Sept. 5, 1933. J. H. MAAG 1,925,331

BUILDING CONSTRUCTION

Filed Feb. 11, 1931

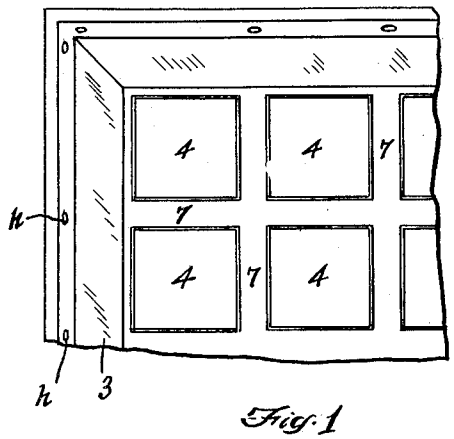

Fig. 1

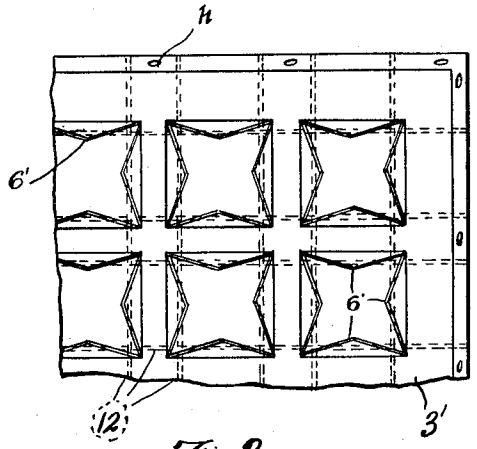

Fig. 2

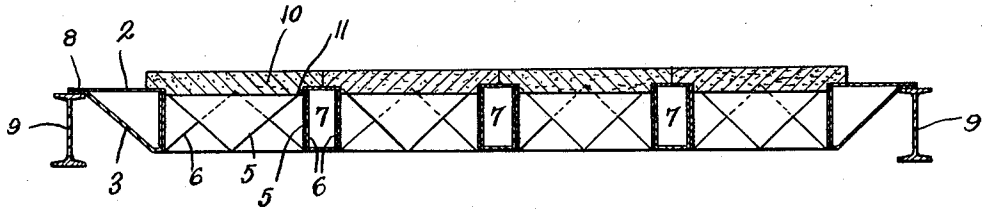

Fig. 3

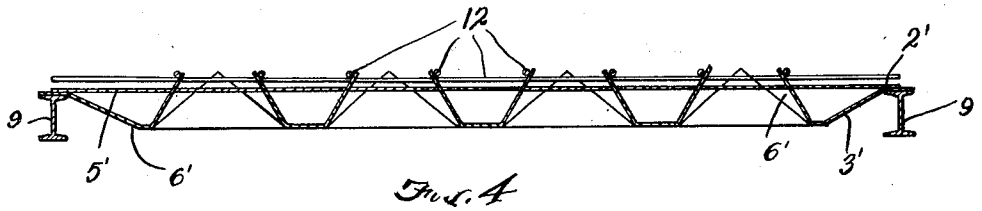

Fig. 4

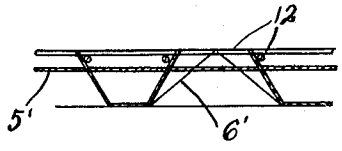

Fig. 5

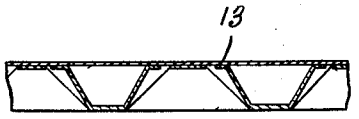

Fig. 6

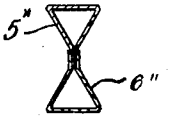

Fig. 7

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BUILDING CONSTRUCTION

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8 Claims. (Cl. 72—70)

This invention relates to building structures, and more particularly structures involving sheet-metal; and it is among the objects of the invention to provide a construction itself comparatively light, yet capable of carrying great loads. Another object of the invention is the provision of unit sections adaptable to factory-production and requiring a minimum of work in the field. A further object is the provision of a structure making possible tension-portions of sheet metal and compression-portions of concrete or the like. Other objects and advantages will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described, and particularly pointed out in the claims, the following description and the annexed drawing setting forth in detail certain structures embodying the invention, these being illustrative, however, of but a few of the various ways in which the principle of the invention may be applied.

In said annexed drawing:—

Fig. 1 is a fragmentary under plan view of an embodiment of the invention; Fig. 2 is a similar view of another form; Fig. 3 is a transverse sectional view of the construction shown in Fig. 1; Fig. 4 is a similar view of the construction shown in Fig. 2; Fig. 5 is a fragmentary transverse section showing the relation of concrete thereto; and Figs. 6 and 7 are sectional views of other modifications.

In its general aspects, the invention contemplates a building structure, adaptable preferably to unit-type production, and involving spaced sheet-metal plates, one or both of which have openings and in-bent tongue portions for connection to the other member, such structures being sufficiently rugged to be applicable as floor panels, or roof panels, or wall panels, in accordance with particular requirements. Concrete-reinforcing rods may also be associated, as desired.

Sheet-metal plates 2, 3, of suitably heavy gauge, and of over-all dimensions in accordance with the particular size-requirements to be met, are stamped or otherwise provided with openings 4, tongue-projections 5, 6, respectively, being in-turned toward the other sheet, the sheets being suitably spaced apart. As an example, for a unit-section for I-beam centering on lines customarily occurring, an over-all dimension of 8 feet 4 inches is convenient, and the section may be rectangular, preferably square, to such dimension. Metal of a gauge, for instance, of 18—14 may be employed, heavier metal being applied where particular weight-loads are to be encountered, and carrying the illustration further, the openings 4 may be on the order of 1 foot 4 inches square. With the upper tongues 5 turned down, and the tongues 6 of the lower plate 3 turned up, lapping where opposite, and secured together by desired means, for instance welding at one or more points, beam-like portions 7 are had, each formed by the over-lapping tongues 5, 6, and affording dimensions as may be desired, for instance carrying out the illustration, 4 inches in width by 8 inches in depth. About the periphery the lower plate 3 may be joined to the upper plate 2, being bent up and brought into union at the edge 8, and such edge may then in turn be secured to the I-beams 9 in any suitable manner, for instance by welding through holes *h* provided for such purpose. The unit section, thus of latticed box-like character having beam portions 7 extending in both directions, forms a closely-knit structure braced within itself, and securely attachable to the building framing. The openings 4 may now be closed above in any desired manner. Preferably, cast concrete slabs 10, each having a positioning shoulder 11, and fitted together at the mid-line of the beam-portion 7, may be employed as the upper finishing portion for such construction. Such flooring may be completed peripherally by suitable blocks of cast concrete or the like, as desired. A compression-portion of concrete may thus be had while the tension-portion of the structure is of metal. Beneath, or at the ceiling below, any suitable closure and finish may be applied, for instance metal lathing, and plaster.

Instead of cutting fenestrations in the upper plate, it is desirable in some cases to maintain such plate in substantially continuous expanse, and confine the cutting to the lower plate, as indicated in Figs. 2 and 4. In this, the upper plate 2′ is substantially unbroken, and the lower plate 3′ is cut with fenestrations, and tongues 6′ bent up, and as shown in Fig. 4, extending through slots in the upper plate to free terminals thereabove. Suitable attachment may be had, as for instance by spot-welding. Concrete reinforcing-rods 12 may be applied both ways, crossing one another, and aligning with the respective upstanding tongues, and attachment may be had thereto by suitable means, for instance welding. In this manner, the reinforcing rods are securely tied to the plates, and in a spaced position well adapted to receive the enveloping concrete, the closed upper plate forming an excellent receiv-

ing deck therefor. As in the case above-mentioned, the metallic unit structure may also be anchored to the I-beams 9 in any suitable manner, as by welds through holes *h* provided for such purpose. The ceiling finish underneath may be of any desired character, conveniently for instance, metal lath, and plaster.

Instead of projecting the lower plate-tongues up through the upper plate, in some instances it is preferable to turn these under against such plate, as indicated at 13, Fig. 6, and attachment may be had in any suitable manner, for instance welding. Such construction is particularly advantageous in many instances of roof-requirements.

While ordinarily a rectangular-section is most desirable for the beam-portions 7 of units, in some cases I prefer to further bend the component side walls of such portions, as indicated in Fig. 7, the tongues 5'' and 6'' being then brought together at a central zone, lapping to such extent as desired, and being secured together by suitable means, conveniently, for instance, welding.

As thus readily seen, structures of a light character, yet capable of sustaining great weights, may be had, and adaptable to various positions, whether in floors, roofs, or walls, the proportioning of cut-outs and securing-tongues being capable of such ranges as circumstances may dictate desirable. Besides, concrete or like material is most feasibly applicable in association or finish relation, affording utilities of metal-strength, although with lightness, and concrete or like ruggedness.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the means stated in any of the following claims, or the equivalent of such, be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. A building structure, which comprises a compression-portion including a sheet-metal member, and a sheet-metal tension-portion having tongues fastened in openings in said member.

2. A building structure, which comprises spaced sheet-metal plates, one at least of which has openings and tongues extending through the other plate, and concrete reinforcing rods attached to such tongues.

3. A building structure, which comprises spaced sheet-metal plates, each plate having aligned openings and tongues bent in the tongues of each plate being connected respectively with the other plate.

4. A building structure, which comprises spaced sheet-metal plates, each plate having aligned openings and tongues cut therefrom bent in, the tongues of one plate being connected to the tongues of the other plate in the space between the plates.

5. A building structure, which comprises spaced sheet-metal plates, each plate having aligned openings and tongues projecting in, the tongues of one plate being connected to the tongues of the other plate in the space between the plates, and a concrete floor portion covering such openings.

6. A building structure, which comprises spaced sheet-metal plates, each plate having aligned openings and tongues projecting inwardly, and pre-formed concrete slabs positioned over such openings, the tongues of one sheet lapping with and being joined to those of the adjacent sheet.

7. A building structure, which comprises spaced sheet-metal plates, each plate having openings and tongues projecting inwardly, the tongues of one sheet lapping with and being joined to those of the adjacent sheet, forming beam-like portions, and shouldered pre-formed concrete blocks positioned over the openings between such beam-like portions.

8. A building structure, which comprises a sheet-metal tension-portion and a compression-portion of assembled pre-formed blocks of mineral material, and hollow air-cell insulation between such tension-portion and compression-portion formed by openings and inturned portions in the sheet-metal.

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