Feb. 25, 1936. A. F. BEMIS 2,031,631

BUILDING CONSTRUCTION

Filed March 23, 1933 4 Sheets-Sheet 1

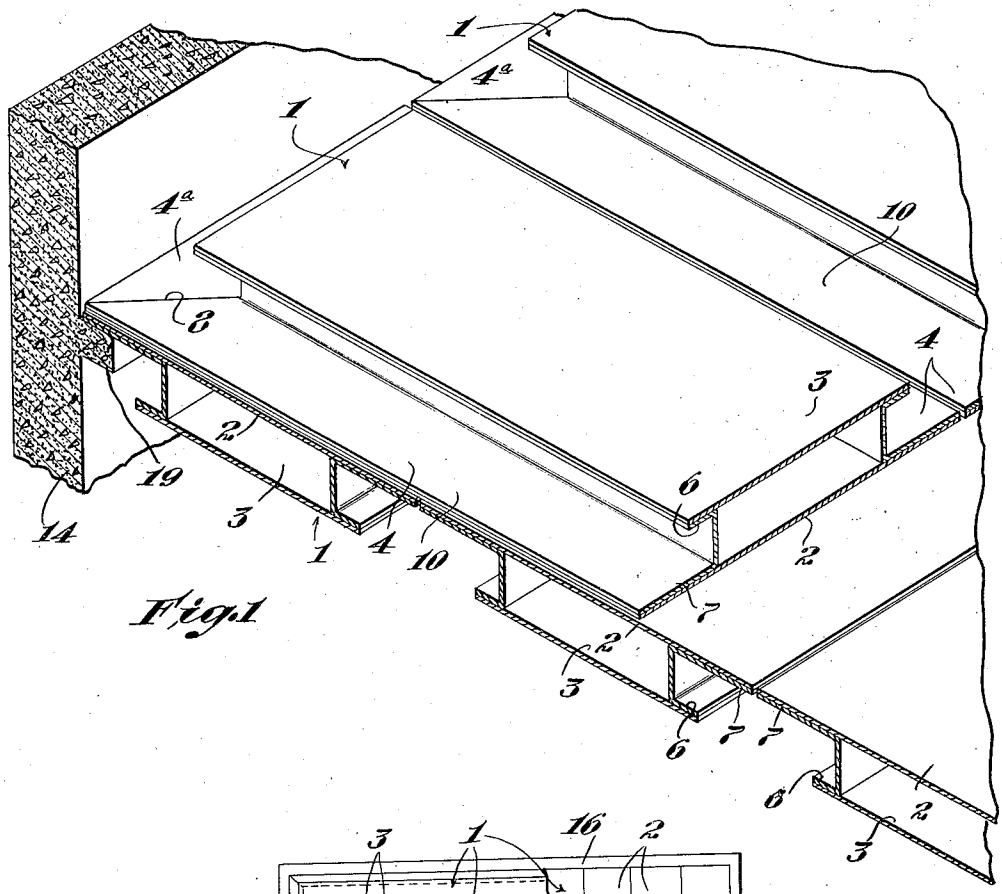


Fig. 1

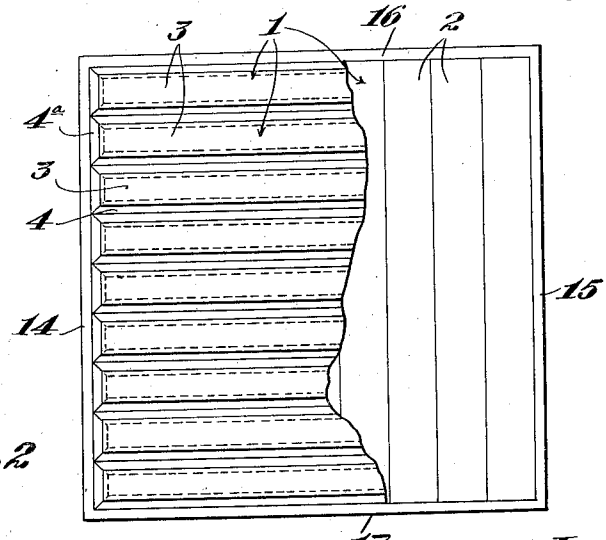


Fig. 2

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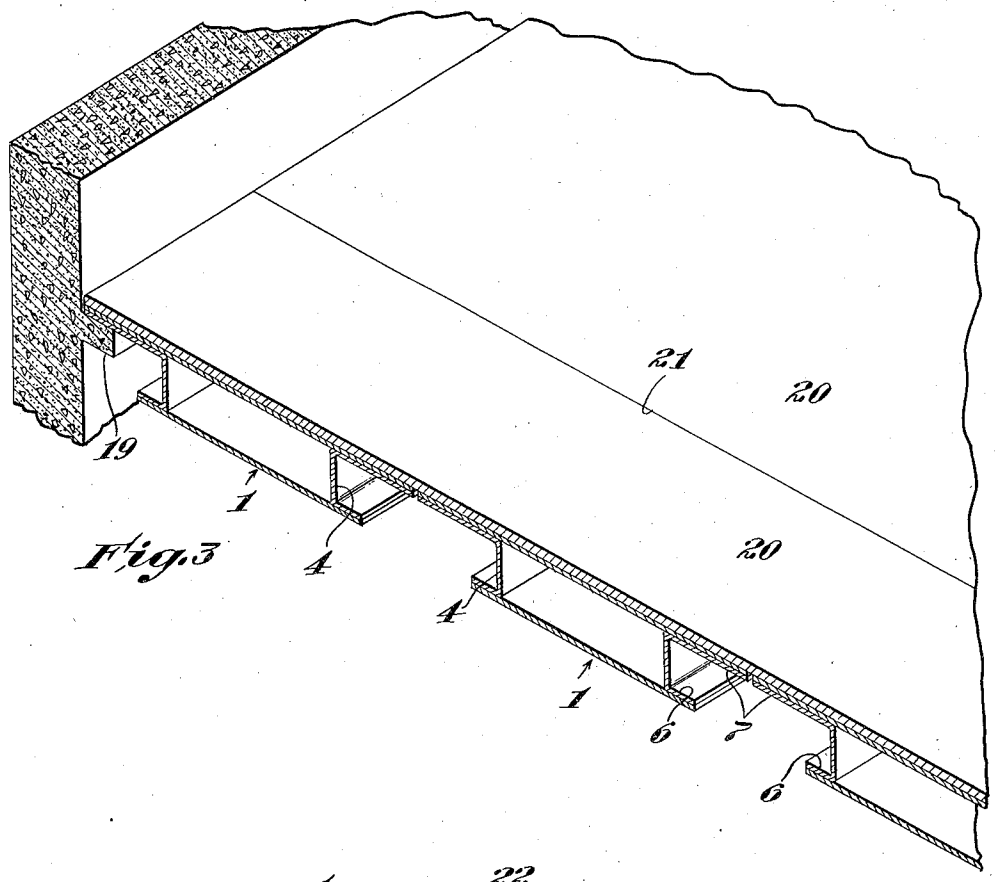


Fig. 3

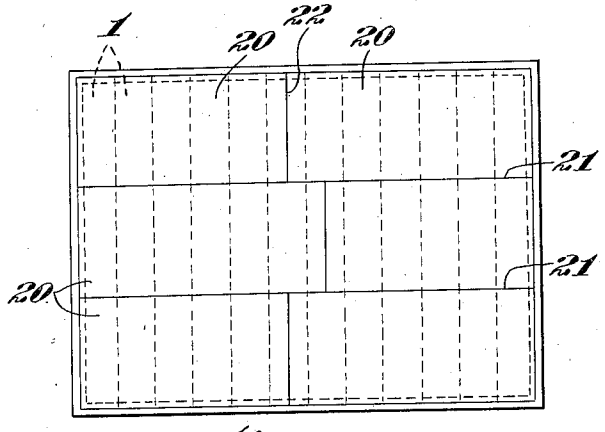


Fig. 4

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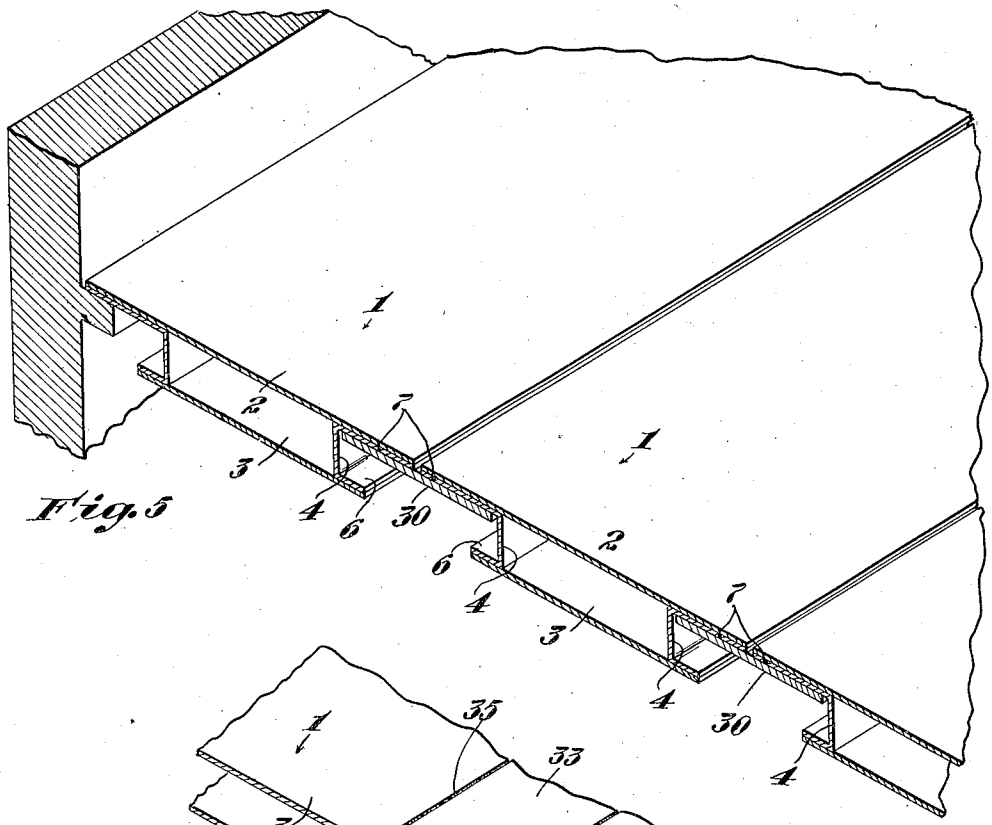


Fig. 5

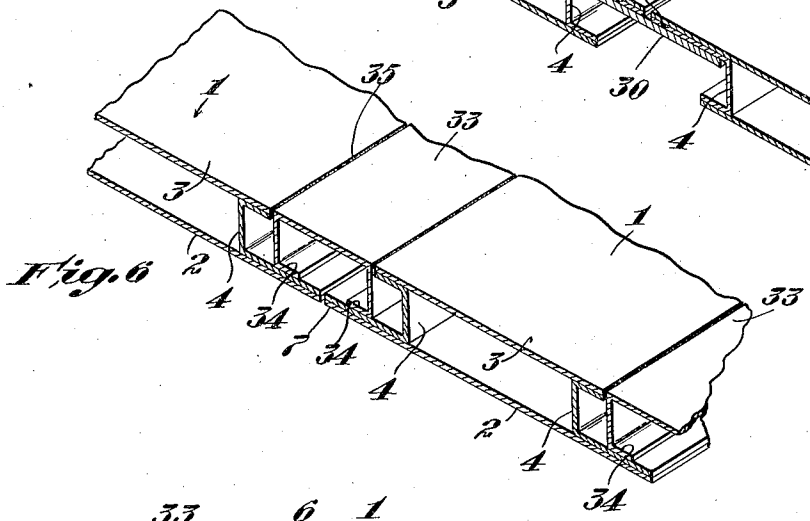


Fig. 6

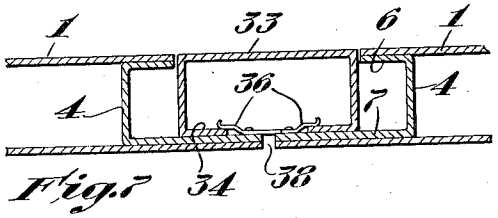


Fig. 7

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BUILDING CONSTRUCTION

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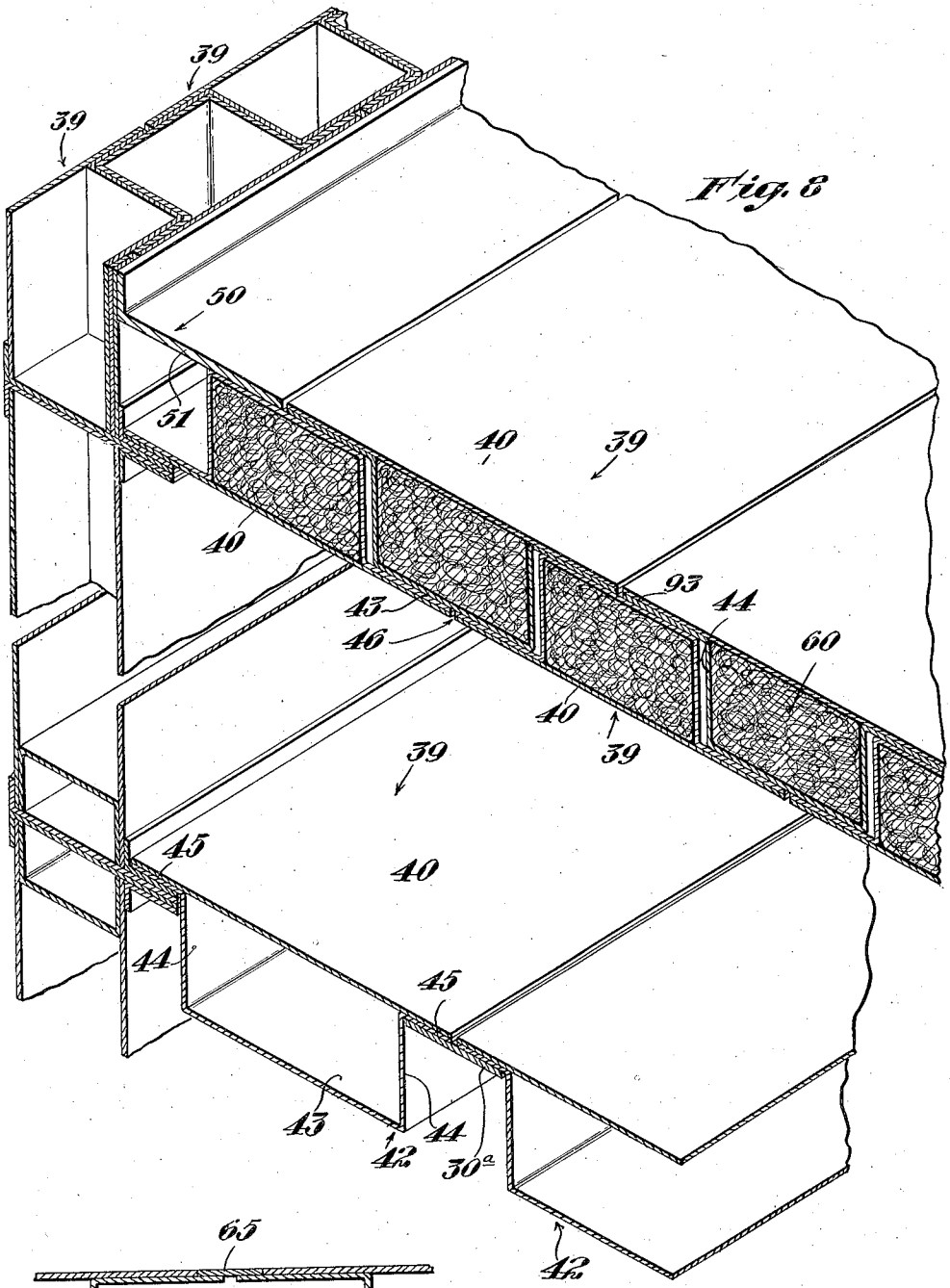


Fig. 8

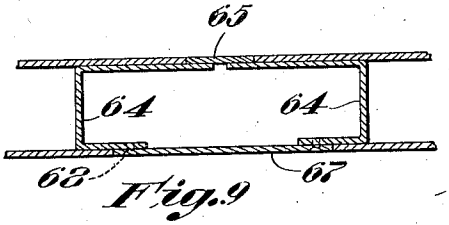


Fig. 9

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Patented Feb. 25. 1936 2,031,631

UNITED STATES PATENT OFFICE

2,031,631

BUILDING CONSTRUCTION

Albert F. Bemis, Newton, Mass., assignor to Bemis Industries, Incorporated, Boston, Mass., a corporation of Delaware

Application March 23, 1933, Serial No. 662,275

8 Claims. (Cl. 189—34)

This invention relates to improvements in building construction, and particularly the construction of walls, especially walls of the horizontal type providing floors and ceilings.

This application is a continuation in part of my copending application Serial No. 553,033, filed July 25, 1931, which issued May 8, 1934 as Patent No. 1,958,124.

In accordance with this invention, units of generally box-like form but having outstanding perimetric flanges may be employed in various ways to afford a floor construction. Units of this type may be manufactured of various materials, but sheet metal is particularly suitable for the face sheets, and the edges of these sheets may ordinarily be connected by channels which have their bight portions spaced inwardly from the margins of the face sheets and their legs extending outwardly substantially to the edges of the sheets, thus cooperating with the margins of the sheets in affording the flanges of the units. Units of this character are particularly advantageous in affording a relatively high degree of stiffness or rigidity, even with a comparatively low weight of material employed.

Various arrangements of the units may be made to suit different wall or floor requirements, the channels in effect affording beams which are reinforced and braced by the face sheets and aid the stiffness and strength of the floor assembly. In certain cases it is desirable to accord reinforcing elements for the units. Thus in certain embodiments of the invention such elements may be in the form of flat sheets of metal which are welded to the upper face sheets of the unit. In certain other embodiments of the invention, particularly when a relatively large room having a length and width ratio of substantially 1:1½ or less is to receive a floor, it may be desirable to have the units span the distance between both pairs of opposite walls, in other words, have the units disposed in two layers extending transversely of each other and suitably secured together. In other embodiments of the invention various other bracing and reinforcing arrangements may be provided.

The units arranged in the manner described have channeled marginal portions or marginal recesses in juxtaposition, thus to provide passageways or ducts in the floor which conveniently may receive various conduits or pipes, as for lighting or heating purposes; or in certain embodiments of the invention, the ducts provided by the units themselves may be employed for circulating hot air or for ventilating purposes or the like.

In the accompanying drawings:

Fig. 1 is an isometric view of a portion of a floor assembly constructed of my improved units arranged in two superposed layers with the units in the respective layers extending transversely of each other;

Fig. 2 is a plan view of such a floor assembly with a portion of the upper layer of units broken away;

Fig. 3 is an isometric view of an optional flooring arrangement, wherein a single set of units may be combined with a series of reinforcing plates secured to their upper surfaces;

Fig. 4 is a top plan view of such an assembly;

Fig. 5 is an isometric view of another floor assembly having the margins of its units connected to each other by suitable splicing plates;

Fig. 6 is an isometric detail of an optional jointing arrangement employed between floor units;

Fig. 7 is a sectional detail showing another jointing arrangement;

Fig. 8 is a broken isometric view of a portion of a building assembly, including my improved units in both vertical and horizontal walls and showing optional forms and arrangements of units; and

Fig. 9 is a transverse section of another arrangement of the units, and particularly of a jointing arrangement employed between longitudinal edges of the units.

First, referring to Fig. 1, typical units employed in accordance with this invention are designated by the numeral 1 and may comprise opposite face sheets 2 and 3 which are substantially rectangular, the former having a greater longitudinal and lateral extent than the sheet 3. Between the margins of the sheets 2 and 3 are disposed longitudinal channels 4 and end channels 4a, these channels each being of such a cross section as to have legs of unequal width, the narrower leg 6 of each of these channels being disposed in engagement with the margin of a smaller face sheet 3 and the larger leg 7 being similarly disposed in engagement with the margin of a larger face sheet 2. At the corners of the units, the channels 4 and 4a may be provided with juxtaposed beveled edges, designated by numeral 8, these edges being connected to each other and to the face sheets by welding. The legs 6 and 7 of the channels may be similarly connected to the face sheets, or, if desired, other connecting means such as rivets may be employed. A unit

of this type may be formed of comparatively thin gauge metal. In certain cases it may be desirable to make the channels 4 and 4a of somewhat thicker stock than the face sheets. In any case, a unit constructed in this manner may be relatively stiff, although light in weight.

Units of this character may be arranged in various ways to afford a floor assembly, a typical arrangement being illustrated in Fig. 1 wherein the units 1 are arranged in two superposed layers with their wider marginal flanges provided by the larger face sheets 2 and the larger channel legs 7 arranged in direct superposed relation and preferably secured to each other at intervals by welding. The arrangement of the smaller face sheets affords access to the wider margins at points of crossing so that welds may be made at certain intervals as, for instance, the areas designated by numeral 10 (Fig. 1). Furthermore, the arrangement of the margins of the units affords suitable passages or channels in the floor and ceiling, these passages extending transversely to each other, thus affording a large number of uniformly distributed spaces for the introduction of service conduits for electric wiring, gas pipes, water or steam pipes or the like, as desired, or these passages may receive reinforcing material such as concrete.

Obviously the face sheets 3 of the upper units may be covered by any suitable flooring sheets or strips, while any suitable decorative material may be applied to the corresponding face sheets of the lower units.

An arrangement of the character illustrated in Fig. 1 affords an unusually stiff wall which has little tendency to flex and vibrate under shocks. Such a wall or flooring assembly is particularly advantageous where a substantially large room of dimensions approaching a square may require a floor. Such a room, for example, is shown in Fig. 2, it being evident that the upper set of units spans the distance between one pair of parallel walls 14 and 15 and that the other set of units spans the distance between the other pair of walls 16 and 17, the channels of the units, in effect, affording beams which extend across the room in transverse relation to each other and which, being connected at intervals, afford an unusually strong grid-like structure, which in turn is reinforced by the individual face sheets of the units. The ends of the units may, if desired, be firmly secured to all four walls of the room, thus in effect affording a single integral floor unit or slab secured to all walls to provide an especially firm and strong assembly.

The ends of the units may be mounted on the wall structure in any suitable manner. As shown in Fig. 1, the wall 14 may be provided with a ledge 19 upon which the ends of the units may rest and to which they may be connected by suitable bolts, rivets, welding or the like, if desired.

Fig. 3 illustrates an arrangement which may be conveniently employed with but a single layer of units 1 of the same type and general shape as illustrated in Fig. 1. This arrangement is particularly suitable with a rectangular room having a width substantially less than its length. With such a room the units ordinarily will be arranged so that their longitudinal channels span the room in the direction of its shortest dimension, as indicated in dotted lines in Fig. 4. The ends of the units and the edges of the outer units may be connected to or mounted upon the adjoining walls in the same manner as illustrated in Fig. 1.

Above this single layer of units, I may conveniently employ a plurality of cover plates or sheets 20. These sheets may afford seams extending transversely of the units, i. e., longitudinally of the room, as indicated by numeral 21. The arrangement of the channels 4 with their shorter legs 6 disposed on the lower side of the assembly permits access to the surfaces of the larger legs 7 of the channel and consequent welding to the reinforcing plates 20. Furthermore, these plates may afford covering sheets to permit the floor to have a relatively smooth continuous surface. In many cases it may be desirable to have the sheets terminate intermediate the length of the room, as designated by numeral 22 in Fig. 4. In such cases the edge portions or seams 22 may be disposed intermediate the marginal portions of one of the units 1 and the seam portions of adjoining courses may be staggered in relation to each other, as shown. Thus the maximum strength may be provided in a floor of this type.

Fig. 5 illustrates a further development of the invention wherein the units 1 are disposed in the same general manner as illustrated in Fig. 3, but splicing or reinforcing plates 30 are disposed beneath the wider longitudinal flanges of the units, i. e., in engagement with the flanges 7 of channels 4. Obviously the narrower flanges 6 are spaced from each other to afford access to the plates 30 and permit the ready welding of the same in place. Thus the plates or sheet 2 at the upper surface of the floor are integrally connected by the plates 30.

Various jointing arrangements may be employed between the marginal portions of the units, and they may be located with either their wider or their narrower marginal flanges uppermost. As shown in Fig. 6, for example, the wider flanges provided by the wide legs 7 of the channels 4 are disposed at the lower part of the horizontal wall, and filler channels 33 may be inserted between the edges of the narrow marginal channels at the upper surfaces of the units. Preferably the opposite sides of each channel 33 are provided with inturned flanges 34 which rest on the flanges 7. Welding 35 may be employed between the edges of the upper faces of the units and the upper edges of the filler channels to afford an integral structure, if desired.

In certain cases, as illustrated in Fig. 7, it may be desirable to employ a general arrangement of the character just described but with the channels 33 removably mounted. For this purpose turn-buttons 36 may be pivotally mounted on the edges of the wider marginal flanges of the units 1 and may be capable of being turned to a position where they extend over the flanges 34 properly to hold a jointing channel 33 in position. Preferably the edges of the wider flanges of the units are spaced to provide a longitudinal slot 38 through which a tool may be inserted to engage the ends of successive turn buttons 36, thus permitting the release of the channel 33 so it may be lifted out of its positon to afford access to the space between the units.

Fig. 8 illustrates a further development wherein units of a somewhat different shape may be employed, such units comprising one face sheet 40 of rectangular shape and a box-like portion 42 providing a spaced rectangular portion or face sheet portion 43 with upturned walls 44 having outturned flanges 45 welded or otherwise secured to the margins of the sheet 40. Thus box-like units are afforded with but a single perimetric flange. These flange portions of the units may be con-

nected to each other in any suitable manner, as by splicing plates 30a.

As shown in the upper floor of Fig. 8, units 39 of the type described may be arranged in interfitting relation with each other, particularly if the flanges thereof are made of suitable width, to provide a relatively rigid, strong structure. Thus one unit may be arranged with its face sheet 40 above the remainder of the unit, i. e., defining the upper face of the horizontal wall or floor, and at either side of this unit there may be similar units 39 with their larger face sheets 40 disposed in such a manner as to define the ceiling surface, the wide flanges of the last-named units being disposed under and secured to the intermediate portion of the smaller face sheet 43 of the first unit by welding, as designated by numeral 46. Similarly the flanges of the first-named unit 39 and similarly disposed units may be secured to the face sheet portions 43 of the inverted units 39. Thus a floor assembly is provided with alternately inverted units, the units each providing flange portions overlapping and secured to the smaller face sheets of adjoining units. At the edge of the floor angles 50 secured to the wall assembly may be provided relatively wide horizontal flanges 51 overlapping the smaller face sheet 43 of an adjoining inverted unit. As shown in Fig. 8, the vertical wall assembly may be formed of units 39 arranged in the same manner as just described.

If desired, any of the units which have been so far described may have their hollow central portions filled with any suitable insulating or filling substance; for example, a light block of felted vegetable or wood fibers has been found particularly satisfactory for this purpose, a block of this character being particularly disclosed in Frobisher Patent No. 1,861,849. The surfaces of the filler block may be secured by any suitable cement, such as sodium silicate, to the faces of the unit before the margins of the face sheets thereof are secured in place. Thus, as shown in Fig. 8, blocks 60 of such material may be disposed within the units. Material of this character may have considerable heat insulating and sound deadening value when employed within the units, and at the same time, although the material of the filler itself may not have any high structural strength, the bonding of the same to the face sheets adds substantially to the strength and ability of the units to resist major stresses as well as localized surface distortion.

Fig. 9 illustrates an optional joint arrangement which may be employed with units of the general character described, these units, however, being characterized by marginal channels 64 having smaller and larger legs extending outwardly beyond the edges of the face sheets to afford shallow rabbets. The rabbets along the edges of the wider flanges of these units are juxtaposed substantially to provide grooves. In such as groove upon the upper face of a floor assembly, a splicing strip 65 may be inserted and secured in place by welding, if desired, while a cover plate 67 may have its margins secured in the spaced rabbets of the lower flanges, being secured in place by detachable fastenings 69 such as screws, if desired.

I claim:

1. Wall comprising a series of metal units, each of said units including a pair of rectangular face sheets, one of which has a greater area than the other, said sheets being disposed with their edges in spaced parallelism, channels disposed between the respective ends and sides of the sheets, said channels having bight portions holding the sheets in spaced relation and each having legs of unequal width, the legs of greater width engaging the marginal portions of the sheet of greater area and the smaller legs engaging the corresponding portions of the other sheet, said units being arranged with the edges of the wider flanges thus provided in juxtaposition.

2. A horizontal wall or floor comprising a series of sheet metal units each having opposite face sheets and channels disposed between margins of the face sheets and having legs secured to said margins to cooperate therewith in providing spaced outstanding flanges, said units being arranged in two substantially continuous layers, flanges of adjoining units of each layer being directly juxtaposed and the channels of one layer spanning the distance between a pair of opposite parallel supporting walls and with the channels of the other layer extending between a second pair of parallel walls.

3. A horizontal wall or floor comprising a series of units each having opposite face sheets and channels disposed between margins of the face sheets and having legs juxtaposed to said margins to cooperate therewith in providing spaced outstanding flanges, said units being arranged in two layers, flanges of adjoining units of each layer being directly juxtaposed and the channels of one layer spanning the distance between a pair of opposite parallel supporting walls and with the channels of the other layer extending between a second pair of parallel walls, means securing the flanges to each other at regions of crossing.

4. A wall comprising a series of units each having opposite rectangular face sheets with parts holding the sheets in spaced relation to define a box-like central portion and outstanding marginal flanges, wider marginal flanges upon one face of the unit extending beyond narrower marginal flanges upon the other face, the wider flanges of adjoining units having their edges juxtaposed, whereby passages or recesses are provided extending along marginal portions of the units.

5. A wall comprising a series of units each having opposite rectangular face sheets with parts holding the sheets in spaced relation to define a box-like central portion and outstanding marginal flanges, the marginal flanges upon one face of the unit extending beyond the marginal flanges upon the other face whereby passages or recesses are provided extending along marginal portions of the units, and cover plates extending between the narrower marginal flanges of the units to complete the enclosure of said recesses.

6. A wall comprising a series of units each having opposite rectangular face sheets with parts holding the sheets in spaced relation to define a box-like central portion and outstanding marginal flanges, the marginal flanges upon one face of the unit extending beyond the marginal flanges upon the other face whereby passages or recesses are provided extending along marginal portions of the units, and cover plates extending between the narrower marginal flanges of the units to complete the enclosure of said recesses, and means detachably supporting said cover plates to permit the removal thereof so that access may be afforded to said recesses.

7. A horizontal wall or floor comprising a

series of sheet metal units each having opposite face sheet portions and portions extending between the face sheet portions and disposed inwardly of certain edges of the same to provide outstanding elongate flanges on opposite sides of the units, said units being arranged in two layers with elongate flanges of adjoining units of one layer juxtaposed to each other and spanning the distance between a pair of opposite parallel supporting walls and with elongate flanges of adjoining units of the other layer juxtaposed to each other and extending between a second pair of parallel walls.

8. A horizontal wall or floor comprising a series of sheet metal units each having opposite face sheet portions and portions extending between the face sheet portions and disposed inwardly of certain edges of the same to provide outstanding elongate flanges on opposite sides of the units, said units being arranged in two layers with elongate flanges of adjoining units of one layer juxtaposed to each other and spanning the distance between a pair of opposite parallel supporting walls and with elongate flanges of adjoining units of the other layer juxtaposed to each other and extending between a second pair of parallel walls, and means securing the flanges to each other at regions of crossing.

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