Aug. 12, 1941. F. TENCH 2,252,533

METALLIC STRUCTURE

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Fig. 1.

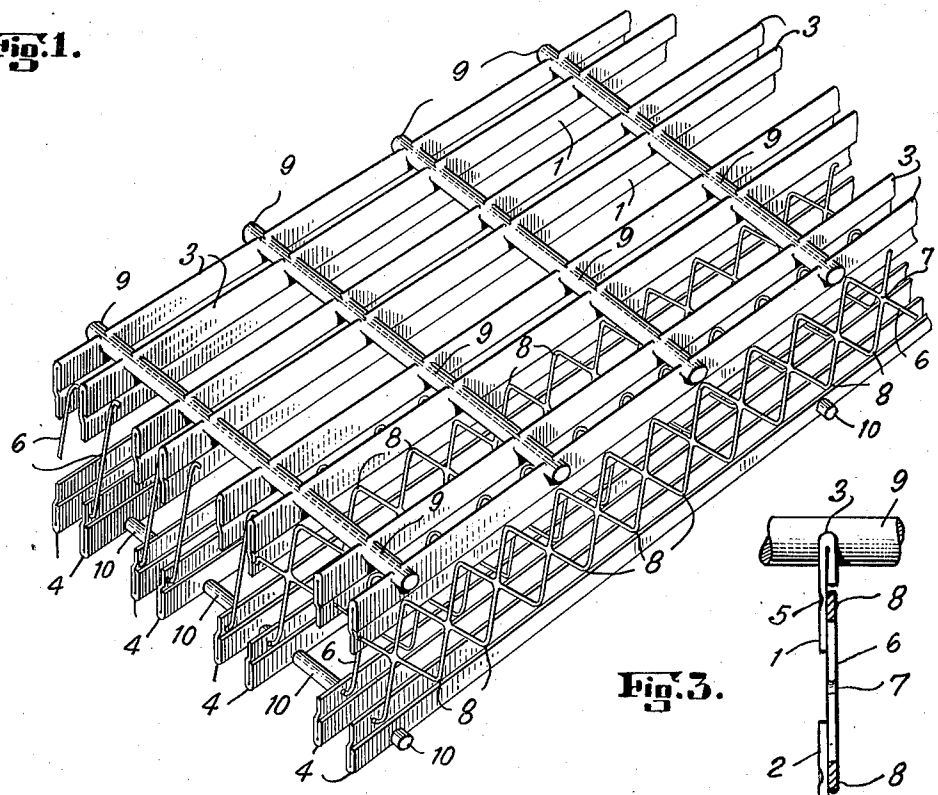

Fig. 3.

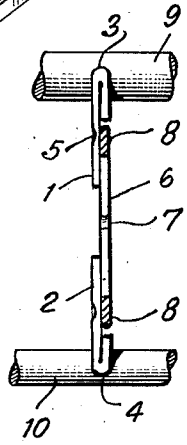

Fig. 2.

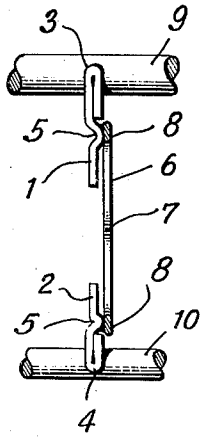

Fig. 4.

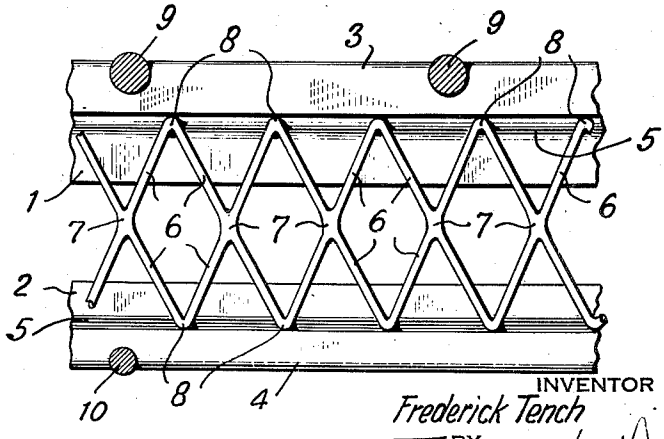

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Fig. 5.

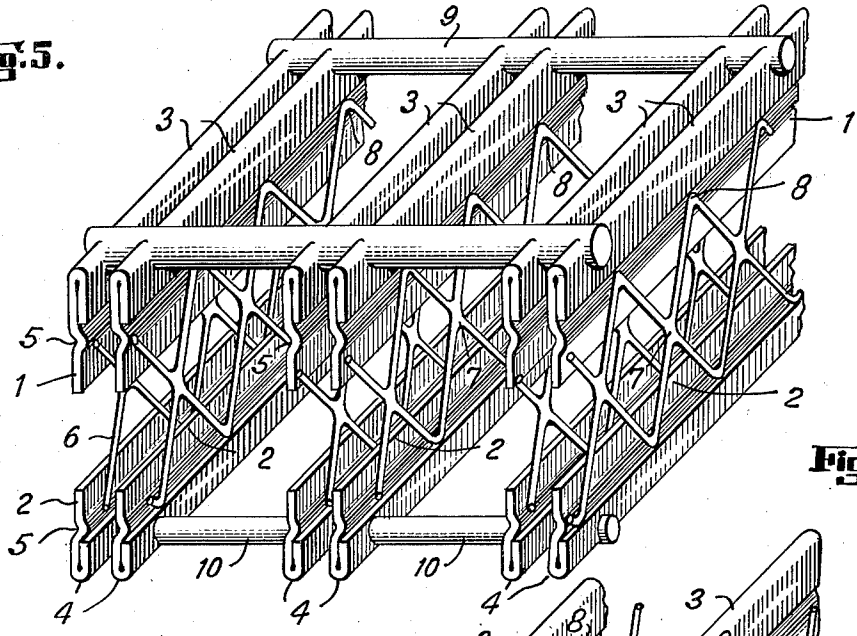


Fig. 6.

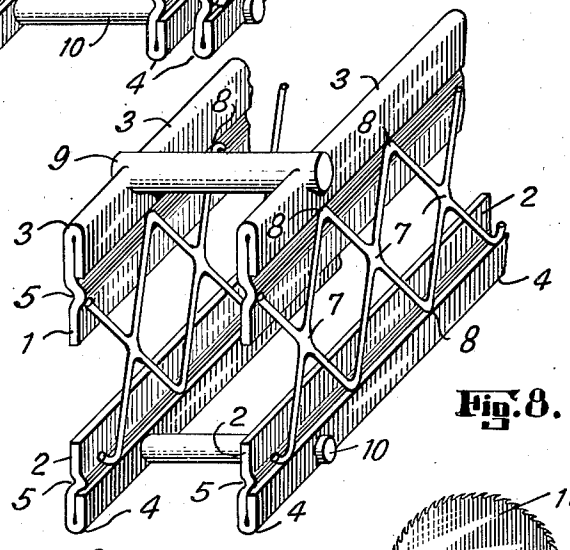


Fig. 7.

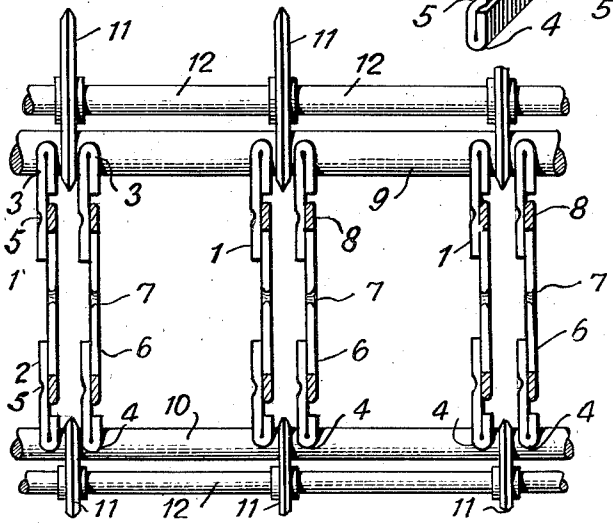
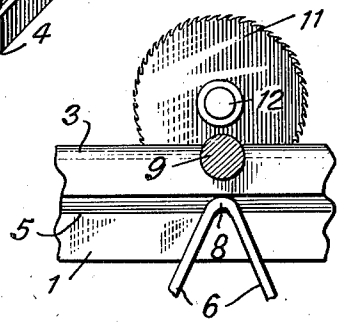


Fig. 8.



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Patented Aug. 12, 1941

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UNITED STATES PATENT OFFICE

2,252,533

METALLIC STRUCTURE

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Application March 6, 1939, Serial No. 260,020

8 Claims. (Cl. 189—82)

The present invention relates to metallic structures comprising gratings such as employed in sidewalks for purposes of ventilation, bridge deckings, and trusses used especially in building constructions and the like, and in short to metallic structures so designed as to be adapted to support and maintain heavy loads and to provide a maximum of resistance to force applied under compression.

The principal object of the invention is the production of a metallic structure of the character above described which shall be comparatively light in weight but of maximum strength.

A further object of the invention is the production of a metallic structure having the above characteristics and which shall not be susceptible to twisting or buckling under great stress.

Still a further object of the invention is the production of a structure of the type referred to above which shall preferably be constructed of rods and bars of standard dimensions which are easily and cheaply obtainable thus eliminating the expense of the special manufacture or rolling of said or analogous parts.

Another object of the invention is the production of a metallic structure in which the parts thereof are preferably integrally and homogeneously united to produce a product having great strength.

A further object of the invention lies in a novel method of producing a boxlike truss structure in a simple and efficacious manner whereby the completed trusses may be manufactured with great speed at a minimum of expense.

To the above ends the invention consists in the novel metallic structure and in the method of producing a box-like truss hereinafter more particularly described and then specified in the claims.

In the accompanying drawings illustrating a practical embodiment of the invention:

Fig. 1 is a fragmentary perspective view of a metallic structure embodying the invention.

Fig. 2 is an end elevation of one of the bearing members prior to the welding of the parts together of which it is constituted.

Fig. 3 is a similar view after the parts have been welded together.

Fig. 4 is a fragmentary side elevation of one of the bearing members.

Fig. 5 is a fragmentary perspective view of the structure before it is separated into a plurality of box-like trusses.

Fig. 6 is a perspective of one of the completed box-like trusses.

Fig. 7 is an end elevation of the structure of Fig. 5 showing the rotary cutters for separating the structure into box-like trusses.

Fig. 8 is an end view of a fragmentary part of Fig. 7.

The invention will now be described in detail with reference to the accompanying drawings and it comprises essentially a plurality of spaced bearing members and a plurality of spaced transverse rods or other crossing members welded or otherwise connected to said bearing members to produce an open metallic structure.

The bearing members include upper and lower elements 1 and 2 respectively comprising ordinary flat bars, the ends of which are bent or lapped or folded over on themselves into substantial parallelism with the bodies of said elements as shown clearly, for instance, in Fig. 2. This bending, folding or lapping operation produces enlarged upper and lower heads 3 and 4 respectively consisting of a double thickness of metal having an outer upper curved or rounded edge or surface. In the interest of stable equilibrium and symmetry and in order that no part of the upper and lower elements 1 and 2 shall be subjected to a greater strain or stress than a corresponding part thereof, the bending or folding operation is performed in such manner that the apices of the curved or rounded heads lie in vertical alignment with a vertical central plane taken through the bodies or unbent portions of the elements 1 and 2.

The body of each element 1 and 2 is provided with a combined strengthening rib or projection 5 adjacent the free bent over ends of the heads 3 and 4 and preferably extending lengthwise of the bodies in order to stiffen them and thereby increase the strength thereof and render them resistant to bending or buckling. The ribs or projections also provide suitable welding points or projections for welding a web structure thereto as will be explained hereinafter. If so desired, and as is obvious, the ribs 5 may be superseded by a series of pressed out knobs or tits.

By preference I provide a web structure for the bearing members of extreme lightness in weight but of great strength. This web comprises preferably, but not necessarily, two rods 6 or two cold drawn wires of high tensile strength and of equal cross-sectional area, each being bent into a serpentine or sinuous configuration and one being placed in juxtaposition over the

other and both being welded together at their points of intersection 7 preferably by what is known as the "flush welding" electrical resistance method. Briefly stated, this method consists in bringing the crossing members into surface contact, applying pressure and a heavy heating electric current at the points of intersection, then reducing the strength of the current to continue the process with slow heating and continued pressure to produce a web in which the portions of the metal of the members at the points of intersection are homogeneously and integrally combined so that the outer surfaces of the members will occupy the same common plane on each face of the web.

The bent portions of the rods or wires are indicated at 8 and these are side-welded to the welding and strengthening ribs 5 to produce the completed bearing members. The reticulated web structure described is smooth and free of mars or burrs, is extremely light in weight and possesses great strength. It lies intermediate the free or bent over ends of the heads 3 and 4 and immediately adjacent to or in engagement with said ends which provide a support therefor should any of the side welds referred to be defective or become loose. As is manifest, other forms of a web structure reticulated or otherwise could be employed without departing from the spirit of the invention.

To complete the structure I set the bearing members on edge in spaced relation to each other and connect them together by a series of spaced upper and lower crossing or transverse members or rods 9 and 10 respectively of standard construction and size which are preferably electrically welded to the heads 3 and 4 respectively. These rounded enlarged heads act not only to considerably increase the strength of the bearing members and therefore of the completed structure, but they provide an abundance of material for the operation of welding the transverse members thereto which is thus considerably facilitated.

The welding of the crossing or transverse rods 9 and 10 to the heads 3 and 4 results in the embedding of the rods in the heads. In some cases, however, I propose to effect the welding in such manner that a small part of the transverse rods, after the welding operation, will lie in a plane slightly above the upper surfaces of the upper edges of the apices of the heads of the bearing bars. This provides a non-slip tread in the finished structure which is of advantage, for instance, in the case of sidewalk gratings. It will furthermore be obvious that the heads 3 and 4 of the bearing members, in addition to providing an enlarged mass of material for the welding operation and for strengthening the joint, also act to prevent the transverse members from cutting into the reticulated webs resulting from the pressure applied by the welder during the welding operation.

As is manifest, the lower transverse members 10 may be dispensed with in some cases, as in sidewalk grating constructions; also a plate may be used in lieu of and to supersede the lower bearing element 2.

In the structure illustrated in Figs. 5 to 8 inclusive the bearing members are set on edge in pairs with but a slight space obtaining intermediate the members constituting any one pair but with a space of relatively greater and material width intervening between any given pair and the next succeeding pair (see Figs. 5 and 7). The upper and lower transverse or crossing members are then electrically welded to the heads of all of the pairs of the bearing members. Rotary or other suitable cutting tools 11 mounted on shafts 12 or other driven members are then brought into operation and cut the transverse rods at points intermediate the pairs of the bearing members which results in the production of a plurality of box-like trusses of the form illustrated in Fig. 5. Any surplus material of the cut transverse rods projecting outwardly from the sides of the heads 3 and 4 may be readily ground off. While there may be a very slight waste of the material of the crossing or transverse rods when practicing the process, the loss is insignificant and is more than offset by the great speed of manufacture of the trusses and the large saving in labor.

The invention claimed is:

1. A metallic structure consisting of a plurality of spaced bearing members comprising upper and lower plates one end of each of which is bent over on itself to form enlarged rounded heads having free ends, longitudinally extending ribs on said plates adjacent said free ends, a web comprising crossing rods welded to each other and to said ribs and transverse rods welded to said enlarged rounded heads.

2. A metallic structure consisting of a plurality of spaced bearing members comprising upper and lower plates one end of each of which is bent over on itself to form enlarged heads having free ends, combined strengthening and welding projections on said plates adjacent said free ends, a web comprising crossing rods flush-welded to each other at their points of intersection whereby the outer surfaces of said rods will occupy the same common plane on each face of the web, said crossing rods also being side-welded to said projections intermediate the free ends of said heads and spaced crossing members welded to and embedded in said heads.

3. A metallic structure consisting of a plurality of spaced bearing members comprising upper and lower plates one end of each of which is bent over adjacent itself to form enlarged rounded heads having free ends, longitudinally extending ribs on said plates, a web comprising rods welded to said ribs with the ends of said rods lying in close proximity to the aforesaid free ends and transverse members fastened to the heads of said upper plates.

4. A metallic grating structure comprising a plurality of spaced truss units arranged side by side and each consisting of an upper bearing plate and a lower bearing plate, said plates being set on edge substantially in vertical alinement and vertically spaced from each other, the upper portions of the upper plates and the lower portions of the lower plates being respectively bent downwardly and upwardly over upon their bodies to form enlarged heads at the upper and lower portions of the bodies of the respective plates, and a web member bridging the space between the free edges of the turned over portions of said plates and lapping over upon and side welded to the bodies of the plates in the plane of their turned over portions, and crossing members secured to and connecting the enlarged heads of the upper plates of the units.

5. A box-like metallic grating structure comprising a plurality of horizontally spaced truss units arranged side by side and each consisting of an upper bearing plate and a lower bearing plate set edgewise and lying substantially in vertical

alinement and vertically spaced from each other, the upper portions of the upper plates and the lower portions of the lower plates being respectively bent downwardly and upwardly over upon their bodies to form enlarged heads at the upper and lower portions of the bodies of the respective plates, and a web member bridging the space between the free edges of the turned over portions of said plates and lapping over upon and side welded to the bodies of the plates in the plane of their turned over portions, and upper and lower sets of crossing members extending between and respectively secured to the enlarged heads of said upper and lower plates of the units.

6. A box-like metallic grating structure comprising a plurality of spaced parallel truss units arranged side by side and each consisting of an upper bearing plate and a lower bearing plate set on edge substantially in vertical alinement and vertically spaced from each other, the upper portions of the upper plates and the lower portions of the lower plates being respectively bent downwardly and upwardly over upon their bodies to form enlarged heads at the upper and lower portions of the bodies of the respective plates, and web members comprising rods side welded to the body portions of the plates of each unit and lying substantially in the same vertical plane as their bent over portions, transverse members embedded in and welded to the heads of said upper plates of the units, and transverse members embedded in and welded to the heads of said lower plates of the units.

7. A metallic structure comprising an upper bearing plate and a lower bearing plate set edgewise in the same vertical plane, the upper plate having its upper portion turned downwardly over upon one side of the upper portion of its body and the lower plate having its lower portion turned upwardly over upon the corresponding side of the lower portion of its body, said turned over portions of the plates lying in the same vertical plane, and a web member bridging the space between the free edges of the turned over portions of said plates and lapping over upon and side welded to said sides of the bodies of the plates in the plane of the turned over portions.

8. A metallic structure comprising an upper bearing plate and a lower bearing plate set edgewise in the same vertical plane, the upper plate having its upper portion turned downwardly over upon one side of the upper portion of its body and the lower plate having its lower portion turned upwardly over upon the corresponding side of the lower portion of its body, said turned over portions of the plates lying in the same vertical plane, longitudinally extending ribs on said plates adjacent the free edges of their turned over portions, and a web bridging the space between the free edges of said turned over portions of the plates and welded to said ribs substantially in the plane of the turned over portions.

FREDERICK TENCH.