

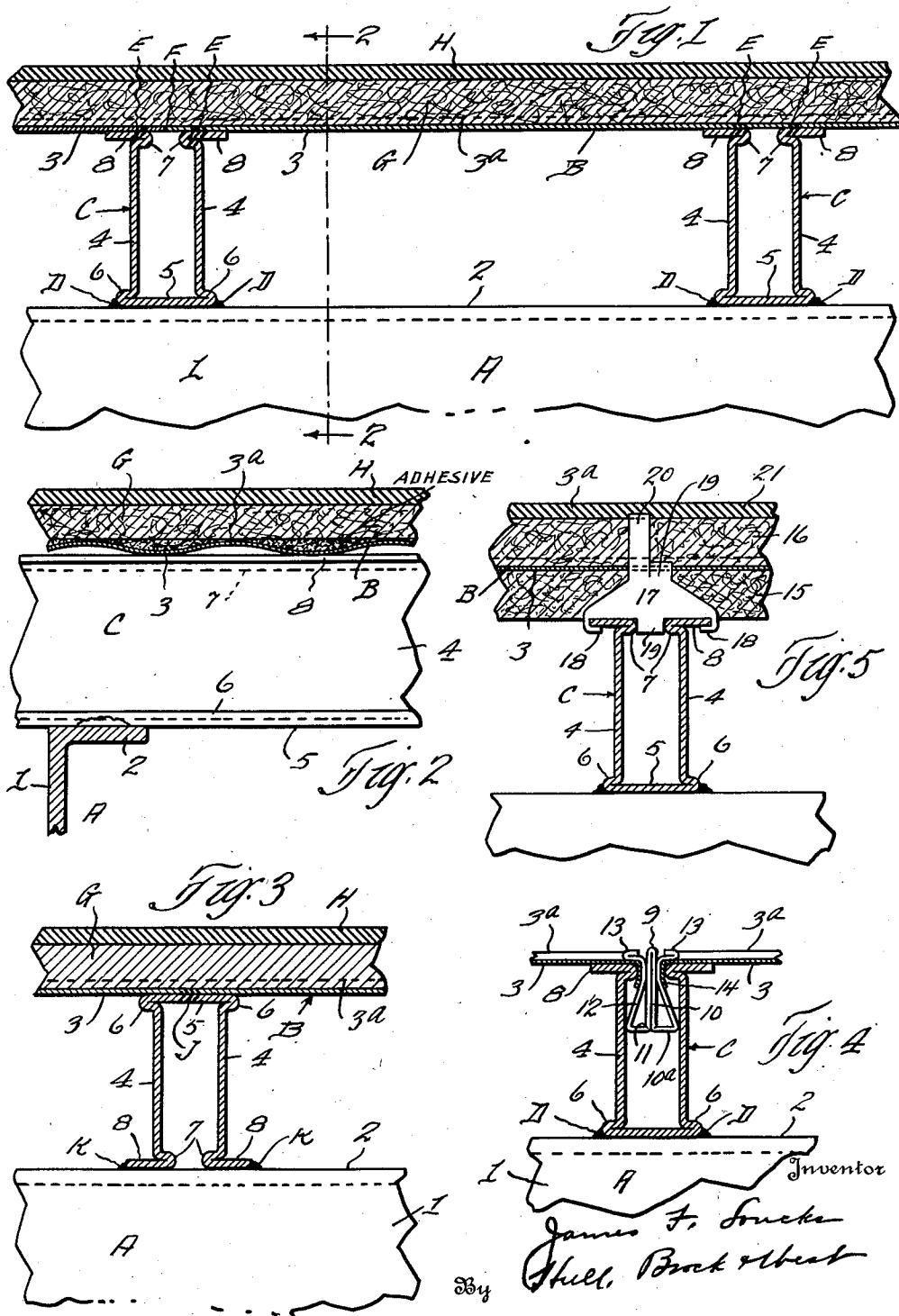
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SHEET METAL BUILDING CONSTRUCTION

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SHEET METAL BUILDING CONSTRUCTION

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This invention relates to building constructions and more particularly to roofs, decks or ceilings which employ a plurality of sheet metal units supported by hollow ribs on beams or purlins, the sheet metal foundation formed by assembling such units being provided with suitable weather-protecting and insulating material adhesively united thereto.

It is the general purpose and object of the invention to provide a cooperating construction and arrangement of such units and ribs which will enable them to be quickly and conveniently assembled "on the job". A further and more limited object of the invention is to provide for such sheet metal foundations a construction of sheet metal ribs which will enable the foundation and ribs to be welded together without weakening the ribs and thereby weakening the supports for the foundation.

I accomplish the foregoing objects in and through the construction and arrangement of parts shown in the drawing, wherein Fig. 1 represents a longitudinal sectional view through a part of a roof embodying my invention, a part of one of the beams or purlins being shown in elevation; Fig. 2 a detail in section corresponding to the line 2—2 of Fig. 1; Fig. 3 a detail in section showing a modified arrangement of the ribs employed in Fig. 1; Fig. 4 a detail in section showing a modification of the means for connecting the foundation to one of the ribs; and Fig. 5 a view similar to Figs. 3 and 4 and showing a further modification of my invention.

Referring first to Figs. 1 and 2, and describing the parts by reference characters, A denotes one of the supporting beams or purlins, the same being shown as comprising a vertical web 1 and an upper horizontally extending flange 2. B denotes the sheet metal foundation, which may be made up from any suitable number of units 3. This foundation is supported from the beams A by means of hollow ribs C, each preferably of the shape shown and comprising parallel vertical sides 4 connected to a base 5 by outwardly projecting bends 6. The upper end of each rib C is formed by bending inwardly upon itself the metal at the top of each side, to provide a pair of inwardly extending bends 7, the extreme ends of such sides forming outwardly extending horizontal flanges 8. The units 3 are provided each with shallow flattened corrugations 3^a.

With the parts constructed as described, the ribs C are secured upon the beams A at the desired distances apart, by welding the bends 6 to

the flanges 2, as shown at D. The sheet metal units are welded to the flanges 8 of the said ribs, as indicated at E. The welding referred to is preferably that known to the trade as "spot welding". In assembling the units B, it is preferable to break joints between adjacent units above the centers of the ribs C; I prefer to employ butt joints for this purpose, as indicated at F.

Due to the manner of forming the ribs C, I am enabled to use light-gauge sheet metal for such ribs and at the same time provide at the welding points a sufficient thickness of metal to prevent injurious burning of the metal of the ribs. It will be noted that a double thickness of metal is provided for the welds D and E.

The ribs having been applied to the purlins and the sheet metal foundation having been applied to the ribs in the manner indicated, the roof or deck may be completed by adhesively uniting to the upper surface of the foundation a coating G of fibrous insulating material, such as asbestos or felt, and this coating may in turn be protected by a coating H of asphalt or other adhesive agent.

In Fig. 3, I have shown an arrangement wherein the positions of the ribs C are merely reversed as compared with their positions in Fig. 1. In this view, the base 5 of each rib is presented upwardly and supports the sheet metal foundation, being welded thereto, as shown at J, while the flanges 8 bear on top of the flanges 2 of the beams A, being welded thereto, as indicated at K.

In Fig. 4 there is shown a further modification of my invention, wherein the ribs C are welded to the flanges 2 of the beams A in the same manner as shown in Fig. 1. However, instead of welding the sheets 3 to the flanges 8, I employ as a fastening means, special nails such as shown in Fig. 4.

Each of these nails comprises generally a central post 9 of doubled flat metal, the lower ends of the branches 10 of said post being united to continuations 10^a thereof by bending lines 11, the lower ends of the sides 10^a being in turn connected with upwardly extending sides 12 having doubled flanges 13 at their upper ends between which the post 9 extends.

In connecting the body portion of the sheet metal foundation to a rib, it is merely necessary to punch openings through such body portion at suitable intervals apart and registering with the central portion of the slot provided in the top of the rib between the parts 7. Then, by driving the posts 9 downwardly through such open-

ings, the tops of the post will be brought into approximately the plane of the flanges 13, and the nails will assume the form shown in Fig. 4, whereby the sheet will be anchored to the ribs.

5 Fig. 4 shows the positions which the edge portions of two adjacent units assume when the nail is driven into the top of a hollow rib and through the joint between such units. In this case, edges of adjacent units are flanged downwardly and the flanges 14 project into the slots between the rib flanges.

The construction shown in Fig. 4 and described in connection therewith can be used where it is desired to suspend a ceiling by fasteners from beams A.

15 In Fig. 5 there is shown a still further modification of my invention wherein the rib C is supported upon the beam A in the same manner as shown in Figs. 1, 3 and 4. In this case, however, a layer 15 of insulating material is applied directly on top of the flanges 8. To the top of the layer 15 the corrugated metal sheet 3, 3^a is applied, and an additional layer 16 of insulating material is applied to the top of said sheet. Where no special fastening means is employed between the ribs and the parts 15, 3, 3^a and 16, the layers of insulating material will preferably be attached to the sheet metal unit by means of an adhesive, such as asphalt. However, when the fastening device such as shown in Fig. 5 is employed, the adhesive material may be omitted. In this view, 20 17 denotes the body of one of such fastening devices, the device being preferably made of sheet metal and having a base adapted to rest on top of the flanges 8 and provided with hooks 18 adapted to engage slidably beneath the flanges 8, with a central tongue 19 projecting into the slot formed between the flanges thereby to prevent the closing of the slot by the application of the clips thereto. Each clip comprises, in addition to the base portion 17, a pair of prongs 19, 20, respectively, each having a pointed end, the prong 19 being of such length as to extend through the layer 15 and to be projected through the unit 3 and then bent down into engagement with the upper surface thereof. The prong 20 is of sufficient length to extend through the layer 16 and to be bent down into engagement with the top upper surface thereof. A coating of water-proofing material 21 may then be applied on top of the insulating layer 16.

It will be observed that, in all forms of my invention, the combined width of the flanges 8 is equal to the width of the base 5 of each rib, whereby the said flanges provide jointly a supporting area equal to that afforded by the base.

One of the great advantages of this invention resides in the fact that the ribs and sheet metal units may be carried in stock and may be applied "on the job". Furthermore, it enables me to provide ribs which can be made conveniently and cheaply of light sheet metal and to weld the ribs to the beams or purlins and the sheets to the ribs without injury to the ribs, owing to the double thickness of metal which is provided at the points where the welding is effected.

Still further, due to the fact that the sheets are formed with shallow corrugations, it is not necessary to anneal the sheets in order to provide them with such corrugations, as is necessary where the sheets are formed with integral hollow ribs. These corrugations so strengthen the sheets as to enable me to obtain the requisite degree of strength in the sheets with the employment of metal of materially lighter gage than

has heretofore been considered practical in constructions of the kind to which this invention relates. The downwardly extending corrugations constitute ribs by which the sheets are supported on a plurality of hollow ribs, such as the ribs C; and, due to the additional strength which these corrugations impart to the sheets, the ribs C may be spaced further apart than is the case in usual practice—the net effect being a material reduction in the weight of steel employed for a given installation with a corresponding reduction in the cost of the same. The downwardly extending corrugations also provide shallow troughs which serve to retain the asphalt or other adhesive medium which is employed to unite the cover G with the deck and also to prevent such adhesive medium from drying out and deteriorating, with a consequent prolongation of the life of the bond between the insulating material and the deck and therefore of the entire deck itself. In practice, I have found that good results are obtained by employing 24-gage unannealed steel for the deck and providing the same with corrugations from one-eighth to three-sixteenths of an inch in depth.

Having thus described my invention, what I claim is:

1. A construction of the character described comprising a sheet metal foundation, beams for supporting such foundation, hollow sheet metal ribs interposed between the said beams and foundation, each rib being provided at the top and bottom thereof with flanged projections of doubled metal and being welded through such projections to the said beams and foundation.

2. A construction of the character described comprising a sheet metal foundation, beams for supporting such foundation, hollow sheet metal ribs interposed between the said beams and foundation, each rib having a bottom united to its sides by outwardly extending flanges of doubled metal and each rib also having outwardly extending flanges at the top thereof united to their respective sides by inwardly extending portions of doubled metal, the ribs, beams and foundation being united by spot welding to said outwardly extending flanges.

3. A construction of the character described comprising a sheet metal foundation, beams for supporting such foundation, hollow sheet metal ribs interposed between the said beams and foundation, each rib having a bottom united to its sides by outwardly extending flanges of doubled metal and each rib also having flanges at the top thereof each united to the body of its side by a thickness of doubled metal, the ribs, beams, and foundation being united by spot welding to said flanges.

4. A construction of the character described comprising a sheet metal foundation, beams for supporting such foundation, hollow sheet metal ribs interposed between the said beams and foundation, each rib having a bottom united to its sides by outwardly extending flanges of doubled metal, the top of each side being bent upon itself to form a flange of doubled metal, and means for securing the ribs to the beams and the sheet metal foundation to the said ribs.

5. A construction of the character described comprising a sheet metal foundation, beams for supporting such foundation, hollow sheet metal ribs interposed between the said beams and foundation, each rib having a bottom united to its sides by outwardly extending flanges of doubled metal, the top of each side being bent upon itself

to form a flange of doubled metal, the ribs being secured to the beams by welding the flanges at the bottoms of the ribs to said beams, and means cooperating with the flanges at the tops of said ribs for securing the foundation thereto.

6. A construction of the character described comprising a sheet metal foundation, beams for supporting such foundation, hollow sheet metal ribs interposed between the said beams and foundation, each rib having a bottom united to its sides by outwardly extending flanges of doubled metal, the top of each side being bent upon itself to form a flange of doubled metal with a slot between such flanges, fastening devices extending through the sheet metal foundation and into the slots in the tops of said ribs for anchoring the foundation thereto, and means cooperating with the bottom flanges of the ribs for securing the latter to said beams.

7. In a building construction of the character described comprising a sheet metal foundation and beams for supporting such foundation, a hollow sheet metal rib adapted to be interposed between the foundation and beams, said rib being provided at the top and bottom thereof with flanged projections of doubled metal whereby it may be secured to the said beams and foundation.

8. In a building construction of the character described comprising a sheet metal foundation and beams for supporting such foundation, a hollow sheet metal rib adapted to be interposed between the said foundation and beams, said rib having a bottom united to its sides by outwardly extending flanges of doubled metal and also having outwardly extending flanges at the top thereof united to their respective sides by inwardly extending portions of doubled metal, whereby the rib may be united to said foundation and beams by spot welding applied to said flanges.

9. A device of the class described comprising a substantially I shaped sheet metal beam including vertical parallel side walls having portions thereof arranged in close proximity to frictionally engage and grip the sides of a fastening driven in between said portions, and means secured to the beam for retaining said closely arranged portions in predetermined spaced relationship.

10. A device of the class described comprising a sheet metal foundation, a substantially I shaped sheet metal beam including vertical parallel side walls having portions thereof arranged in close proximity and welded at intervals to said foundation to frictionally engage and grip the sides of a fastening driven in between said portions.

11. A device of the class described, comprising a hollow sheet metal beam having an elongated slot, sheet material disposed upon said beam, a fastening element supported by the beam across said slot and engaging said sheet material, said fastening element having a projection snugly received in the slot, and said element having deformable arms to stress the margins of the slot into engagement with said projection thereby securely attaching the fastener to the beam without deforming the latter.

12. A device of the class described comprising a hollow sheet metal beam formed from a flat strip formed into substantially rectangular cross section with reversely folded portions of its sides directed inwardly toward each other to define an elongated slot for the anchorage of fastening elements.

13. A device of the class described comprising

a hollow sheet metal beam formed from a single flat strip formed into substantially rectangular cross section with portions of the parallel sides of the beam bent transversely thereof to form a unitary double section extending inwardly of the hollow beam.

14. A device of the class described comprising a hollow sheet metal beam formed from a single flat strip formed into substantially rectangular cross section with portions of the parallel sides of the beam folded upon itself with the free longitudinal margins extending outwardly of the beam in opposite directions and in a given plane.

15. A device of the class described comprising a sheet metal foundation, a beam formed from a single elongated blank of sheet metal formed into hollow form with parallel side walls and the free margins of the side walls directed outwardly in a given plane to constitute the base of the beam for anchoring said free margins, and the top of said beam being secured to said foundation.

16. A device of the class described comprising a sheet metal foundation and a hollow sheet metal beam provided at one of its supporting surfaces with a folded metal reinforce welded to said foundation.

17. A device of the class described comprising a sheet metal foundation, and a hollow sheet metal beam having a supporting portion folded back upon itself to provide a double thickness of metal, secured at such double thickness to said foundation.

18. A device of the class described comprising a sheet metal foundation, and a sheet metal beam provided with an angular extension, the metal at the juncture of the extension and the body being folded back upon itself to provide a thickened portion and welded to said foundation.

19. A device of the class described comprising a strip of sheet metal bent along longitudinal lines to provide a hollow beam substantially rectangular in cross section, and having substantially parallel side walls, one pair of longitudinal corners of the beam being bent to extend outwardly of the side walls, and the other pair of corners being bent inwardly of the side walls.

20. A device of the class described comprising a strip of sheet metal bent along longitudinal lines to provide a hollow beam substantially rectangular in cross section, and having substantially parallel side walls, the longitudinal corners of the beam being folded upon themselves to extend inwardly and then outwardly of the side walls.

21. A device of the class described comprising a strip of sheet metal bent along longitudinal lines to provide a hollow beam substantially rectangular in cross section, and having substantially parallel side walls, the top and bottom of the side walls having laterally extending flanges projecting outwardly thereof.

22. A device of the class described comprising a strip of sheet metal bent along longitudinal lines to provide a hollow beam substantially rectangular in cross section, and having substantially parallel side walls, the metal strip at the juncture of the side walls with the top and bottom of the beam being folded back upon itself.

23. In a building construction, a plurality of hollow sheet metal ribs, slabs of insulating material supported upon said ribs, metallic sheet material supported upon said slab, and fasteners extending through said slabs and secured to said ribs and the metallic sheet material.

24. A construction of the character described, comprising a corrugated sheet metal foundation, beams for supporting said foundation, and hollow sheet metal ribs interposed between said beams and foundation and extending at right angles to the corrugations in said foundation, each rib being provided at the top and bottom thereof with flange projections of doubled metal and being welded through such projections to the said beams and foundations.
25. A construction of the character described, comprising a plurality of hollow sheet metal ribs, a corrugated metal sheet extending across a plurality of said ribs and secured thereto, adhesive waterproofing material substantially filling said corrugations and extending thereabove and across for the full width and length of said sheet, and a covering of insulating material adhered to said material.

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