

July 18, 1933.

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1,918,345

JOIST, BEAM, GIRDER, AND THE LIKE

Filed Aug. 22, 1928

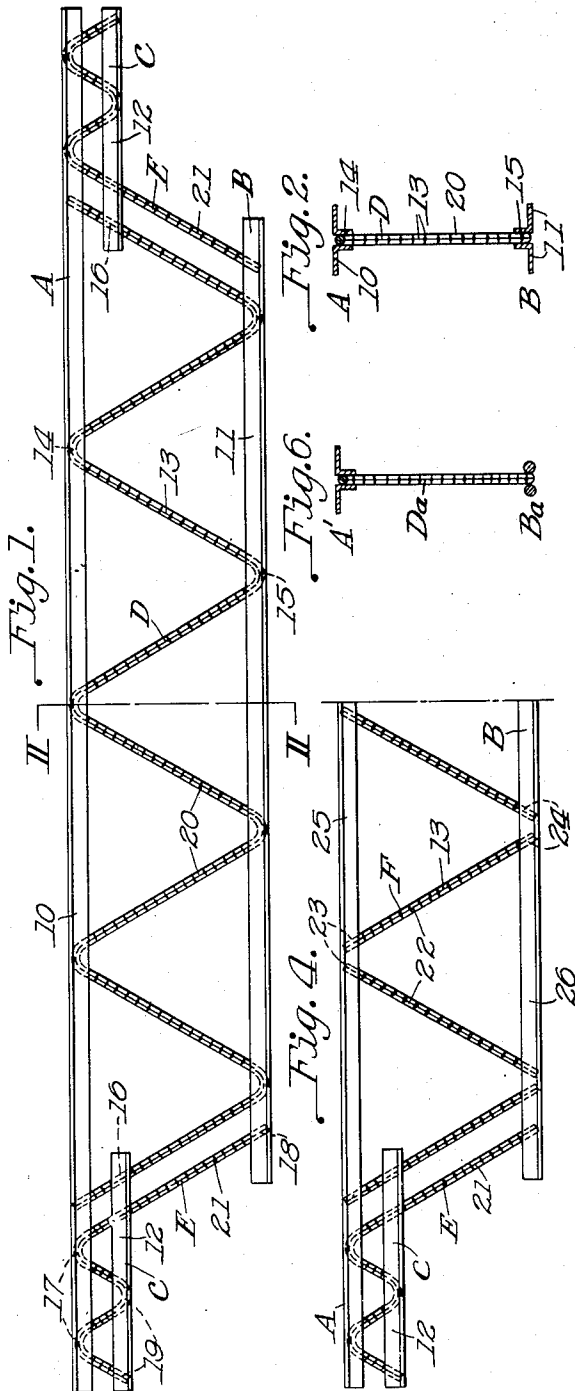


Fig. 3.

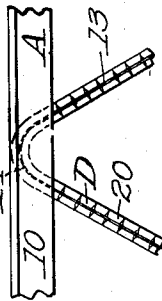
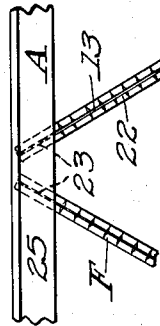


Fig. 5.



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JOIST, BEAM, GIRDER, AND THE LIKE

Application filed August 22, 1928. Serial No. 301,280.

This invention relates to improvements in metallic welded joists, beams, girders or the like of the type including spaced-apart chords united by a webbing.

Among the objects of the present invention are, to eliminate the use of welding projections, ribs or edges on the chord members of the structure, whether said members be made up of angles, beams, channels, T-sections, rods, or other shapes, thereby greatly reducing the cost of chord members, and enabling me to employ standard or commercial sections for the chord members, free of parts that tend to cause difficulty in storing, handling and assembling the chord sections; to provide a construction including, for the web portion of the joist, etc., commercial or standard sections of round or square deformed bars having welding projections thereon, for example, commercial deformed reinforced concrete bars; and to provide a construction in which the weld between the members constituting the joist, etc. may be considerably longer, and consequently stronger, than has heretofore been the case.

Further objects of the present invention are, to provide a novel construction which avoids the necessity of bending either chord, and particularly bending the ends of the lower chord of the joist, etc., upwardly toward the upper chord; and to provide a construction in which the top and bottom chords are parallel throughout their lengths.

Various additional objects and advantages will become apparent and, in part, be pointed out in the description following, taken in connection with the accompanying drawing illustrating operative embodiments.

In said drawing:

Fig. 1 is a side elevation of the improved joist;

Fig. 2 is a cross sectional view, taken on the line II—II of Fig. 1;

Fig. 3 is an enlarged detail view, particularly showing the manner of connecting a web member to a chord;

Fig. 4 is a partial side elevation of a modified form of joist;

Fig. 5 is a view similar to Fig. 3, showing a modified form of webbing; and

Fig. 6 is a sectional view, showing a modified form of lower chord.

Referring to the drawing, and first to the form of Fig. 1, the joist consists of upper and lower chords, respectively designated A and B. The lower chord B, as illustrated and as preferred, is shorter than the upper chord, and is arranged to terminate inwardly of both ends of the upper chord. Between the upper and lower chords, a plurality of short auxiliary or bearing members C are provided. The members C are arranged relatively close to the top chord A, one adjacent each end of the latter, with its outer end terminating in the same plane as the ends of the upper chord.

The upper and lower chords are primarily connected together and reinforced by a web D. Said members C are also positioned and reinforced by webs E, which are additionally connected to the upper and lower chords of the joist. The chords A and B and members C are, as illustrated, each made of straight lengths of slightly spaced-apart angle members, respectively designated 10, 11 and 12, although other structural shapes or sections may be employed.

The webs D and E are disposed between the angle members 10, 11 and 12, and are preferably made of reinforcing bar material, of commercial form, such as corrugated steel, either round, square or the equivalent as employed in connection with concrete work. Such material is used because it is distorted and presents various ribs or welding projections, as at 13, which at portions thereof, 14, 15 and 16, in the case of the web D, are electrically spot welded to the adjacent flanges of the angle members 10, 11 and 12. In the case of webs E, which are made of the same metallic material as the web D, such ribs 13 are electrically spot welded, as at 17, 18 and 19, to and between adjacent flanges of the angle members 10, 11 and 12.

The web D is preferably a single piece bent into zigzag form, so as to present diagonals 20. Each of the webs E are generally of M-shape, and have one of their legs extended to form a diagonal 21 arranged parallel to and relatively close to the terminal diagonals

20 of the web D. This provides an extremely rigid and reinforced construction in which the upper portions extend outwardly beyond the lower portion, as is highly desirable in a joist of the present character.

Further, by reason of the particular construction described, I am able to use material, all of which is commercial or stock, and which has webs which are connected by spot welding along more extended lines or surfaces, to the various angle members.

It is to be understood that the form of reinforcing bar shown is representative only, and that any of the various forms in commercial use, having projections, may be employed with the attendant advantages possessed by that specifically illustrated.

A modified form of the invention is shown in Fig. 4, and differs from that of the form of Fig. 1 only with respect to a reinforcing web F, which may be used in place of that at D. The web F is made of exactly the same reinforcing bar material as the web D. Web F, however, is formed of individual bars or diagonals 22, which at their ribs 13 are electrically spot welded, as at 23 and 24, to the angle members 25 and 26, respectively, forming the upper and lower chords. In other words, the construction of Fig. 4 is similar to that of Fig. 1, except the web D has the diagonals thereof severed or cut at the points 14 and 15.

In the form of Fig. 6, the lower chord Ba of the joist is formed of round rods in place of the angle member chord B, of the other forms illustrated. In this modified construction, I contemplate employing a web Da corresponding with the web D, and a top chord A' corresponding with the chord A of the form of Fig. 1.

I claim:

1. A structural metal unit comprising a chord, a bearing member disposed relatively close to a terminal thereof, a second chord spaced inwardly from the outer terminals of the first chord and bearing member, said chords and member formed of spaced-apart angle members, a web connecting said first and second chords and entered between the angle members, and a web connecting said first chord and the bearing member and entered between the angle members.

2. A structural metal unit comprising a chord, a bearing member disposed relatively close to a terminal thereof, a second chord spaced inwardly from the outer terminals of the first chord and bearing member, said chords and member formed of spaced-apart angle members, a web connecting said first and second chords entered between and welded to the angle members, and a web connecting said first chord and the bearing member, said latter web being also entered between and welded to the angle member of the second chord.

3. A structural metal unit comprising a chord, a bearing member disposed relatively close to a terminal thereof, a second chord spaced inwardly from the outer terminals of the first chord and bearing member, a web connecting said first and second chords and welded thereto, and a web connecting said first chord and the bearing member, said second web being also welded to the second chord, the adjacent terminal portions of said first and second webs being diagonal, relatively close together, and substantially parallel.

4. A structural metal unit having chords, one of said chords formed of angle members, a web of bar material therefor, said web being of a type with projections and having said projections welded to the chords.

5. A structural metal unit having chords each formed of spaced-apart angle members, a web of bar material distorted in cross section providing welding projections, the projections adjacent to the chords being welded to the said angle members thereof.

6. A metallic joist including an upper and a lower chord each formed of angle members free of welding projections, a web of bar material therefor of a type having projections, said web projections being welded to the angle members.

7. A structural metal unit having an upper chord, a bearing member below the same and relatively close thereto and extending to substantially an outer end thereof, a lower chord having a terminal inwardly of said end, a zig-zag web of distorted cross-section providing welding projections in contact with said chords, said projections being spot welded to the chords, and a web independent of the first mentioned web of similar cross section thereto having its projections welded to the upper chord and the bearing member.

8. A structural metal unit having an upper chord, a bearing member below the same and relatively close thereto and extending to substantially an outer end thereof, a lower chord having a terminal inwardly of said end, a zig-zag web of distorted cross section providing welding projections in contact with said chords, said projections being spot welded to the chords, and a web independent of the first mentioned web of similar cross section thereto having its projections welded to the upper chord and the bearing member, each of said chords being formed of a pair of angle members with the web members arranged between them, the second web being of M-shape having one of its legs extended and with the projections thereon welded to the lower chord, said leg being relatively close to and substantially parallel to one of the diagonals of the first web.

9. A structural metal unit having an upper chord, a bearing member below the same and relatively close thereto and extending to sub-

stantially an outer end thereof, a lower chord having a terminal inwardly of said end, a zigzag web of distorted cross section providing ribs in contact with said chords, said ribs being spot welded to the chords, and a web independent of the first mentioned web of similar cross section thereto having its ribs welded to the upper chord and the bearing member, each of said chords being formed of a pair of angle members with the web members arranged between them, the second web being of M-shape having one of its legs extended and with the ribs thereon welded to the lower chord, said leg being relatively close to and substantially parallel to one of the diagonals of the first web, said first web consisting of a plurality of individual bars.

10. A structural metal unit consisting of a top and a bottom chord, a bearing member between them having its outer end in substantially the same plane as the adjacent end of the upper chord, the adjacent end of the lower chord being inwardly of said ends, each of said chords being straight, a zigzag web member welded to the top chord and to the bottom chord, and to the bearing member, and an additional web member of zigzag form welded to the top chord and the bearing member, said additional web member having an extension welded to the lower chord.

11. A structural metal unit consisting of a top and a bottom chord each formed of angle members, a bearing member disposed between them having its outer end in substantially the same plane as the adjacent end of the upper chord, the adjacent end of the lower chord being inwardly of said ends, each of said chords being straight, a zigzag web member welded to the top chord and to the bottom chord and to the bearing member.

12. A structural unit comprising top and bottom chord members of flanged sections, each top and bottom chord members composed of a pair of spaced bars having flat side faces, a zigzag web member having bent apex portions formed with depressions and contact projections, both of which are in transverse alignment with each other respectively, and adapted to be inserted between the flat side faces of the top and bottom chord members and welded to said spaced bars forming the top and bottom chord members.

13. A structural unit the combination of top and bottom chord members of flanged sections, each top and bottom chord members comprising a pair of spaced bars having flat side faces, a zigzag web member having bent apex portions adapted to be inserted between the flat side faces of the top and bottom chord members, depressions formed on the opposite side faces of the apex portions of the zigzag web member, the depressions formed in one side of the apex portions of the web member being in transverse alignment with

the depressions formed in the other side of the web member and contact projections formed between the depressions having their outer surfaces in the same plane as the sides of the bar forming the web member adapted to engage and weld together the spaced bars forming the top and bottom chord members when a welding current is applied to said members.

14. A structural unit, the combination of top and bottom chord members, each top and bottom chord members comprising a pair of spaced angle bars having their legs disposed vertically and horizontally, a zigzag web member round in cross section having apex portions formed with transversely aligned depressions on the opposite side faces, and transversely aligned contact projections on the web member between the depressions adapted to be welded to the vertical legs of the angles forming the top and bottom chord members.

15. A structural unit, the combination of top and bottom chord members, each formed of a pair of flanged sections, a zigzag web member, transversely aligned contact projections formed in the apices of the zigzag web member adapted to be welded to the top and bottom chord members.

16. A structural unit, comprising spaced top and bottom chord members, each formed of a pair of flanged sections, a zigzag web member, depressions formed on the opposite side faces of the apices of the zigzag web member, and transversely aligned contact projections between the depressions having their outer surfaces in the same plane as the sides of the bar forming the web member adapted to be welded to the top and bottom chord members.

17. A structural unit, comprising spaced top and bottom chord members formed of flanged sections, a web member of uniform cross sectional area throughout its length connecting the top and bottom chord members together formed from a bar bent into zigzag form, spaced depressions formed in transverse alignment on the opposite side faces of the apices of the zigzag web member, and contact projections having their outer surfaces in the same plane as the outer sides of the bar forming the web member between the depressions adapted to form a line contact and to be welded to the top and bottom chord members.

18. A structural unit comprising top and bottom chord members spaced apart and in parallel relation with each other, a bar bent to form a zigzag web member having bent apex portions, transversely aligned depressions formed in spaced relation to each other in the opposite sides of the apices of the zigzag web member, and contact surfaces between the depressions adapted to engage and

to be welded to the top and bottom chord members.

19. A structural unit comprising top and bottom chord members each formed of a pair of bars spaced apart and in parallel relation with each other, a web member formed of a plain bar of metal of uniform cross section bent into zigzag form with bent apices adapted to be inserted between each pair of bars forming the top and bottom chord members, depressions formed in spaced relation to each other in the apices of the zigzag web member, and contact surfaces between the depressions adapted to engage and to be welded to the top and bottom chord members.

20. A structural unit comprising top and bottom chord members of uniform length, each of said chord members formed of a pair of straight bars spaced apart and in parallel relation with each other, a zigzag web member formed of a plain bar of metal having bent apices adapted to be inserted between each

pair of bars forming the top and bottom chord members, depressions formed in spaced relation to each other in the apices of the zigzag web member, and contact projections between the depressions adapted to engage and to be welded to the top and bottom chord members.

21. A structural unit comprising top and bottom chord members, one of said chord members being shorter than the other, each of said chord members being formed of a pair of bars spaced apart and in parallel relation with each other, a zigzag web member formed of a plain bar of metal having its bent apices adapted to be inserted between each pair of bars forming the top and bottom chord members, depressions formed in spaced relation to each other in the apices of the zigzag web member, and contact projections between the depressions adapted to engage and to be welded to the top and bottom chord members.

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