Dec. 26, 1944. J. R. TENCH 2,365,850

CHANNELED BOX-LIKE METALLIC STRUCTURE

Filed Aug. 15, 1942

Fig. 1

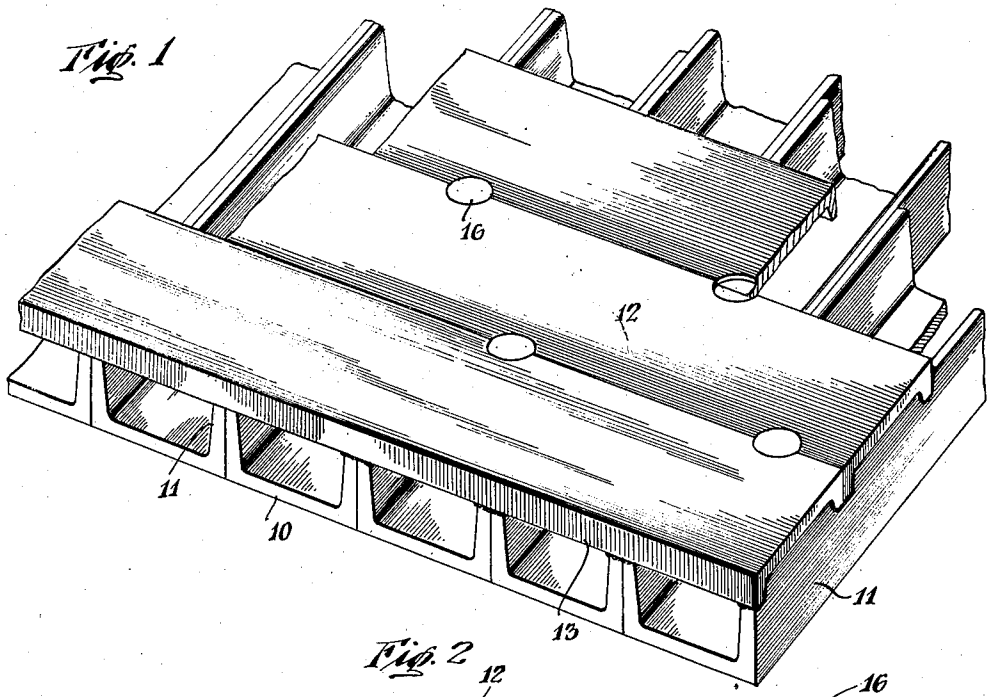


Fig. 2

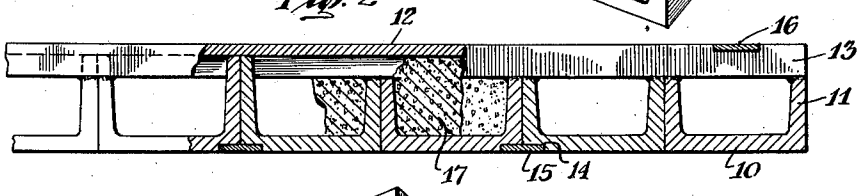


Fig. 3

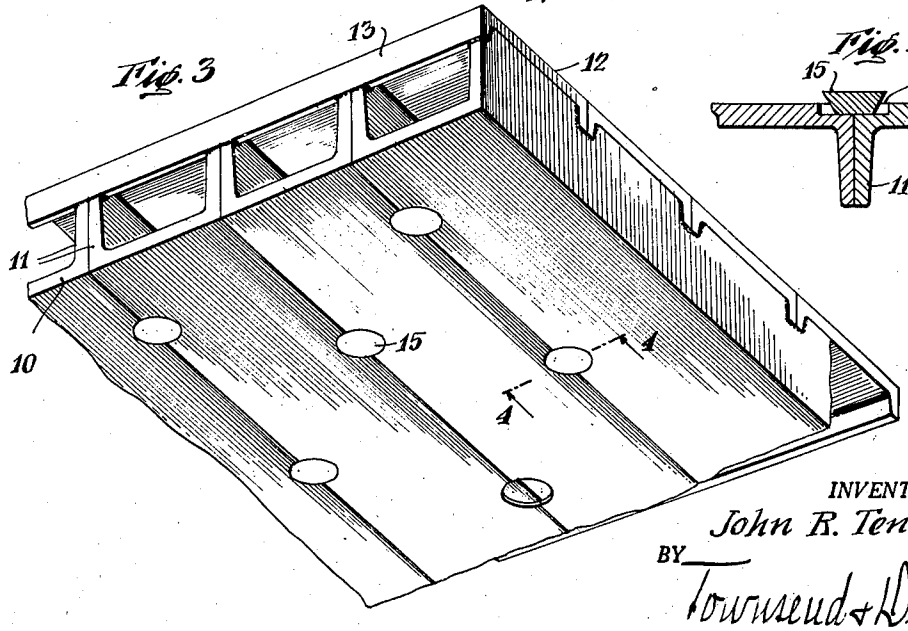


Fig. 4

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CHANNELED BOXLIKE METALLIC STRUCTURE

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4 Claims. (Cl. 189—34)

This invention relates generally to metallic structures adapted for use in buildings or in a variety of other constructions or for fortification purposes such as for the walls of tanks, bomb-shelters, the decks of ships and analogous uses.

The invention is peculiarly adapted for use where great strength, rigidity and durability are essential requirements and when used for fortification purposes it will be found to be particularly resistant to the penetration of projectiles, bombs and to explosives and flying fragments and will act to localize and minimize their destructive effects.

The principal object of the invention is the production of a metallic structure possessing the above characteristics which, by preference, shall constitute or be made up of a plurality or series of walled boxes each of which has a wall or part constituting a wall or part of the next succeeding box of the series and all of the boxes forming a composite structure constituting an integral unit which may be manufactured with ease and facility at relatively small expense.

A further object of the invention is the production of a metallic structure having the above characteristics which, in addition, shall be resistant to deforming, bending or twisting forces or stresses exerted thereagainst and to loads applied under compression as well as to any other forces acting to distort, break or damage the structure or parts thereof.

Further and other objects of the invention will appear from the accompanying description, the invention consisting in the novel metallic structure hereinafter more particularly described and then specified in the claims.

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

Fig. 1 is a perspective view of a portion of the structure of the invention showing some of the parts broken away in the interest of clarity.

Fig. 2 is an end elevation (partly in section) of the structure.

Fig. 3 is a further perspective view of the parts shown in Fig. 1 but looking at a different angle thereto so as to show the outer face of the structure.

Fig. 4 is a sectional detailed view on the line 4—4 of Fig. 3 of a portion of two of the opposed channels comprising one side of the structure and which illustrates the manner in which said channels are integrally united one with the other at their meeting edges adjacent their flanges.

Referring in detail to the several figures of the drawing:

The structure comprises essentially a primary supporting wall and a secondary wall. The primary wall is made up of a plurality or series of U-shaped channels which may be of uniform size and which, in the preferred embodiment of the invention, are conventional rolled channels of standard size and construction and thus are easily procurable. The webs of these channels are indicated at 10 while the flanges or legs thereof, which are integral with the webs, are indicated at 11. The channels are assembled side by side in apposition to each other, as shown, with the side of the flange of one channel closely engaging the side of the flange of the next succeeding channel and with all of the webs of all of the channels lying in the same plane to form the primary wall presenting a substantially smooth and uninterrupted outer surface as clearly illustrated in Fig. 3. Said channels are rigidly and securely connected together in the manner hereinafter described to produce a structure of great strength, rigidity and durability.

The secondary wall of the structure likewise comprises a series or plurality of transversely extending tying U-shaped channels which may be of uniform size and the webs of which are indicated at 12 while their flanges or legs which are integral with the webs are indicated at 13. These transverse channels preferably, but not necessarily, constitute rolled channels of standard size and construction easily procurable. It will be noted that the flanges 13 of said tying or transverse channels are appreciably shorter than the flanges 11 of the channels constituting the primary wall and first referred to.

The aforesaid transverse tying channels are assembled on the channels comprising the primary supporting wall with the lower edges of the flanges 13 engaging and intersecting the upper edges of the flanges 11 and with the side of a flange 13 closely engaging a side of a similar flange of the next succeeding transverse channel of the series to produce the secondary wall of the structure which, manifestly, has a substantially smooth and uninterrupted outer surface similar to the outer surface of the primary wall. As the edges of all of the flanges are of confined or reduced area, they present an ideal condition for the practice of the electric resistance welding process for connecting and integrally uniting the flanges of the primary wall with those of the secondary wall, which process is utilized in the present case. Heating electric current is passed through the contacting edges of the flanges while pressure is simultaneously applied

to force the edges of the tying transverse channels downwardly into and weld them to the opposed edges of the flanges constituting the primary wall and preferably until the webs 12 engage the upper edges of the flanges of the channels of the primary wall whereby homogeneous integral joints between the opposed parts may be efficaciously and expeditiously produced. Inasmuch as the points of intersection of the opposed members are of relatively small area, the heating electric current accordingly is localized thus minimizing the necessary amount thereof and effecting a saving in the cost of the manufacturing operation. It will be noted also that a four-point contact is made at the intersections of the opposed members which obviously enhances the strength of the welded joint between the members at each place of intersection and which results in welded joints which are extremely resistant to any tendency of one member to rotate or be rotated with respect to the other or any tendency of one member to become disconnected from the other even though a defective weld occasionally may result in the manufacturing operation.

For the purpose of preventing any possible spreading of the longitudinal meeting edges of the flanges constituting the primary wall, that is, the edges lying immediately adjacent the webs 10 thereof, and to supplement and enhance the strength and rigidity of the structure as a whole, each channel, adjacent its lower edge, is provided with a groove 14 of substantially semi-circular configuration, which registers with a correspondingly-shaped groove in the next succeeding channel in the series and which forms a circular groove therewith adapted for the reception of a welding button 15. This welding button 15, by preference, is substantially tapered or cone-shaped and the maximum and upper diameter thereof is such as to permit it to snugly interfit within the circular groove just described while the diameter of its lower end which bridges or spans the meeting edges of the opposed channels is considerably more restricted in size (see Fig. 4). Said welding buttons 15 preferably have a vertical thickness considerably in excess of the depth of the circular grooves which receive them to compensate for the loss of metal resulting from the tapered configuration of the buttons whereby the grooves will become entirely filled with the metal of the button after fusing of the metal as a result of the welding operation to be now described.

For welding the buttons within the grooves to integrally unite the meeting longitudinal edges of the channels together, the electric resistance welding process is preferably again employed. The buttons 15 are first seated within the grooves, as shown in Fig. 4 whereby their lower ends will bridge the meeting edges of the channels and heating electric current is thereupon passed through the buttons and channels with the simultaneous application of pressure to weld the buttons to the channels and within the grooves and thus rigidly and integrally connect the channels together at their meeting edges by integral welds of substantial strength. The purpose of tapering the buttons is to restrict the area of the lower ends thereof which contact with and bridge the meeting edges of the channels so that the heating electric current is thereby localized which facilitates and expedites the electric welding operation and minimizes the amount of electric current necessary therefor. After employment of the electric welding operation just described the grooves become entirely filled with the metal of the buttons because of their increased vertical thickness referred to above. To secure uniformity of strength and rigidity of the structure the positions of the grooves and of the buttons 15 which are received by them are preferably staggered all as more clearly shown in Fig. 3.

As shown more especially in Fig. 1, the upper meeting edges of the transverse channels forming the secondary wall are integrally and rigidly connected together by buttons 16 similar in configuration to the buttons 15 previously described and spanning or bridging the meeting edges of the channels and interfitting and welded within grooves similar to those described in the case of the channels forming the primary wall. As shown in said Fig. 1, the positions of these buttons and welded joints are staggered for obvious reasons.

In the electric welding operation employed herein any suitable form of clamps, dies, electrodes or machines or necessary parts thereof may be utilized which form no part of the present invention but which may be readily selected by a person skilled in the art.

It will be apparent from the foregoing description that a metallic structure of great strength has been produced and a structure which in effect comprises a plurality or a series of elongated walled boxes or hollow compartments forming a composite, integral structure. These boxes or compartments, obviously, may be closed at their ends, if desired, by plates or any other suitable closure members. Also, and as indicated in Fig. 2, the boxes or compartments may receive or be filled with any filler such as concrete and as indicated at 17.

When the structure is used for fortification purposes, should a shell, bomb or projectile pierce the outer or primary wall, much of its force and momentum has then become spent and accordingly its ability to pierce the inner or secondary wall is problematical. Furthermore, and as is manifest, should the outer wall be pierced the destructive effects, as by flying fragments etc., of any explosion occcurring within the structure will be of a local and somewhat limited character for the reason that the flanges 11 will act as guards, shields or baffles to confine such destructive effects to a more or less limited area.

The invention claimed is:

1. A metallic structure comprising a series of channels each having a web and undeformed plate-like flanges integral therewith, said channels being arranged in sidewise relation to each other with a flange of one channel closely engaging a flange of the next succeeding channel, transversely disposed channels each having a web and undeformed plate-like flanges integral therewith with a flange of one transverse channel closely engaging a flange of the next succeeding transverse channel and with the free edges of the flanges of the transverse channels intersecting and integrally united with the free edges of the flanges of the first-named channels by pressure electric resistance welding to form a series of hollow, walled compartments each having a wall in common with that of the next succeeding compartment, means for integrally connecting the meeting edges of the first-named channels adjacent their webs by pressure electric resistance welding and means for integrally connecting the meeting edges of said transverse

channels adjacent their webs by pressure electric resistance welding.

2. A metallic structure comprising a series of channels each having a plate-like web and undeformed plate-like flanges integral therewith, said channels being arranged in sidewise relation to each other with a flange of one channel closely engaging a flange of the next succeeding channel and said webs lying in substantially the same plane with one another and with the lower ends of their flanges, transverse tying channels each having a plate-like web and undeformed plate-like flanges integral therewith, said transverse channels also being arranged in sidewise relation to each other with a flange of one channel closely engaging a flange of the next succeeding channel, the free edges of the flanges of said first-named channels being welded to and within those of said transverse channels by pressure electric resistance welding to integrally connect all of said channels together and connecting means welded within the webs and adjacent flanges of said first-named channels by pressure electric resistance welding.

3. A metallic structure comprising a series of channels each having a plate-like web and undeformed plate-like flanges integral therewith, said channels being arranged in sidewise relation to each other with a flange of one channel closely engaging a flange of the next succeeding channel and said webs lying in substantially the same plane with one another and with the lower ends of their flanges, transverse tying channels each having a plate-like web and undeformed plate-like flanges integral therewith of considerably less depth than the depths of the flanges of said first-named channels, said transverse channels also being arranged in sidewise relation to each other with a flange of one channel closely engaging a flange of the next succeeding channel, the free edges of the flanges of said first-named channels being welded to and within those of said transverse channels by pressure electric resistance welding to integrally connect all of said channels together and to form a series of hollow individual compartments open only at their ends and connecting means welded within the webs and adjacent flanges of said first-named channels by pressure electric resistance welding.

4. A metallic structure comprising a series of channels each having a plate-like web and undeformed plate-like flanges integral therewith, said channels being arranged in sidewise relation to each other with a flange of one channel closely engaging a flange of the next succeeding channel and said webs lying in substantially the same plane with one another and with the lower ends of their flanges, transverse tying channels each having a plate-like web and undeformed plate-like flanges integral therewith, said transverse channels also being arranged in sidewise relation to each other with a flange of one channel closely engaging a flange of the next succeeding channel, the free edges of the flanges of said first-named channels being welded to and within those of said transverse channels by pressure electric resistance welding to integrally connect all of said channels together and means bridging adjacent webs of said first-named channels and said transverse tying channels and welded within said adjacent webs by pressure electric resistance welding to integrally connect adjacent channels together at points remote from the free edges of their flanges and to prevent spreading apart of said channels adjacent their webs.

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