

March 27, 1945.

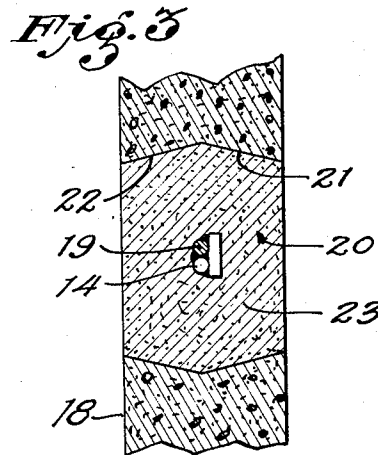
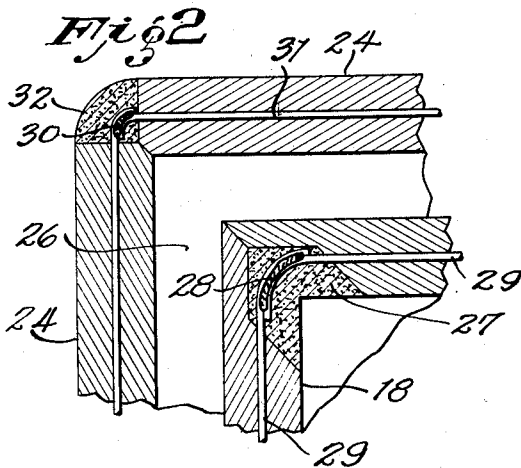
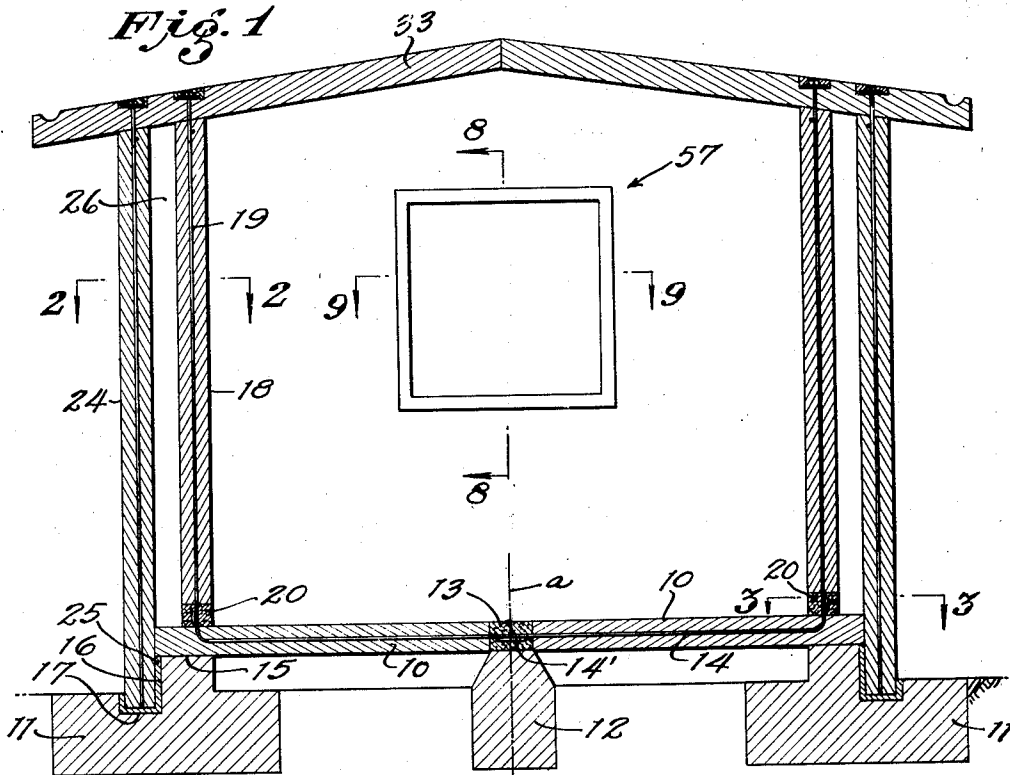
H. B. HAYES

2,372,200

PRE-CAST CONCRETE STRUCTURE

Filed Oct. 4, 1941

3 Sheets-Sheet 1



Inventor,
HAL B. HAYES

By

James M. Abbott

Attorney

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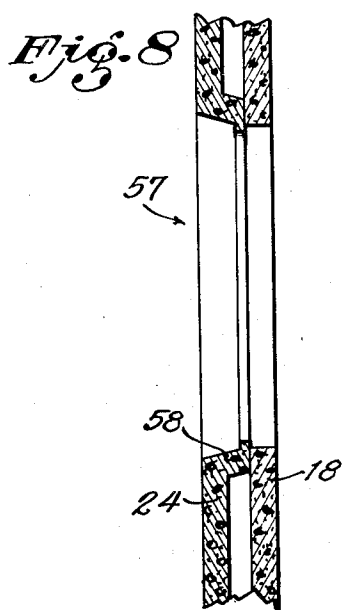
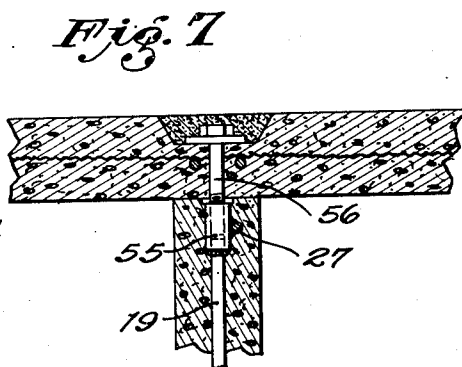
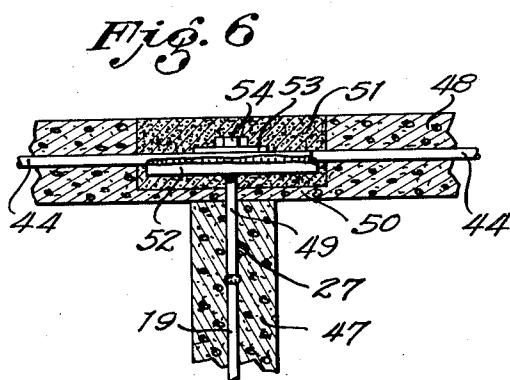
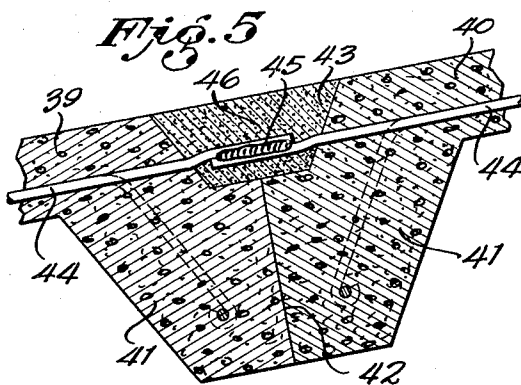
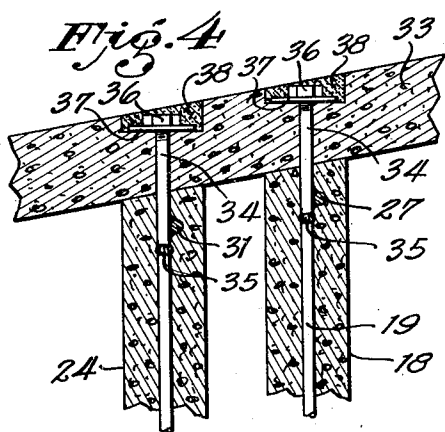
H. B. HAYES

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3 Sheets-Sheet 2



By

Inventor,
HAL B. HAYES
James M. Abbott
Attorney

March 27, 1945.

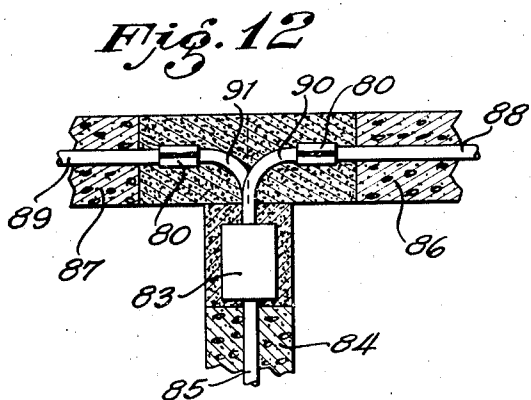
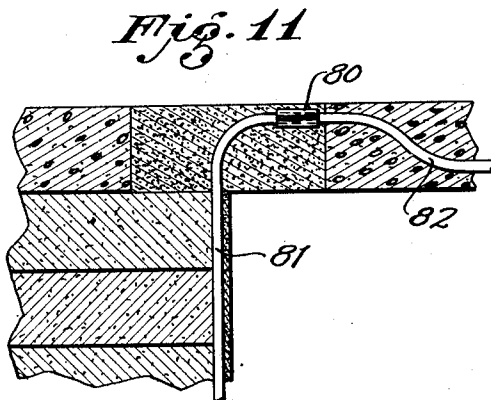
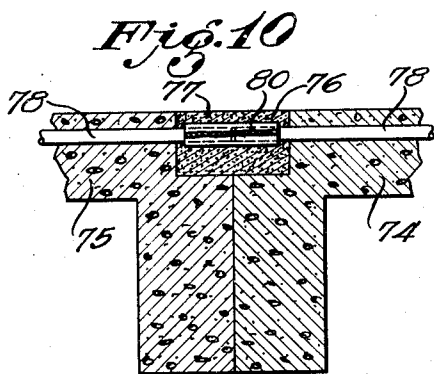
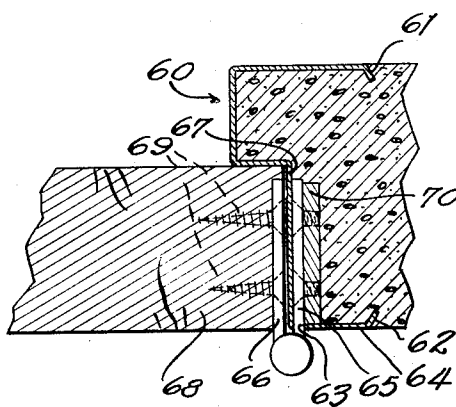
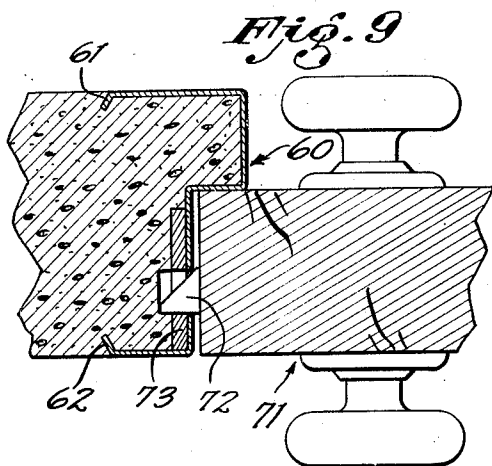
H. B. HAYES

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PRE-CAST CONCRETE STRUCTURE

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3 Sheets-Sheet 3



Inventor,
HAL B. HAYES
By *James M. Abbott*
Attorney

UNITED STATES PATENT OFFICE

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PRECAST CONCRETE STRUCTURE

Hal B. Hayes, North Hollywood, Calif.

Application October 4, 1941, Serial No. 413,626

2 Claims. (Cl. 72-1)

This invention relates to building construction and particularly pertains to pre-cast concrete structures.

In the construction of pre-cast building structures, such for example as a residence, it is desirable to provide wall, floor and ceiling slabs which may be readily formed and set in position, and which may be quickly assembled to make a rigid structure which will have the strength and durability of monolithic construction but which does not require the use of erected forms in the building operation. In such structures it is also desirable to form walls having an air space between them which will tend to insulate against heat, cold and sound without transmission through contacting parts of the wall. It is the principal object of the present invention, therefore, to provide a pre-cast building structure, the outer walls of which are formed of two separate sets of panels pre-cast and spaced from each other without contact, whereby a continuous air space will occur between the sets of panels, the building structure being further provided with interlocking joints and fastening means which may be quickly assembled to form a strong and rigid structure.

It is another object of the present invention to provide a building structure employing pre-cast slabs and within which electric and water conduits may be incorporated in a manner to insure that joints may be conveniently secured and connections made between conduits in contiguous panels.

The present invention therefore contemplates the provision of a set of slabs from which inner and outer wall panels, partition walls, ceiling and floor slabs may be made, said slabs having convenient means for being quickly connected and held in an assembled condition by cheap and permanent elements, whereby a building having a wall structure carrying a continuous air space will be formed.

The invention is illustrated by way of example in the accompanying drawings, in which:

Figure 1 is a view in central vertical section showing one example of the construction with which the present invention is concerned.

Fig. 2 is an enlarged view in horizontal section as shown on the line 2-2 of Fig. 1 and discloses a corner detail of an outside wall.

Fig. 3 is a view in horizontal section as shown on the line 3-3 of Fig. 1, and discloses the construction of a wall slab.

Fig. 4 is an enlarged fragmentary view in verti-

cal section showing one method of tying the outer wall panels to a roof panel.

Fig. 5 is an enlarged fragmentary view in vertical section showing a method of assembling two roof panels.

Fig. 6 is an enlarged fragmentary view in vertical section showing a method of tying a roof or ceiling panel to a partition wall panel.

Fig. 7 is an enlarged fragmentary view in vertical section showing another method of tying roof or ceiling panels to wall panels.

Fig. 8 is an enlarged fragmentary view in vertical section as seen on the line 8-8 of Fig. 1 and shows the manner in which the outer wall panels join to form a window opening.

Fig. 9 is an enlarged view in horizontal section with parts broken away, as seen on the line 9-9 of Fig. 1, and shows the details of a window or door frame.

Fig. 10 is a fragmentary view in section showing one form of conduit connection.

Fig. 11 is a fragmentary view in section showing an additional type of conduit connection.

Fig. 12 is a view showing a conduit connection together with a terminal box.

Referring more particularly to the drawings, 10 indicates a floor structure, here shown as resting upon outer foundation footings 11 and intermediate footings 12. The floor slabs 10 may be brought to meet over the intermediate footings 11 along a center line *a*. Formed in the marginal edges of the floor slabs are openings 13 which match along contiguous edges of the slabs. The floor slabs are preferably constructed with reinforcing material, such as reinforcing rods 14 which extend longitudinally of the slabs and are imbedded in the cementitious mass. The ends of these reinforcing members extend into the recesses 13 so that an overlapping metal element 14' may be laid against them and a welded joint made. The outer portion of the concrete floor slabs 10 rests upon the foundation footings 11 and directly bears against the upper flat faces 15. The outer edges of these floor slabs terminate in alignment with an outer vertical face 16 of the foundation footing which leads downwardly and forms one wall of a recess 17. Resting upon the portions of the floor slabs 10 which are supported by the foundation footings 11 are the inner wall slabs 18 of the enclosing wall structure. These wall slabs are formed with reinforcing elements 19 which extend downwardly into recesses 20 along the lower marginal edge of the slabs 18 and into which up-turned ends of the reinforcing members 14 project. The contiguous ends of the

reinforcing elements 14 and 19 are then welded together in the recesses 20, after which the recesses are filled with cement grouting.

By reference to Fig. 3 it will be seen that the recess 20 is formed with walls having converging planes 21 and 22 which cause the recess to be wider at its center than it is at its outer edges. Thus, when the grouting, as indicated at 23, is filled into the recess and sets, the grouting will be locked in place and will have imbedded within it the welded joint of the reinforcing elements 14 and 19.

The recess 17 in the foundation footings 11 is at a lower level than the level of the face 15 on which the floor slabs are supported, with the result that when outer wall panels 24 are disposed to rest within the recesses 17 they will extend down over the outer edge of the floor panels and the joint between the floor panels and the foundation footings 11, so that an effective seal will be made entirely around the house and below the level of the floor. Grouting, as indicated at 25, is filled into the recesses 17 and upwardly between the panel 24 and the wall face 15 as well as the edge of the floor slabs. The panels 18 and 24 are spaced from each other to form a continuous air space 26.

By reference to Fig. 2 of the drawings it will be seen that at the corners of the building structure the wall panels 18 are joined together with a miter joint, and that recesses 27 are formed to accommodate a welded joint 28 of the horizontally extending reinforcing rods 29. The pocket formed by the recesses 27 is filled with grouting, as previously described. It will also be noted from Fig. 2 that an outer corner recess is formed at the contiguous edges of the outer wall panels 24 to accommodate a welded joint 30 of horizontal reinforcing elements 31 in the outer wall panels 24. A corner mold 32 is formed by grouting to close the pockets within which the weld 30 occurs. By this construction it is apparent that the air space 26 extends completely around the corner and between the panels 18 and 24, and that it is not necessary to provide any horizontal contact between the wall sections which would decrease the insulating effect of the wall space.

In the particular type of dwelling with which the present invention is concerned it is desirable to provide ceiling and roof slabs made of cementitious material and pre-cast, so that the building structure may be completely fire-proof. A form of connection between the outer wall panels 18 and 24 and a roof slab 33 is shown in Fig. 4 of the drawings. Here it will be seen that at the upper ends of vertical reinforcing elements 19 bolts 34 are welded, as indicated at 35. The free ends of these bolts are threaded and receive nuts 36 which rest upon washers 37. The washers 37 and the nuts are seated within the pockets 38 formed in the upper face of the roof slabs 33 and have flat bottom faces which are disposed horizontally when the roof slabs are resting upon the upper edges of the outer wall slabs 18 and 24. In order to insure that the bolts 34 will be held rigidly within the mass of concrete of the wall panels 18 and 24 the horizontal reinforcing members 27 and 31 are welded to the bolts. Thus, the bolts will be held so that they may be engaged by hoisting means to lift the panel and to move it from place to place.

In roof structures of appreciable area it is not practicable to form the roof from one slab of concrete only, and it is necessary to provide joints. The joint between roof slabs is particularly shown

in Fig. 5 of the drawings, where it will be seen that slab sections 39 and 40 are formed with downwardly projecting ribs 41 which provide a transverse bearing surface 42. Recesses 43 occur in the upper face of the slab sections 39 and 40 and provide a pocket into which horizontal reinforcing elements 44 extend. These elements are welded together, as indicated at 45, after which the pocket formed by the recesses 43 are filled with grouting as shown at 46. Certain of the reinforcing elements 44 are turned downwardly into the flanges 41 to reinforce the same.

In the form of the invention shown in Fig. 5 an intermediate partition wall 47 is provided as a support for a roof or ceiling slab 48. Secured to the upper end of reinforcing elements 19 is a bolt 49 which projects upwardly through the wall 50 of a pocket 51. Reinforcing elements 44 extend longitudinally of the slabs and overlap in the recess 51. A spliced piece 52 may be provided to reinforce the joint of the overlapping members 44, after which a weld may be made to hold these elements in position. If desired, the spliced piece 52 may be formed with a central eye through it to receive the bolt 49 and to further tie the entire structure together. When a washer 53 is mounted on the bolt and is held down by a nut 54 the entire structure will be held together, and the pocket formed by the recess 51 may then be filled with grouting.

In some instances it may be desirable to eliminate the projecting bolts 34 or 49 from the edges of the panels, since they may be accidentally struck and bent. In order to eliminate this objection a structure is shown in Fig. 7 of the drawings in which the vertical reinforcing element 19 is fitted with a threaded nut or sleeve 55 into which a bolt 56 may be screwed. In order to rigidly hold the entire structure the horizontal reinforcing bars 27 may be welded to the sleeve 55.

In building a structure having spaced wall slabs as here shown, it may be desirable to provide a wall opening. This may be either a window or door. A window is indicated at 57. The wall panels 18 and 24 are formed as shown in Fig. 8 of the drawings, where an intumed flange 58 is formed on the outer panel 24 around the perimeter of the opening.

Referring to Fig. 9 the form of a door or window frame is disclosed. Here it will be seen that a sheet metal element 60 forms the frame and is made of relatively thin steel which is imbedded within the cementitious material by its intumed edges 61 and 62. A slotted opening 63 is formed through an element 64 of the frame and receives the leaf 65 of a hinge. The other leaf 66 folds over the outer face of the frame portion 67 and is secured to a window or door frame 68 by screws 69. The hinge leaf 65 is attached to a plate 70 which is imbedded within the cementitious material at the corner of the vertical post of the window opening. A latch or other structure 71 is carried at the opposite side of the frame and has a latch bolt 72 which extends into a plate 73 held in the rear of the frame structure 60. It will be seen that with this arrangement the entire window frame can be incorporated with the cementitious material and will be sufficiently strong without requiring the use of heavy metal parts.

In a pre-cast house made of cementitious or other similar material it is necessary to provide convenient means for connecting various conduits which have been cast in the walls of the house and also to put terminal boxes in position. The

structures shown in Figs. 10, 11 and 12 are concerned particularly with these features.

In the form of the invention shown in Fig. 10 slabs 74 and 75 are disposed with their edges abutting. Recesses 76 and 77 are cast in the composite abutting faces of the slabs and conduits 78 and 79 are cast in the slabs and terminate in the recesses. Thus, it is possible to place a split sleeve 80 around the contiguous ends of the conduits, after which the sleeve may be clamped in position or welded to make a complete joint. When this has been done the recesses 76 and 77 may be filled with cementitious material.

In the form of the invention shown in Fig. 11 a connection is illustrated as being made between a vertical conduit 81 and a horizontal conduit 82. These conduits are suitably bent and connected with the sleeve 80 within a pocket in the wall or ceiling, after which the pocket may be filled with cementitious material.

In the form of the invention shown in Fig. 12 a terminal box 83 is provided in a horizontal wall 84. A conduit 85 leads upwardly in the wall to the terminal box. Ceiling slabs 86 and 87 rest upon the wall 84 and have imbedded within them conduits 88 and 89. Pipe elbows 90 and 91 may be led from the terminal box 83 and attached to the conduits 88 and 89 by sleeves of the type indicated at 80.

In the operation of the present invention the slabs from which the walls and ceiling are made, as well as the panels, are pre-cast, preferably while in a horizontal position, as shown in my co-pending application entitled "Concrete building structure and method and means of building the same," Serial No. 361,024, filed October 14, 1940. In this method of fabricating the building parts, the bolts or reinforcing members, such as bolts 34, are engaged by a hoist so that the panels and slabs may be elevated to a vertical position and then moved onto a truck for transportation or swung directly from the molds to their positions in the final structure being made.

In any event, when the panels and slabs are assembled, as indicated in the drawings and the foregoing description, they will produce a substantially monolithic double walled building structure of great strength, while requiring a minimum of material in the construction and a minimum amount of labor for the erection of the buildings.

It will thus be seen that the invention here disclosed provides simple and effective means whereby cheap and durable building structures may be made, and may be erected rapidly without the use of building forms, such as would be required when concrete is mixed and poured into the forms to produce the structure.

While I have shown the preferred form of my invention as now known to me, it will be understood that various changes may be made in combination, construction and arrangement of parts by those skilled in the art, without departing from the spirit of the invention as claimed.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. In a cementitious building structure formed of pre-cast slabs, a wall panel within which a conduit is imbedded, said panel having a recess at a point in its edge into which an end of said conduit projects, a panel disposed transversely of said first named panel and abutting thereagainst, said panel having a conduit cast within it, an opening in the transverse panel registering with the recess in the first named panel and within which the ends of the conduits of the two panels lie in close proximity, and a sleeve member engaging said ends to form a connection between the two conduits and whereby the opening and recess may be filled with cement to imbed the connected members within said cement.

2. The structure of claim 1 including a terminal box disposed within the recess within the wall panel.

HAL B. HAYES.