Oct. 22, 1940. H. A. FABER 2,218,705

METHOD OF BUILDING CONSTRUCTION

Filed Dec. 18, 1937

Fig. 1.

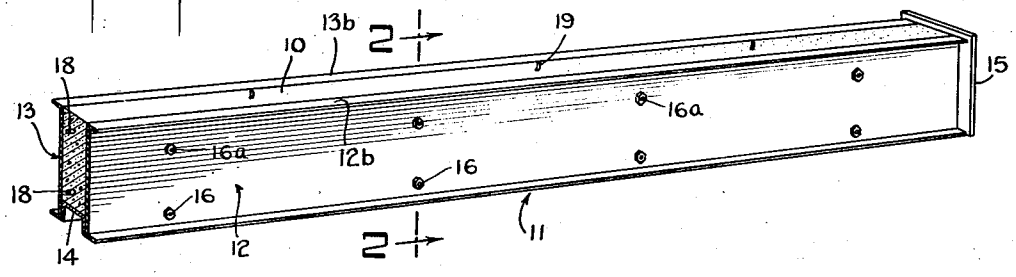



Fig. 2.

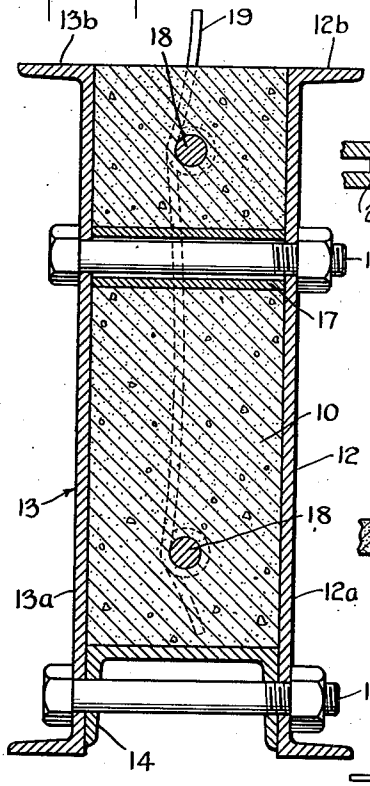



Fig. 3.

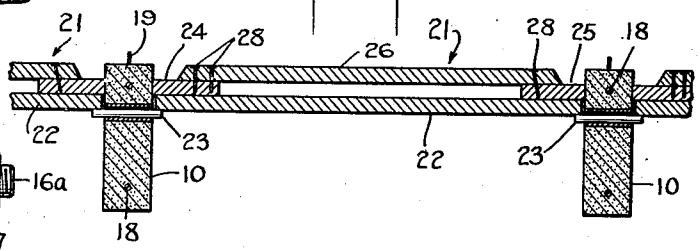



Fig. 4.

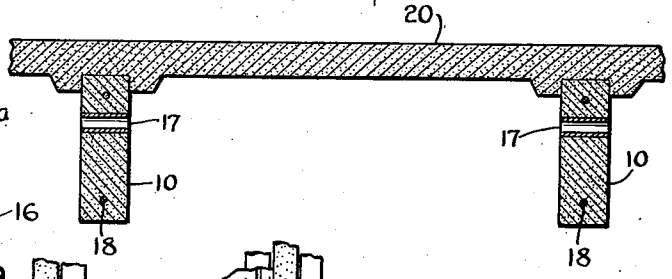
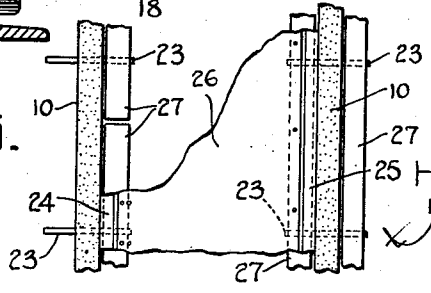



Fig. 5.




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2,218,705

## METHOD OF BUILDING CONSTRUCTION

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Application December 18, 1937, Serial No. 180,512

3 Claims. (Cl. 25—154)

This invention relates to improved methods of building construction.

More particularly, this invention relates to improvements in mold-structures, bracing, or other formwork incident to the construction or formation of a concrete, masonry or equivalent floor or ceiling structure and to improvements in means for supporting such formwork, the supporting means simplifying the stated formwork and the positioning and demounting thereof with respect to beams or other floor or ceiling supporting elements.

In this invention, the mold or formwork, adaptable for receiving fluid structural material or for supporting masonry units and the like from which the floor or roof structure is to be formed, may consist of sheets of plywood, composition board or like material, resting upon suitable bridge members, the latter being arranged longitudinally or transversely with respect to the beams, as preferred, and supported with respect thereto in novel manner.

It is a feature of this invention that the bridge-member supporting devices may be brought out of load-supporting position by moving such devices transversely of the stated formwork-supporting bridge members.

It is yet another feature that the mold structure or formwork may be removably, but firmly, supported in exact relationship to the floor or ceiling supporting structure and held in such relationship during the stage of floor or ceiling construction, upon completion of which, the bridge support of such formwork may be removed from beneath, permitting the formwork to drop away from the under side of the then formed floor or ceiling structure.

Desirably, the stated supporting beams or equivalent are of concrete or equivalent moldable material. Such material lends itself to casting processes, the casting mold for which may include elements later adaptable to provide for the support, accurate positioning, and subsequent ready removal of the stated bridge supporting devices.

In the accompanying drawing:

Fig. 1 is a perspective of a beam-forming mold of indeterminate length, concrete having been poured into such mold;

Fig. 2 is a section through 2—2 of Fig. 1 showing the mold structure in elevation, and additionally showing the through-bolt receiving sleeves;

Fig. 3 shows, in end section, two pre-cast floor beams supporting formwork, such as floor-forming molds, pursuant to the present invention;

Fig. 4 shows a portion of the completed floor and its juncture with the pre-cast beams;

Fig. 5 is a plan view, showing a second method of supporting the formwork on pre-fabricated supporting beams.

Referring to Figure 2, a floor or ceiling supporting structural member—in the present instance a concrete load-carrying beam 10—may be formed by pouring concrete into a demountable mold 11, formed of preferably commercial sizes of structural steel channels 12, 13 placed back to back to form sides, and spaced by the inverted channel 14, the web of which forms the bottom of the mold. End plates, one shown at 15, Fig. 1, may be suitably secured to the channels. The webs 12*a*, 13*a* of channels 12 and 13 are drilled at suitable locations near the bottom flanges thereof, and also, at spaced locations which may be established in conformity with such factors as beam size and load, intermediate to the top flanges 12*b*, 13*b*, and the surface of inverted channel 14.

It is desirable that the latter drilling be accurately performed, and uniform in as many pairs of channels as are to be used in casting a plurality of beams 10.

In securing the various members forming the mold, and in conformity with its character as a demountable structure, through-bolts 16, 16*a* are employed. As shown in Figure 2, a series of bolts 16 pass through the flanges of the inverted bottom-forming channel 14, and are, therefore, not in the concrete-receiving space. The upper bolts, 16*a*, pass through sleeves 17, which may be made of legnths of pipe or equivalent compression-resistant tubing, cut with square ends, and equal in length to the ultimate desired thickness of the beam. The inner diameter of sleeves 17 should permit the easy passage of the bolts 16*a* without, however, being of such large bore to permit skewing or canting of the sleeves on tightening the bolts. The assembled mold 11 is a structure of substantial strength and rigidity, having smooth, preferably vertical sidewalls held in definitely spaced relationship by the continuous channel 14 and the sleeves 17.

Suitable metallic reinforcement members 18, Fig. 2, may be employed in the customary manner to strengthen the beam structure, with additional reinforcement, as 19, carried around the members 18, as shown, and projecting above the upper surface of the beam to aid in making a mechanically sound bond with the super-structure. During the pouring of the concrete into the mold, the upper flanges 12*b*, 13*b* act as depth-gaging means,

and additionally serve as a track or guide along which a top-surface-levelling tool may be run. The position of the sleeves 17 relative to the upper surface of the beam 10 may thus be accurately established, and in each beam so cast, the sleeves will be uniformly placed.

It will be understood that a plurality of molds 11 may be set up at one time, to facilitate the beam forming operation. The ultimate spacing of the beams 10, and their structural characteristics, obviously depend upon the structural requirements of the building.

After the concrete has hardened, the mold 11 may be dismounted by removing the bolts. The sleeves 17 remain immovably embedded in the concrete and form spaced, horizontal passages through the beam, useful for supporting, in definite relationship therewith, a floor-forming mold for poured concrete construction, as presently described, or equivalent structural formwork.

To form a monolithic floor-slab 20, see Figs. 3 and 4, and to bond it to the beams 10, there may be employed a simple mold, as at 21, Fig. 3, which may be formed principally of suitably sized pieces of plywood or similar material available in smooth-surfaced, large sheets of suitable strength. Desirably, the floor section is thicker at the beams, as shown in Fig. 4, to bond with the beams 10 at the top and sides thereof in accordance with good structural practice. To give this configuration, the floor-forming mold 21 preferably includes longitudinally arranged side pieces 24, 25, bridged by central member 26, of suitable area and strength. The three elements may be arranged in step formation, as shown. Preferably, the edges of the member 26 are bevelled to insure the ready release of the floor-forming mold from the hardened concrete.

The member 26 may be rigidly and permanently secured, as by nailing, to one of the side pieces, such as 24. Nails, 28, are indicated in Fig. 3. The other side piece, 25, is preferably not permanently secured, to make the span of the members 26, 24, 25 adjustable to the spacing of the beams 10. The side pieces 24, 25 may thus be brought into contact with the sides of the beams 10 and a tight joint made at each. After so positioning the side piece 25, it may be lightly nailed to the member 26, as shown.

For supporting the mold or formwork on, and in proper relation to, the beams 10, there may advantageously be employed a plurality of steel or equivalent pins 23, of suitable diameter to pass slidably, but not so loosely as to permit them to tip under load, through the sleeves 17 in the beams 10, the length of the stated pins providing for suitable extension thereof at each side of a beam.

The mold 21 or equivalent formwork may be supported directly on the pins 23; however, it is preferred to use auxiliary members, as 22, Fig. 3, or 27, Fig. 5, for carrying the formwork. As indicated in Fig. 3, the members 22 may be lengths of wood or metal, of suitable width and adequate length to reach from sidewall to sidewall of adjacent beams, slight clearance between the ends of such members 22 and the beam sidewalls being desirable.

As illustrated in plan view in Fig. 5, the formwork supporting members 27 may be of random lengths of material, as, for example, wood boards of suitable width, carried by the pins 23 and laid thereon so as to be longitudinally arranged with respect to the beams. The formwork 21 rests directly upon the supporting members, and need not be nailed or otherwise secured thereto.

Wood being an otherwise satisfactory material for the formwork-supporting members 22, 27, suitable metallic facing may be employed in the area of contact of such members with the pins 23, to prevent crushing the surface of the members 22, 27 in the area of contact with the pins 23.

In practicing this invention, the workman first places the pins 23 in proper position, and positions the supporting members 22 or 27 thereon. The mold or formwork 21 may then be laid on the respective supporting members. These operations may all be carried out by one or a pair of workers standing on the beams 10.

Upon completion of pouring and setting of concrete, asphalt or the like, or upon completion of laying bricks or tile to form the floor or ceiling structure, the mold or formwork 21 may be removed by the simple expedient of driving or knocking the pins 23 to one side, to deprive the mold structure of support and permit it to drop away from the underside of the floor or ceiling by its own weight. Such mold or formwork may be used repeatedly.

The term "bricks or tile," above, includes any pre-fabricated blocks or areas of structural units which are per se of dimension insufficient to reach from beam to beam, or column to column of the ultimate supporting structure, a plurality of such structural units thereby being necessary to span from one of such supporting structures to another, such units requiring external support during the laying or other assembly thereof into the ultimate floor or ceiling structure.

The concrete beam 10 has been used merely to exemplify a suitable supporting structural member. The invention may be used substantially as described in connection with vaulted floor or ceilings supported by vertical columns, the latter being provided with equivalent means for receiving pins 23 or equivalent. It will be understood also that beams having any desired web-section may be employed, in accordance with structural practice.

Whereas I have described my invention by reference to specific forms thereof, it will be understood that many changes and modifications may be made without departing from the spirit of the invention.

I claim:

1. The method of building construction, which comprises positioning a plurality of rows of permanent load-carrying structural members in suitable spaced relationship, the structural members in each of said rows having transverse passages extending therethrough, placing a slidable supporting element within a desired number of said passages, said supporting elements having a length greater than the length of said passages and thereby projecting beyond the surface of the associated structural members on each side thereof, supporting rows of formwork between adjacent rows of said structural members by the projecting terminal ends of said slidable supporting elements, each of said elements thereby being adapted to support formwork disposed on each side of the associated structural member, placing suitable building material on said formworks to effect a permanent structure spanning said rows of permanent structural members, and subsequently removing the formwork of a particular row by sliding the sup-

porting elements therefor inwardly of the associated structural members.

2. The method of fabricating concrete structures, comprising positioning a plurality of rows of permanent load-carrying structural members in mutually spaced relationship, said members being of substantial thickness in face to face dimension and having a plurality of passages of substantial length extending transversely through said structural members from face to face thereof, positioning within said passages slidable supporting elements having a length greater than the length of said passages but substantially less than the spacing between said rows of structural members, whereupon end portions of said slidable supporting elements project beyond the faces of the said permanent load-carrying structural members, spanning adjacent load-carrying structural members with a formwork supported on the projecting end portions of said slidable elements, said formwork being adapted to support concrete structural material prior to the solidification thereof into a self-supporting structure, pouring concrete onto the said formwork, and subsequently removing the formwork by moving said projecting end portions of the slidable supporting elements to a position within the said passages.

3. In the art of building construction, the method which comprises positioning a plurality of rows of permanent load-carrying structural members in spaced relationship, each of said members being of substantial thickness in face to face dimension and having a passage of substantial length extending transversely thereinto, positioning within each said passage a slidable supporting element of substantial length, but of a length less than the spacing between adjacent rows of structural members, said supporting element projecting from the face of its associated structural member and arranged to be moved inwardly of said structural member to a position wherein the terminal end of said slidable element is substantially flush with the face of said member, spanning adjacent load-carrying permanent structural members with a formwork on which may be supported structural material incapable per se of self-support, said formwork being supported on the projecting end portions of said slidable elements, placing said structural material upon said formwork in a manner whereby said adjacent structural members may be joined by an eventually self-supporting structure, and subsequently removing said formwork from beneath, by moving said projecting end-portions of said slidable supporting elements to a position interiorly of said permanent load-carrying structural members, whereby the terminal portion of each said slidable elements is flush with the face of its associated structural member.

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