

May 9, 1939.

E. H. WELLS, JR

2,157,374

TRUSSED PLATE STRUCTURE

Filed Sept. 28, 1936

2 Sheets-Sheet 1

Fig. 1.

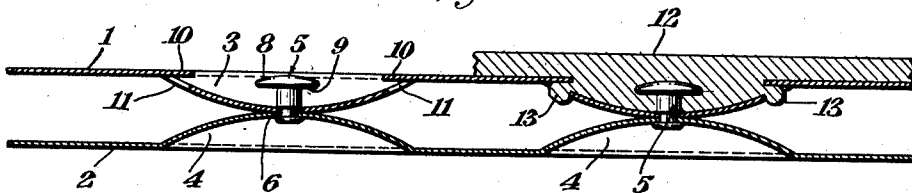


Fig. 2.

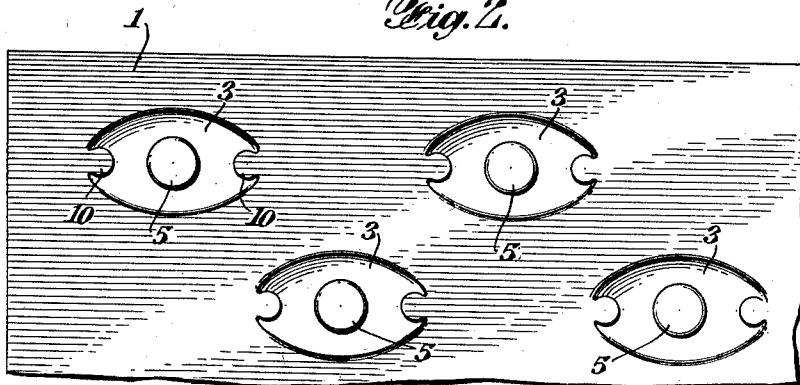


Fig. 3.

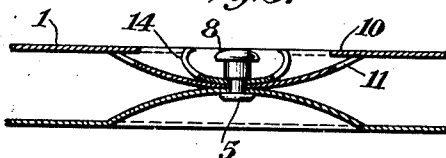


Fig. 4.

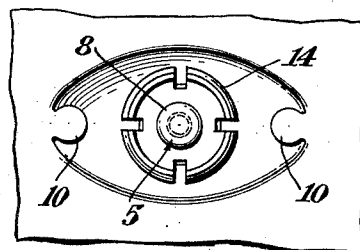
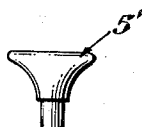


Fig. 5.



INVENTOR
Edward H. Wells, Jr.
BY *Vingil C. Kline*
ATTORNEY

May 9, 1939.

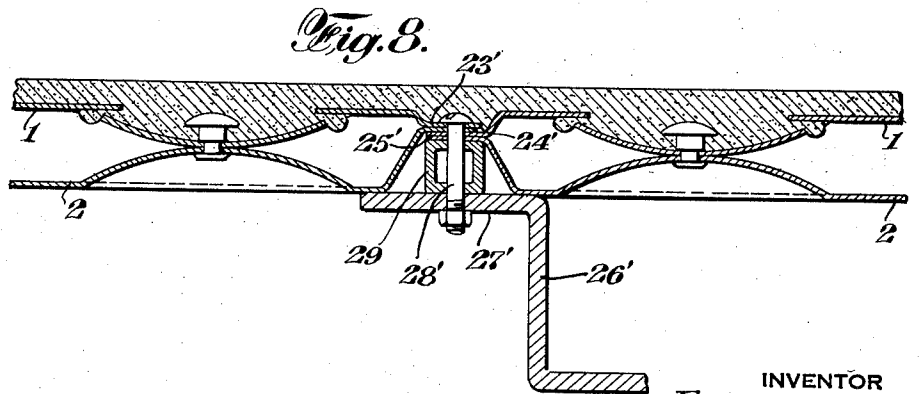
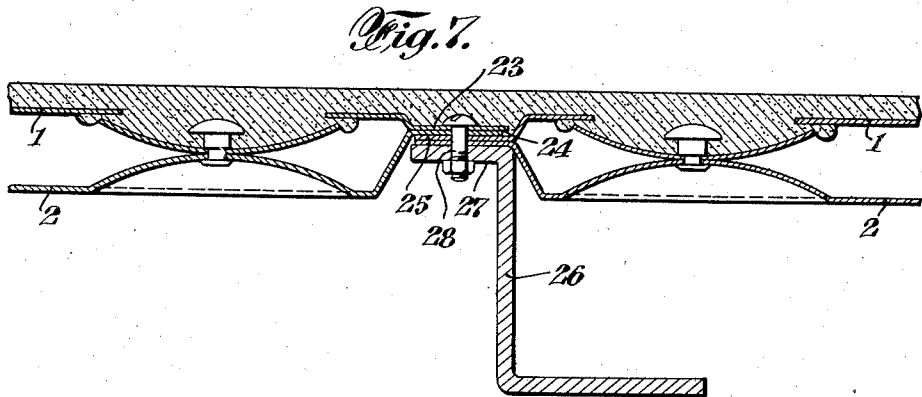
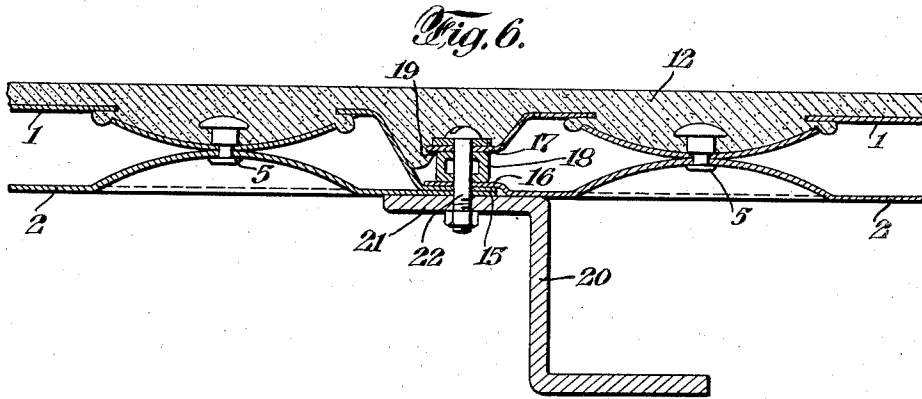
E. H. WELLS, JR

2,157,374

TRUSSED PLATE STRUCTURE

Filed Sept. 28, 1936

2 Sheets-Sheet 2



INVENTOR
Edward H. Wells, Jr.
BY *Virgil C. Kline*
ATTORNEY

UNITED STATES PATENT OFFICE

2,157,374

TRUSSED PLATE STRUCTURE

Edward H. Wells, Jr., New York, N. Y., assignor
to Johns-Manville Corporation, New York,
N. Y., a corporation of New York

Application September 28, 1936, Serial No. 102,958

11 Claims. (Cl. 72-116)

This invention relates to trussed plate structures of the type used to form floors, walls and ceilings of buildings or vehicles. More particularly, it relates to a double sheet type of truss structure, which generally includes two sheets formed with integral depressions and with corresponding depressions of the two sheets joined at their apices. The plane portions of the two sheets serve as chord members and the joined depressed portions serve as the web members of the truss. A layer of plastic material is customarily applied over the surface of the trussed plate structure to act as a finishing coat.

When such structures are used as floors in vehicles, such as railway cars, the plastic coating must be made very thin in order to avoid excessive weight and occupy a minimum of space. When the vehicle twists and weaves during operation, the thin plastic coating is caused to crack, due to its thinness and the imperfect bond between it and the trussed plate, caused by insufficient anchorage being provided by the surface of the trussed plate for the plastic coating.

It is an object of this invention to provide a trussed plate structure in which the bond between the plastic coating and the trussed plate is increased by suitable anchorage devices to the extent that cracking of the plastic surface coating will be entirely prevented.

It is a further object of this invention to provide a connection between adjacent trussed plate members which is strong, creates a very small depression between the plate members, and does not extend above the plane of the top surface of the trussed plate structure.

Other objects and advantages provided by this invention will be apparent to those skilled in the art when recourse is had to the following detailed description of what is now considered to be the preferred embodiment of my invention, and the accompanying drawings illustrating this embodiment, in which:

Fig. 1 is a fragmentary sectional view in elevation of a trussed plate structure formed in accordance with my invention;

Fig. 2 is a fragmentary plan view of the trussed plate structure shown in Fig. 1;

Fig. 3 is a fragmentary sectional view in elevation of a modification of the form of the invention shown in Fig. 1;

Fig. 4 is a fragmentary plan view of the modified form of the invention shown in Fig. 3;

Fig. 5 is an elevational view of a different form of rivet which may be used in place of the rivets shown in Figs. 1 to 4;

Fig. 6 is a fragmentary sectional view in elevation of a connection between adjacent trussed plate members formed in accordance with my invention;

Fig. 7 is a fragmentary sectional view in elevation of a modification of the form of the invention shown in Fig. 6, and

Fig. 8 is a fragmentary sectional view in elevation of another modification of the form of the invention shown in Fig. 6.

Referring to Figs. 1 and 2, two substantially continuous, rigid sheets 1 and 2, usually formed of metal but which might be formed of any desired material, have spaced integral depressions 3 and 4, respectively, formed in them, and are fastened together by rivets 5 passing through suitably formed openings 6 in the apices of the depressions. Rivets are illustrated for the sake of convenience and might be replaced by bolts, machine screws, or any other well-known fastening expedient.

The rivets 5, or whichever particular type of fastening device is used, are formed with enlarged, flared heads 8, which provide a shouldered portion 9 for a purpose to be described later.

Lips 10 are turned up from the walls of the depressions, leaving openings 11.

The depressions 3 and 4 are suitably spaced over the areas of the plates to form an adequate web section for the truss and still leave sufficient strength in the chord sections formed by plates 1 and 2 to prevent the resulting structure from buckling under load.

A relatively thin coating 12 of a plastic, usually a cementitious material, is applied over the surface of the plate 1, and extends down into the depressions 3 so as to completely fill them and extend under the shouldered portions 9 of the rivets and under the lips 10 and out through the openings 11 to form keys 13.

This construction provides a very light, strong trussed plate which has sufficient anchorage formed primarily by the peculiar shaping of the portions of the rivets 5 within the depressions and aided by the lips 10 and openings 11 to create such a close bond between the said trussed plate and its surface coating that cracking of the latter is entirely prevented. In addition to these advantages, the structure can be readily manufactured, due primarily to the fact that the rivets which join the plates together are shaped so as to have the additional and important anchorage function, without which the utility of the structure would be seriously impaired.

Because of space and weight limitations, the

surface coating 12 must be made very thin. This prevents the successful use of a bonding device or devices which extend above the plane of the sheet 1. It is obvious that any bonding device placed above sheet 1 or which would extend out of the depressions above the plane of sheet 1 would approach so close to the surface of the plastic 12 as to weaken the surface area of the coating. Also, such a bonding device might become exposed as the surface material wears and cause injury to passengers.

By the use of a peculiarly shaped rivet, applicant combines an efficient connecting means with an appropriate anchorage which is so shaped as to be firmly gripped by the plastic over a considerable area and at the same time is contained entirely within the depression spaces.

If desired, the bottom sheet 2 may be merely a plane element without depressions and riveted to the depressions formed in sheet 1 in the manner previously described.

If the trussed structure is to be used in a capacity requiring finished surfaces on both sides, it is obvious that the plastic 12 may be suitably applied to both sides of the trussed plate shown in Fig. 1, additional anchorage facilities being provided as required. The additional anchorage may be provided by inserting the rivets 5 with their flared heads alternately projecting into depressions 3 and 4.

In the modification illustrated in Figs. 3 and 4, the anchor formed by the enlarged head 8 on the rivet 5 is supplemented by a member 14 consisting of a cupped washer, slotted radially and turned inwardly at its periphery and seated under the head of the rivet 5 to provide an additional gripping surface for the plastic. Here, again, the upper extremity of the washer is either below or flush with the top surface of the sheet 1, so as to be positioned entirely within the space formed by the depression.

In Fig. 5, rivet 5' is shown which might be substituted for the rivets shown in Figs. 1 to 4. The rivet 5' is of somewhat different shape from the rivets 5. It is to be understood that the peculiar shaping of the enlarged rivet head might be varied to suit different situations, the only requirement of the shape of the enlarged rivet head being that it provide a surface which can be firmly gripped by the plastic surfacing material.

When a large surface, such as a railway car floor, is made in the form of a trussed plate structure a plurality of relatively small units are usually assembled to provide the large surface area. The connection between adjacent trussed plates must be strong and not project above the plane of the top surface of the floor, and yet be light in weight. The sides of adjoining trussed plates cannot, therefore, be merely crimped together and bolted to a floor support, since the depression thereby formed in the floor surface would be great and necessitate filling in with a large amount of relatively heavy surfacing material in order to provide a continuous floor surface. Also, the greater thickness of surfacing material over the joints would cause corrugating of the floor surface over the joints if the surfacing material used should have any appreciable coefficient of expansion or should shrink or expand after application.

One means of connecting adjacent trussed plates whereby the above objectionable conditions are overcome is illustrated in Fig. 6. In making this connection the upper sheet 1 of a

trussed plate is bent downwardly and outwardly to join with the other sheet 2 and form therewith a lug 15. The lower sheet 2 of the adjoining trussed plate is bent upwardly and outwardly so as to provide a lug 16 overlying the lug 15. The upper sheet 1 of the same trussed plate is bent downwardly and outwardly to provide a lug 17 overlying but spaced from the lug 16. A spacer member 18, which may take the form of a flattened continuous tube, is positioned between the spaced lugs with the flange or lug 17 projecting over and beyond the spacer member 18 to provide a ledge 19 which serves as an additional anchorage for plastic surfacing material. A floor support 20 is positioned with a flat portion 21 thereof abutting the under side of the joint between the trussed plate members. A bolt 22, or any other conventional fastening means, is passed through suitably aligned apertures in the several lugs, spacer member, and flat portion of the floor support member to rigidly clamp all of the said members together and thereby form a very strong and lightweight joint.

When the plastic surfacing material 12 is spread over the floor surface it will be forced under the ledge 19 so as to be firmly anchored to the trussed plate structure at the joint. By the use of a spacer member 18 the size of the depression between adjacent trussed plate members is greatly reduced. The amount of plastic surfacing material needed to fill this space is consequently greatly reduced and the plastic which is so used is firmly keyed in position by the ledge 19.

The spacer member 18 may consist of an ordinary U channel or any other structural form which might be desired.

The floor support 20 may take any convenient form, and has been illustrated as being substantially Z shaped in cross section merely because a floor support of this shape is the one most commonly used.

In the modification illustrated in Fig. 7 the depression between adjacent trussed plate members is still further reduced. The sheets 1 and 2 of each trussed plate member are crimped together at one side thereof to form a lug 23. The upper half of the lug 23, formed by the crimped portion of sheet 1 is extended beyond the lower portion to form a shoulder 24. The sheets 1 and 2 of the adjoining trussed plate are crimped together to form a lug 25 lapping the lug 23. A suitable floor support member 26 is positioned with a flat portion 27 thereof abutting the under side of the joint comprising lugs 23 and 25. A bolt or other fastening means 28 is passed through aligned apertures in the lugs 23, 25, and the flat portion 27 of the floor support to rigidly clamp these members together.

The ledge provided by the shoulder 24 serves as an anchor to aid in securing the surfacing material to the trussed plate structure.

The connection illustrated in Fig. 8 is similar to that shown in Fig. 7 in that the sheets are crimped to form lugs 23' and 25' with the shoulder 24' formed on the lug 23', but in this modification a spacer member 29 is positioned between the lugs and the flat portion 27' of the floor support 26'. A bolt 28' clamps the lugs, spacer member 29, and flat portion 27' together. The advantage obtained by this construction over that shown in Fig. 7 is the use of a much wider flat portion 27' on the floor support 26' so as to provide better support for the trussed plate structure.

The foregoing description is intended to be

illustrative and not limitative, since the invention may take other forms, and is to be limited only by the appended claims.

Having now described my invention, I claim:

1. A trussed plate structure, comprising a continuous rigid sheet formed with spaced integral depressions of substantial depth, a second sheet formed with corresponding depressions, rivets connecting the apices of adjoining depressions in the two sheets, said rivets being formed with flared and shouldered portions within the depressions of the first sheet to provide anchors, additional anchor members seated under the rivet heads and within the depressions of the first sheet, lips turned out from the walls of the depressions of the first sheet, and a cementitious surfacing material applied to the first sheet, extending into the depressions thereof, firmly gripping the anchor portions of the rivets and the additional anchor members, and projecting under said lips and into the openings in the depression walls from which the lips were turned.

2. A trussed plate structure, comprising pairs of rigid continuous sheets arranged side to side, means connecting the sheets within each pair, the adjacent portions along one side of each pair of sheets being clamped together to form a lug, the adjacent portions along the adjoining side of the next pair of sheets being directed toward each other to form two separated lugs, one of which contacts with the first mentioned lug and the other of which is distant therefrom, a spacer member positioned between the separated lugs, with the distant lug extending thereover to form a ledge to act as an anchorage for surfacing material, and a clamping means rigidly fastening the lugs and spacer member together.

3. A trussed plate structure, comprising pairs of rigid continuous sheets arranged side to side, each sheet being formed with spaced integral depressions, means connecting the apices of the depressions of the sheets within each pair and forming anchors for surfacing material, the adjacent portions along one side of each pair of sheets being clamped together to form a lug, the adjacent portions along the adjoining side of the next pair of sheets being directed toward each other to form two separated lugs, one of which contacts with the first mentioned lug and the other of which is distant therefrom, a spacer member positioned between the separated lugs, with the distant lug extending thereover to form a ledge to act as an additional anchorage for the surfacing material, a supporting member having a flat portion positioned beneath the said lugs, and clamping means rigidly fastening the lugs, spacer member, and supporting member together.

4. A trussed plate structure, comprising pairs of rigid continuous sheets arranged side to side, each sheet being formed with spaced integral depressions, rivets connecting the apices of the depressions of the sheets within each pair, said rivets being formed with enlarged and flared heads within the depressions of one sheet of each pair to provide anchors for surfacing material, the adjacent portions along one side of each pair of sheets being crimped together to form a lug, the adjacent portions along the adjoining side of the next pair of sheets being directed toward each other to form two separated lugs, one of which contacts with the first mentioned lug and the other of which is distant therefrom, a spacer member positioned between the separated lugs, with the distant lug extending thereover to form a ledge to act as an additional anchor, a support-

ing member having a flat portion positioned beneath the said lugs, means rigidly fastening the lugs, spaced member, and supporting member together, and a surfacing material applied over the pairs of sheets, extending into the depressions thereof and firmly gripping the anchor portions of the rivets and projecting under said ledge.

5. A trussed plate structure, comprising pairs of rigid continuous sheets arranged side to side, means connecting the sheets within each pair, the adjacent portions along one side of each pair of sheets being crimped together to form a shouldered lug positioned between the planes of the sheets of said pair, the adjacent portions along the adjoining side of the next pair of sheets being crimped together to form a lug lapping the first mentioned lug, a supporting member having a flat portion disposed beneath the said lugs, and fastening means for rigidly connecting the lugs and flat portion of the supporting member together.

6. A trussed plate structure, comprising pairs of rigid continuous sheets arranged side to side, means connecting the sheets within each pair, the adjacent portions along one side of each pair of sheets being crimped together to form a lug, the adjacent portions along the adjoining side of the next pair of sheets being crimped together to form a lug lapping the first mentioned lug, a spacing member disposed beneath the said lugs, a supporting member having a flat portion contacting with the main lower surface portion of the adjoining pairs of sheets and disposed beneath the spacer member, and fastening means rigidly connecting the lugs, spacer member, and flat portion of the supporting member together.

7. A trussed plate structure comprising pairs of spaced rigid sheets arranged side to side, means connecting the sheets within each pair, the adjacent portions along one side of each pair of sheets being crimped together to form a lug, the adjacent portions along the adjoining side of the next pair of sheets being directed toward each other to form two separated lugs, one of which contacts with the first-mentioned lug and the other of which is distant therefrom, a spacer member positioned between the separated lugs, and clamping means rigidly fastening the lugs and spacer member together.

8. A trussed plate structure comprising pairs of spaced rigid sheets arranged side to side, means connecting the sheets within each pair, the adjacent portions along one side of each pair of sheets being crimped together to form a lug, the adjacent portions along the adjoining side of the next pair of sheets being bent to form lapping members positioned between the planes of said sheets, a supporting member having a portion disposed beneath the lug and lapping members, and clamping means rigidly securing the lug and lapping members to the supporting structure.

9. A trussed plate structure comprising pairs of rigid continuous sheets arranged side to side, each sheet being formed with spaced integral depressions, means connecting the apices of the depressions of the sheets within each pair and forming anchors for surfacing material, the adjacent portions along one side of each pair of sheets being crimped together to form a lug, the adjacent portions along the adjoining side of the next pair of sheets being bent to form lapping members positioned between the planes of said sheets, the arrangement of said lugs and lapping members being such as to provide an anchor for surfacing material, a supporting member having

a flat portion disposed beneath the lug and lapping members, and clamping means rigidly securing the lug and lapping members to the supporting structure.

- 5 10. A trussed plate structure comprising pairs of spaced, rigid sheets arranged side to side, means connecting the sheets within each pair and including portions for anchoring surfacing material, and connections between adjacent pairs
10 of sheets, said connections including means for anchoring surfacing material.

11. A trussed plate structure comprising pairs of spaced, rigid sheets arranged side to side, each sheet being formed with spaced integral depressions, rivets connecting the apices of the sheets within each pair, said rivets being formed with enlarged and flaring heads within the depressions of one sheet of each pair to provide anchors for surfacing material, and connections between adjacent pairs of sheets, said connections including means for anchoring surfacing material.

EDWARD H. WELLS, JR.