May 15, 1945. D. C. BAILEY 2,376,023

CONSTRUCTION OF BRIDGES AND OTHER METAL FRAME STRUCTURES

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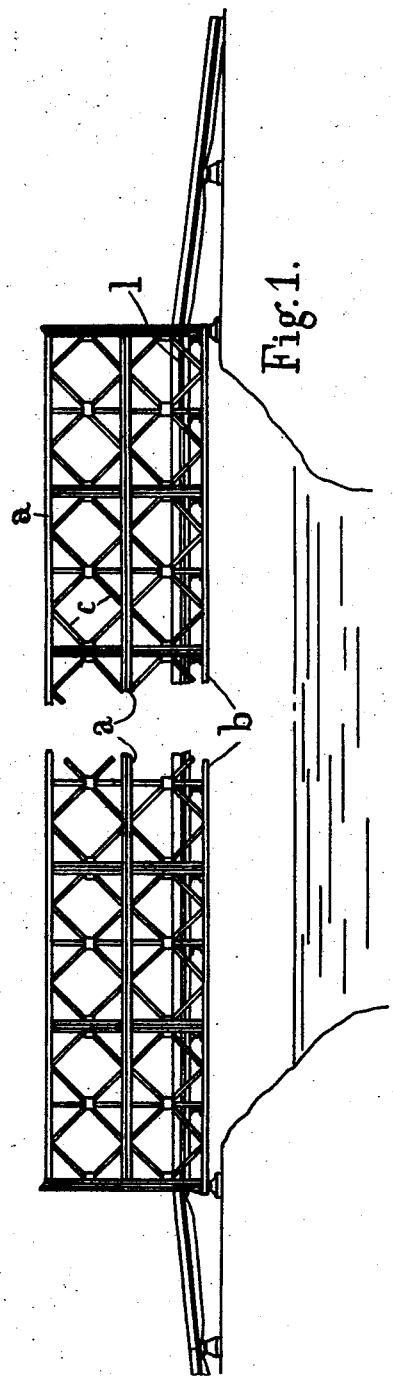

Fig. 1.

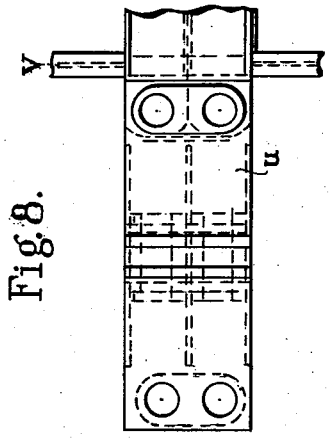

Fig. 8.

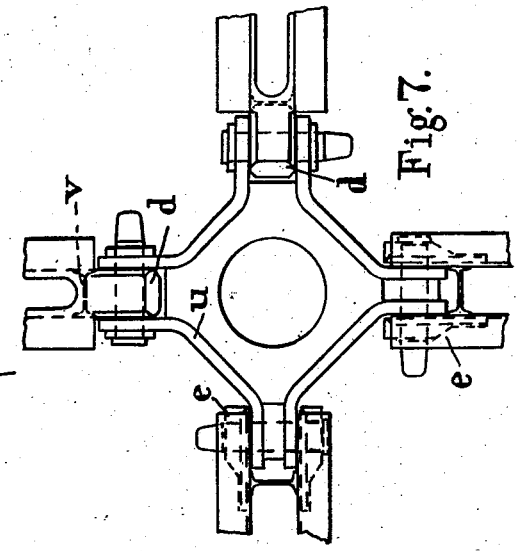

Fig. 7.

Inventor
D. C. Bailey
By Glascock Downing & Seebold
Attys

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Fig. 6.

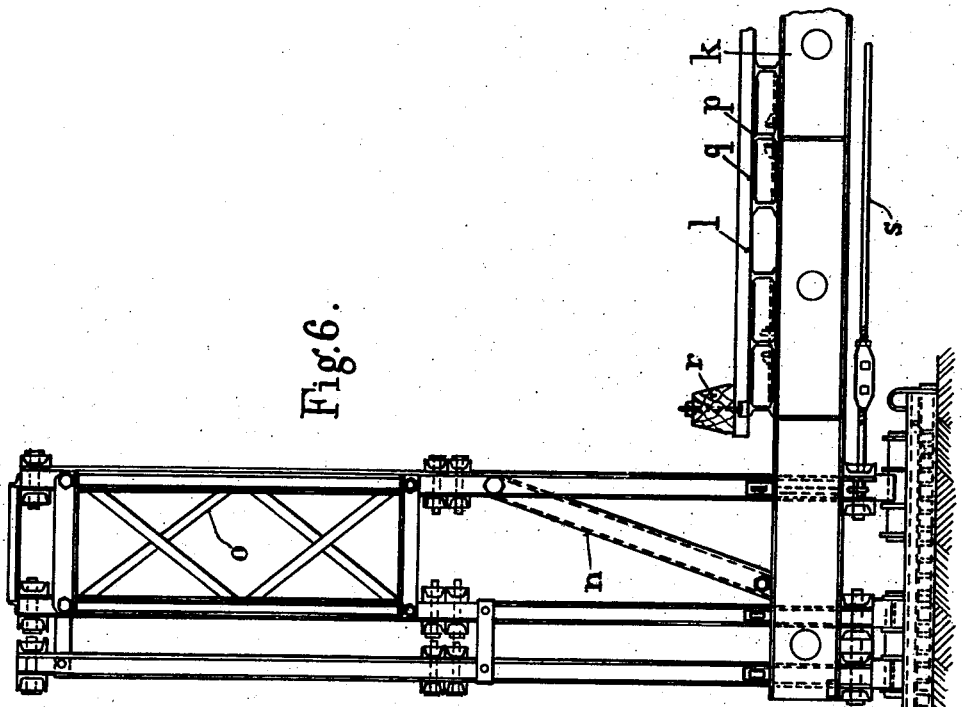
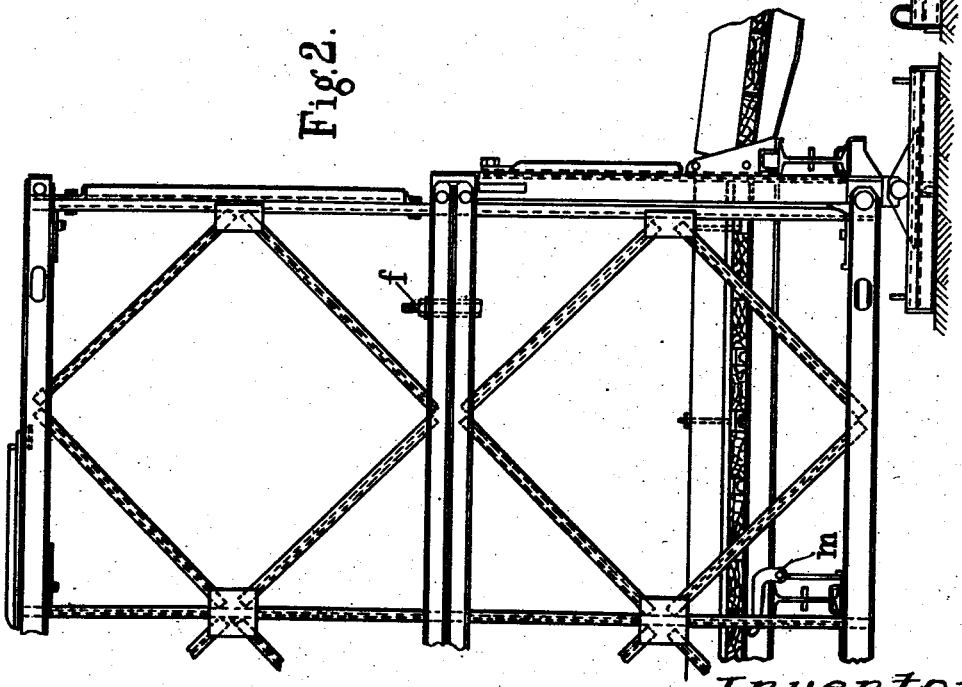


Fig. 2.



Inventor
D. C. Bailey
By Fawcett Downing & Seibold Attys

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CONSTRUCTION OF BRIDGES AND OTHER METAL FRAME STRUCTURES

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Fig. 4.

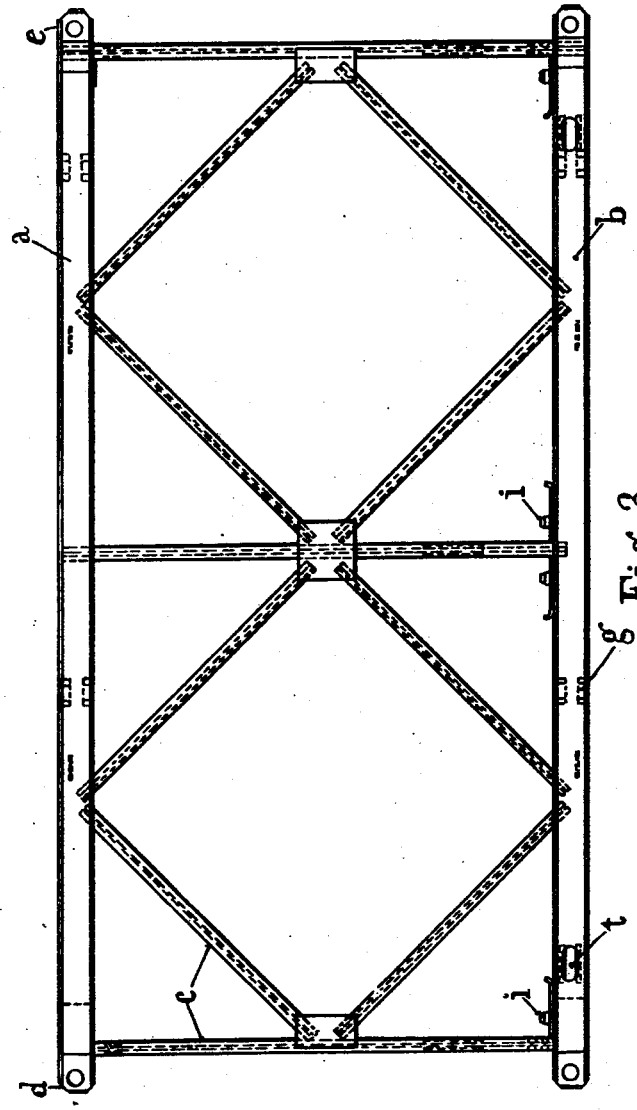

Fig. 3.

Fig. 5.

Inventor
D. C. Bailey
By Mascott Downing & Seibold
Attys

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CONSTRUCTION OF BRIDGES AND OTHER METAL FRAME STRUCTURES

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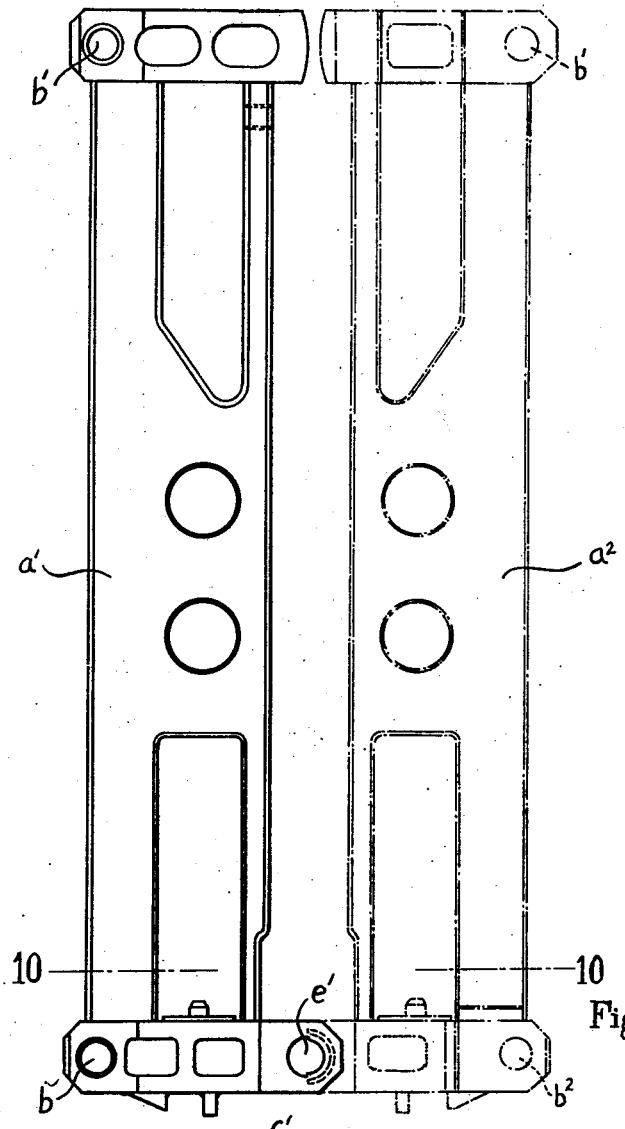

Fig. 9.

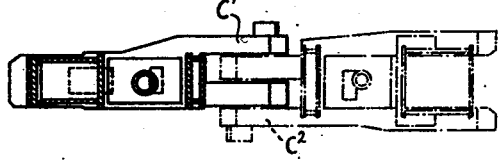

Fig. 10.

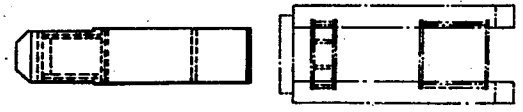

Fig. 11.

Inventor
D. C. Bailey
By Glascock Downing & Seibold
Attys.

Patented May 15, 1945

2,376,023

UNITED STATES PATENT OFFICE

2,376,023

CONSTRUCTION OF BRIDGES AND OTHER METAL FRAME STRUCTURES

Donald Coleman Bailey, Christchurch, England

Application January 11, 1943, Serial No. 472,027
In Great Britain October 14, 1941

4 Claims. (Cl. 14—13)

This invention relates to the construction of bridges, towers, steel frames for buildings and other metal framed structures.

The object of the present invention is to provide simple, relatively cheap and efficient means for producing such structures of any desired strength to meet any particular requirements, the necessary adjustments being made on the site of the structure and not requiring the preforming of a multiplicity of differently designed parts to take care of the different conditions to be fulfilled in actual practice.

According to my invention I employ in the erection of metal framed structures a prefabricated braced panel forming the basic element of the structure and so constructed that a number of these panels may be joined end to end to form a girder of any desired length. The panels may also be connected in superposed relationship to give a girder of any desired depth and, further, they may be united side by side to produce a girder of any desired width.

The affixing of the panels may be effected by pins, bolts, clamps, or other suitable means not involving the exercise of any special skill on the part of the erector.

The invention not only provides girders whose strength (in resistance to bending moment or shear) is variable according to the form in which they are made up but also enables the structure to be readily broken down, when required, into components of a size suitable for ease of handling and transportation, the latter advantage applying also in the case of the erection of the structure.

Furthermore, when extra strength is required in shear, as at the ends of a bridge, a special "end post" is pinned to the end of a panel to provide this. Similarly it is possible to provide extra strength in bending by bolting or otherwise attaching supplementary members on top and bottom of existing chords to provide additional chord area where required on long bridges.

Further features of the invention will be apparent from the description given hereafter.

The accompanying drawings illustrate one mode of carrying out the invention.

Figure 1 is a more or less diagrammatic side elevation of a bridge formed in accordance with the invention.

Figure 2 is a side view, on a larger scale, of a part of the bridge shown in Figure 1.

Figures 3, 4 and 5 are respectively a side elevation, end elevation, and plan on a still larger scale, of one of the basic models in accordance with the invention.

Figure 6 is an end elevation of Figure 2, part being broken away.

Figures 7 and 8 are respectively a plan and side elevation showing a fitting designed to enable panels to be secured at an angle to one another, and

Figure 9 is an end elevation of a section incorporating a hinge to enable an articulated joint to be formed in a girder.

Figure 10 is a section on the line 10—10 of Figure 9 and Figure 11 is a plan of the upper part of Figure 9.

In carrying my invention into effect in one convenient manner, I provide a basic element shown in detail in Figures 2 and 3 in the form of a prefabricated braced panel consisting in an all-welded frame of, say, ten feet in length by five feet in depth, in which the chords *ab* are each formed of two rolled channels spaced from one another back to back, and the web or vertical members are constituted by rolled steel joists *c* of, say, I or H section interposed between the webs of the chord channels.

It will however be understood that this construction is merely given by way of an example of one convenient form of basic panel, and the dimensions of the panel, as also the form of the units composing the same, may be variously modified depending upon the character of structure which is to be erected.

The panels are provided with male jaws *d* at one end and female jaws *e* at the other so that any number of panels may be connected together end to end as shown in Figure 1 by means of simple pin connections in order to form a girder of any desired length. Moreover a plurality of panels may be secured to one another in superposed relationship by means, for example, of tapered or other bolts *f* (Figure 2) inserted through sockets *g* provided between the channels forming the top and bottom chords.

The bottom chords of the panels are preferably fitted with dowels *i* which serve to position cross-girders *k* supporting the deck *l* of a bridge or cross-girders forming part of any other structure, the number and disposition of the cross-girders being varied in accordance with the magnitude of the load to be carried or other practical requirements.

The cross-girders are provided with holes in which engage the dowels on the bottom chords of the panels and preferably I provide a series of such holes in each cross-girder so as to allow

their use with a single row of panels constituting the main girder, or with two or more rows of panels arranged side by side to form single, double, or other multiple main girders. In addition the cross-girders are secured to the verticals and held upright by means of suitable quick action clamps *m*.

When a single row of panels is employed for forming the main girder they may be laterally braced by means of raking struts *n* (Figure 6) connecting the upper parts of the panels with projections or brackets on the cross-girders and when two or more rows of panels side by side are employed they may be additionally braced by means of smaller braced panels *o* of the same general form bolted between adjacent rows of panels either vertically at junctions or horizontally on the top of the panels or both systems may be used together.

When constructing a bridge in accordance with the invention the deck *l* of the bridge which rests upon the cross-girders may be formed of welded-up stringer panels made up of groups of three longitudinal joists *p* with spacing and distributing members *q* between and the wearing surface *l* and kerbs *r* are placed on top of the stringer panels.

In some cases such, for example, as in bridge construction, it may be necessary to provide sway braces *s* and in such case I may provide elongated apertures *t* in the bottom chords of the girders to accommodate such sway bracing.

Figures 7 and 8 show a cruciform fitting *u* which enables panels *v* to be connected at right angles (or any other angle) to one another.

Figures 9 to 11 show a special section incorporating a hinge, to enable an articulated joint to be made in a girder. This consists of two welded or other posts $a'a^2$ each having on one side at top and bottom holes $b'b^2$ by which they may be secured, by means of pins, to a standard panel, the post a' being adapted to be secured to the female jaws *e* of a panel, and the post a^2 to the male jaws *d*. On the other side of the posts at the bottom are the forked members $c'c^2$ adapted to interlock and to be united by a pin through the holes *e'* forming a hinge by which the parts may be articulated. By this means two adjacent girders may be made to meet on a common bearing and to articulate about that bearing as might be required on a consecutive series of bridge spans in a viaduct, for example.

A particular advantage of the invention when applied to bridges, for example, is that it enables a girder to be assembled in skeleton form of only sufficient strength to carry its own weight, in which form it may be most easily launched across a gap. Thereafter it may be readily strengthened by adding another "storey" and/or another "bank" of panels to the necessary extent to enable it to carry whatever loads may be required to pass over.

As above indicated the actual form of the various elements composing a basic panel may be varied as may be found most convenient to suit the particular type of structure to which the invention is to be applied, and in place of uniting the various components by welding I may secure them together by bolting, riveting, or otherwise.

I claim:

1. In a frame structure a prefabricated braced panel including upper and lower parallel chords each composed of two members spaced from each other, joists connected at their ends between members forming the chords to maintain them in spaced relation and forming the web of the panel, means between said chord members to enable panels to be connected in superposed relation to one another, male jaw members extending longitudinally from adjacent ends of the chords at one end of the panel, and female jaws extending longitudinally from the chords at the other end of the panel, whereby a plurality of panels may be united end to end to form a girder by disposing the female jaws of one panel to receive the male jaws of an adjacent panel and uniting the two by a simple pin connection capable of taking the necessary stresses.

2. In a frame structure a prefabricated panel according to claim 1 in which the chords are formed from two rolled channels arranged back to back, sockets being secured between the channels to take bolts for uniting the panels in superposed relation.

3. In a frame structure a prefabricated panel according to claim 1 in which the bottom chord has secured to its upper surface dowels for locating cross members combined with clamps for holding said cross members upon the dowels.

4. In a frame structure a prefabricated panel according to claim 1 in which the bottom chords are formed with elongated apertures therethrough to accommodate sway presses.

DONALD COLEMAN BAILEY.