. 4.



WITNESSES.

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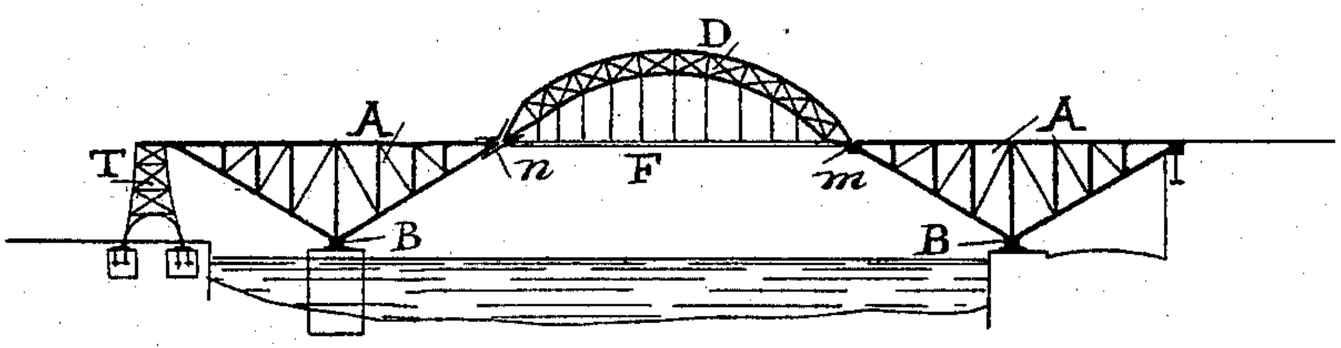
Fig. 5.



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UNITED STATES PATENT OFFICE.

WALTER BEER, OF LONDON, ENGLAND.

CONSTRUCTION OF METAL BRIDGES.

SPECIFICATION forming part of Letters Patent No. 609,001, dated August 16, 1898.

Application filed September 22, 1897. Serial No. 652,601. (No model.) Patented in England November 12, 1896, No. 25,421.

To all whom it may concern:

Be it known that I, WALTER BEER, a subject of the Queen of Great Britain and Ireland, and a resident of London, England, have invented new and useful Improvements in the Construction of Metal Bridges, (for which I have received a patent in Great Britain, bearing date November 12, 1896, and numbered 25,421,) of which the following is a specification.

My said invention relates to improvements in the construction of metal bridges of the well-known double or balanced cantaliver and central-girder type. Hitherto the central portion of such bridges has been spanned by some form of girder or structure having practically only vertical reactions. Such structures impose very severe loads upon the supporting-cantalivers. The object of my invention is to reduce the severity of this loading, and this I effect by substituting for the central girder which spans the space between the projecting double or balanced cantalivers any suitable form of arch, whereby I obtain oblique reactions or thrusts instead of the ordinary vertical reactions. The arch is of metal of any suitable section, and the central portion of the platform or floor of the bridge is supported by the arch, which abuts against the cantalivers.

In order that my invention may be clearly understood, I have annexed to this specification illustrative diagrams and drawings.

Figure 1 represents, diagrammatically, an ordinary double or balanced cantaliver and central-girder bridge. A A represent the cantalivers resting upon their piers or abutments B B. C represents the ordinary girder which spans the gap between the two cantalivers A A and is carried by them. It will be seen that the girder, together with its load, bears vertically upon the projecting ends of the cantalivers and produces vertical reactions R R, as indicated by the arrows *g g*. The tendency of the downward pressure from the girder C on the ends of the double cantalivers is to raise the other end of each cantaliver in the direction of the arrows marked *x*. The severity of these reactions may be conveniently measured by their moments about the points of support B B, which moments are respectively represented by the algebraic quantity $R \times y$.

My invention, as illustrated by Figs. 2 to 5, consists in substituting for the central girder hereinbefore described an arch D, abutting on the double or balanced cantalivers, thereby attaining oblique reactions R R. The moments of these reactions about the points of support B B may be measured by the formula $R \times z$ in the same way that the moments of the reactions from girder C, Fig. 1, were measured by the quantity $R \times y$. By varying the rise or form of the arch D the directions R may be changed so that they will pass below the points of support, as in Fig. 2, through these points, as in Fig. 3, or above, as in Fig. 4.

In the case of Fig. 2, $R \times z$ may be made considerably less than $R \times y$ in Fig. 1.

In Fig. 3, $R \times z$ will equal O, and in Fig. 4 $R \times z$ will have a negative value (if $R \times y$ in Fig. 1 be taken as positive) and will help to support any loads upon the cantaliver-arms *e e* or cause downward reactions at *x x*.

Fig. 5 illustrates an application of my invention.

The roadway F is carried on the top of the double or balanced cantalivers A A and suspended from the arch D. It may be reached by lifts or stairways in a tower, as at T, or by an inclined approach-road or from high ground or by any other convenient means. The arch may simply abut against the ends of the cantalivers, as shown at *m*, or it may be secured by a hinge or by plates, as shown at *n*, or by other convenient means.

I claim—

A bridge having a pair of double or balanced cantalivers, and an arch located above the plane of the roadway and occupying the space between the ends of the cantalivers, the ends of the arch abutting against the ends of the cantalivers, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

WALTER BEER.

Witnesses:

WALTER G. GRIBBLE,

FRANK H. S. JONES.