Nov. 29, 1938. W. J. WEESNER 2,138,683

BUILDING WALL CONSTRUCTION

Filed April 24, 1937 5 Sheets-Sheet 1

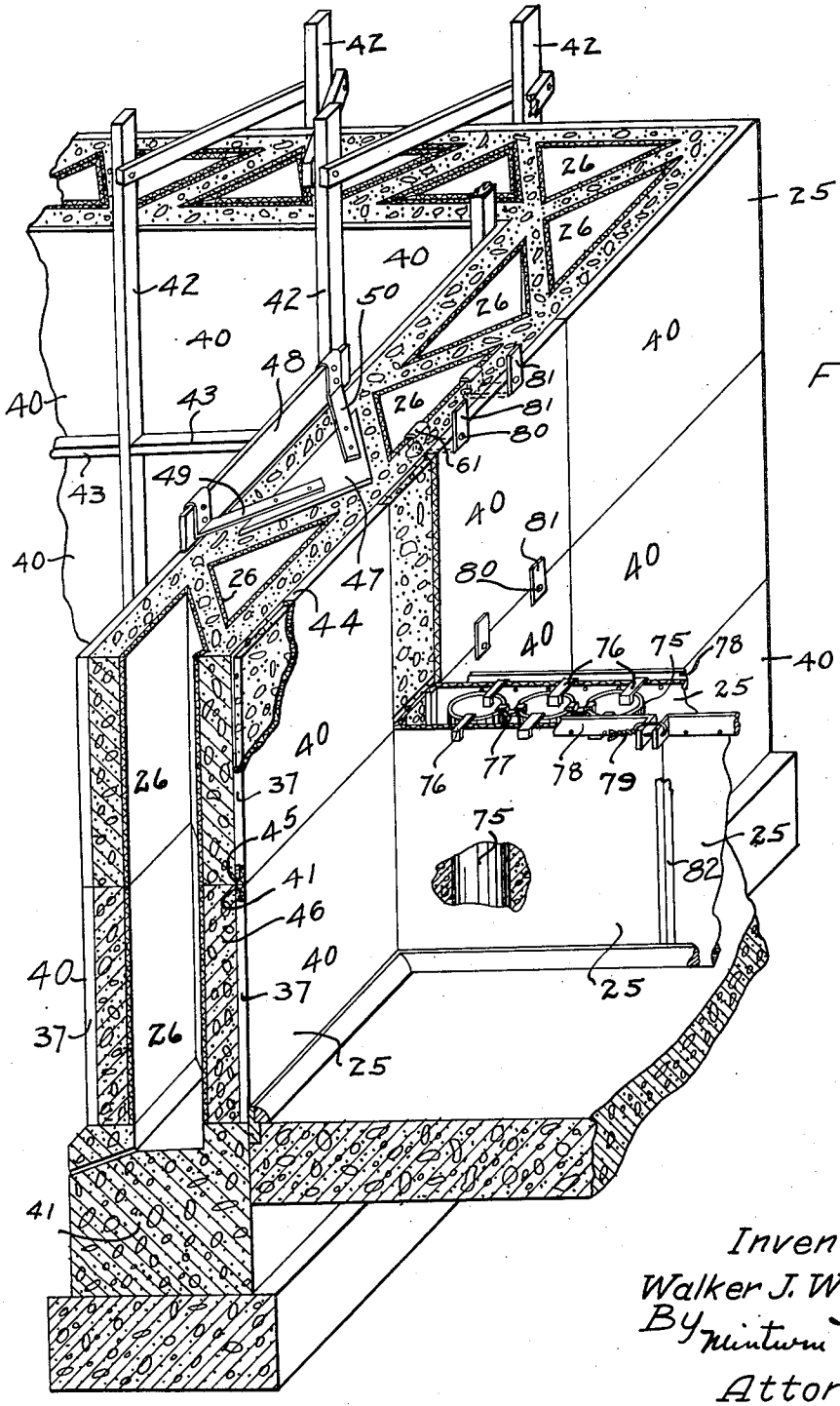


Fig. 1

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BUILDING WALL CONSTRUCTION

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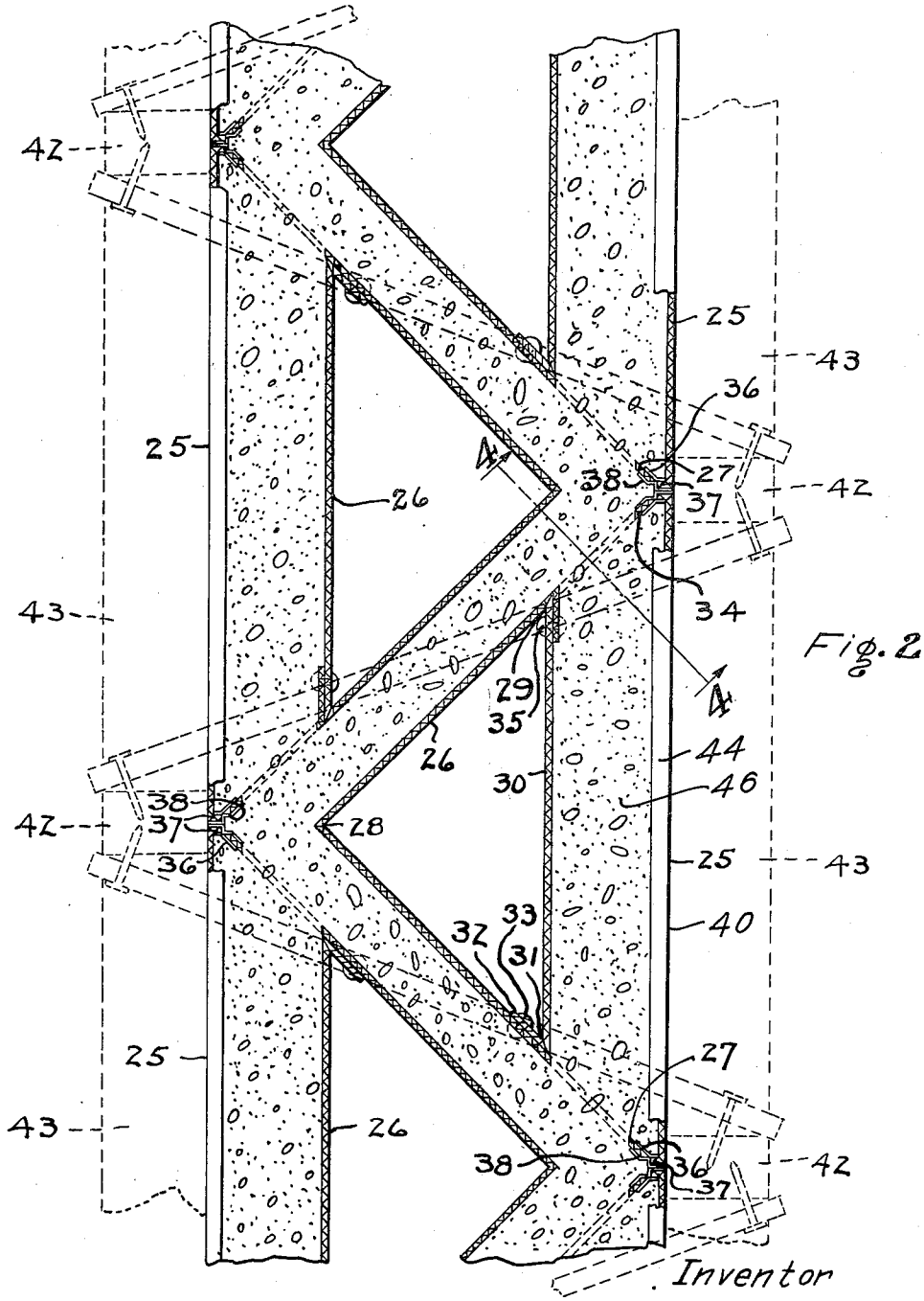


Fig. 2

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BUILDING WALL CONSTRUCTION

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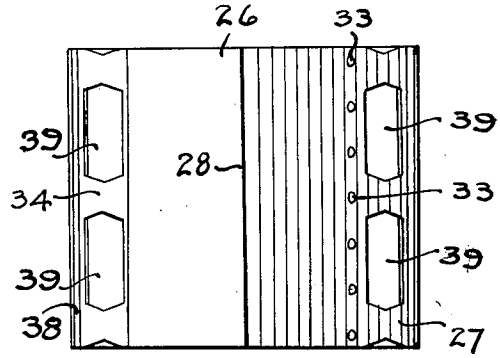


Fig. 3

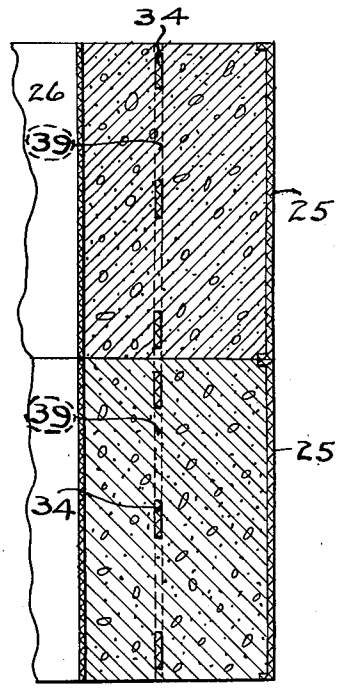


Fig. 4

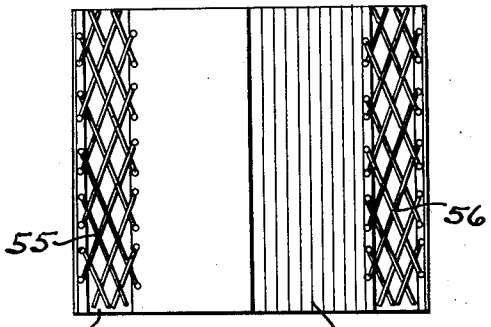


Fig. 5

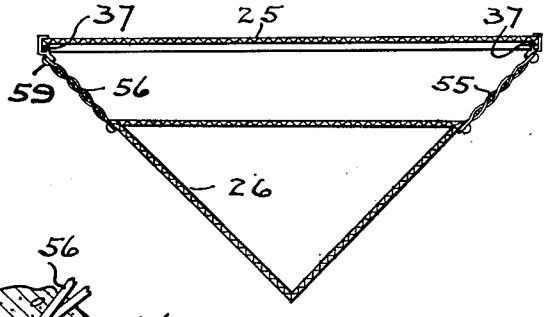


Fig. 6

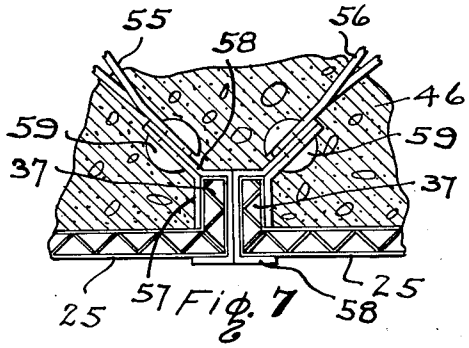


Fig. 7

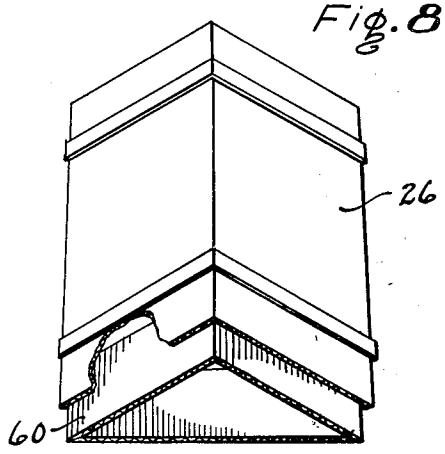
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Nov. 29, 1938. W. J. WEESNER 2,138,683

BUILDING WALL CONSTRUCTION

Filed April 24, 1937 5 Sheets-Sheet 4

Fig. 8



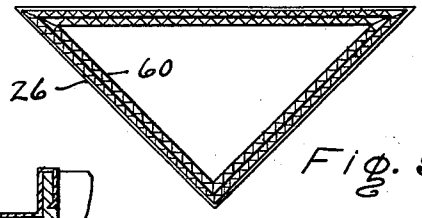


Fig. 9

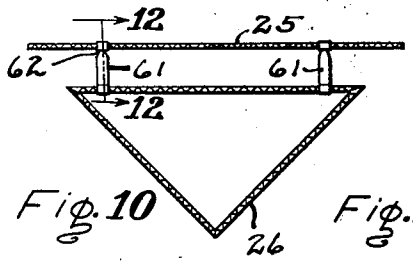


Fig. 10

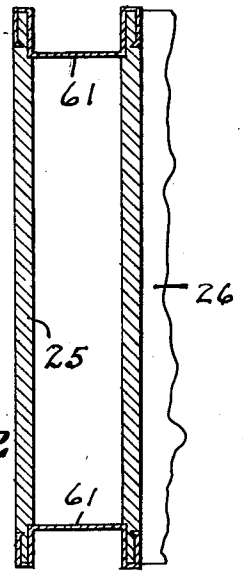


Fig. 12

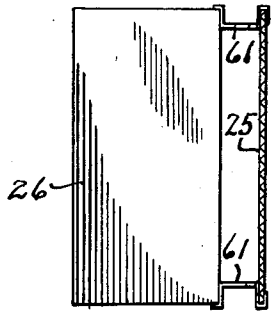


Fig. 11

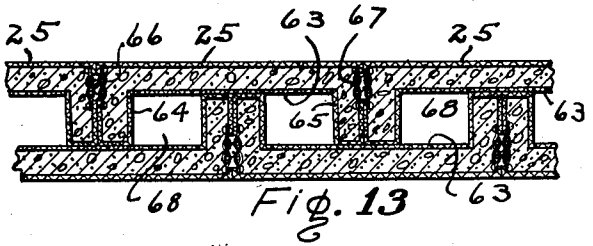
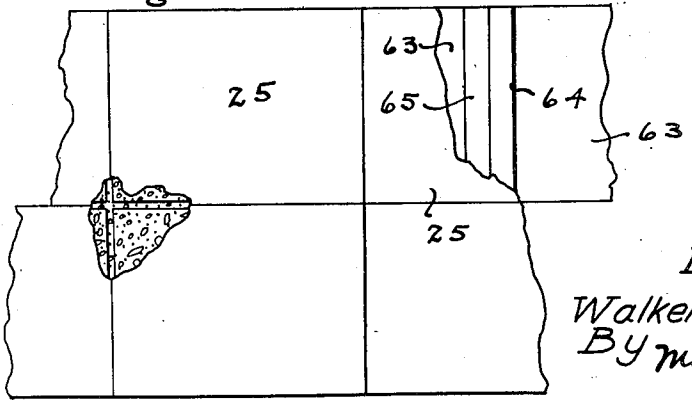


Fig. 13

Fig. 14



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BUILDING WALL CONSTRUCTION

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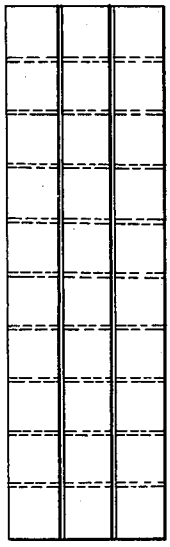


Fig. 15

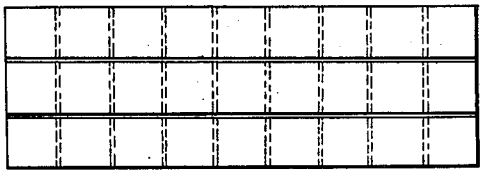


Fig. 16

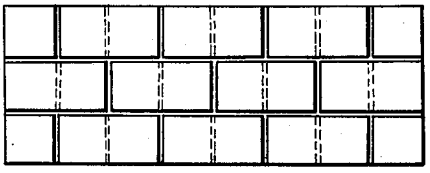


Fig. 17

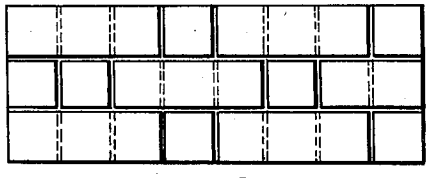
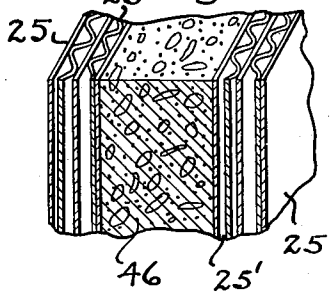


Fig. 18

Fig. 22



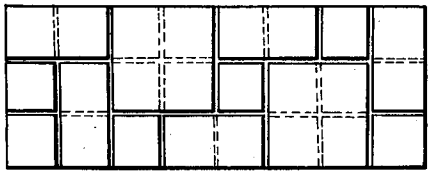


Fig. 19

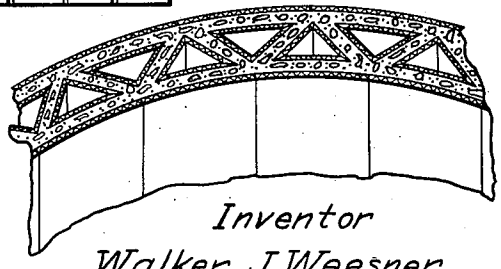


Fig. 21

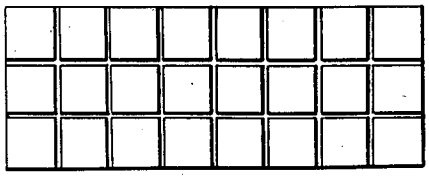


Fig. 20

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Patented Nov. 29, 1938 2,138,683

UNITED STATES PATENT OFFICE

2,138,683

BUILDING WALL CONSTRUCTION

Walker J. Weesner, Indianapolis, Ind., assignor of one-half to Robert E. Stevenson, Indianapolis, Ind.

Application April 24, 1937, Serial No. 138,728

15 Claims. (Cl. 72—48)

This invention relates to a method and means for constructing building walls, having among its many features and advantages great economy and also flexibility of design.

The invention comprises broadly the use of an outer wall as well as an inner air cell core made preformed in units from some cheaply produced material such as fiber board, preferably in the nature of a cellular board, one type of which is commonly known as "corrugated" board made from straw or the like. The invention further consists in employing these preformed units in such a manner that the outer face forms may be readily removed if desired and the wall cell cores left in position to serve selectively as conduits for heat, ventilating, air conditioning, service pipes, wiring, and the like, while the core wall itself, when made of cellular board, serves as an excellent heat transfer insulation.

A further important feature of the invention is to be had through the use of preformed fiber forms which produce a wall in which checks or cracks may be controlled to occur at predetermined locations. Also by use of the invention the exterior surfaces of the walls built in accordance with the invention may be finished in wide ranges of designs.

In employing fiber board forms, the face of the forms exposed to concrete may be waterproof or finished in a semi-waterproof manner whereby the paper or fiber form walls may take up moisture from the freshly poured concrete and retain the moisture on the face of the concrete to induce a better curing of the wall.

These and many other objects and advantages will become apparent to those versed in the art in the following description of the invention as more or less diagrammatically illustrated in the accompanying drawings.

Fig. 1 is an elevation in perspective of a wall in the process of construction in accordance with the invention:

Fig. 2, a top plan view on an enlarged scale of the wall:

Fig. 3, a rear elevation of a form-unit of the type employed in Fig. 2:

Fig. 4, a vertical section on the line 4—4 in Fig. 2:

Fig. 5, a rear elevation of a modified form-unit:

Fig. 6, a top plan view of the unit shown in Fig. 5:

Fig. 7, a detail on enlarged scale of the corner construction of the unit shown in Figs. 5 and 6;

Fig. 8, a rear view in perspective of a core-unit:

Fig. 9, a top plan view of the unit shown in Fig. 8:

Fig. 10, a top plan view of a still further modified form-unit:

Fig. 11, a side elevation of the unit shown in Fig. 10:

Fig. 12, a vertical section on enlarged scale on the line 12—12 in Fig. 10:

Fig. 13, a horizontal transverse section through a wall with a still further modified form-unit:

Fig. 14, a side elevation of the wall shown in Fig. 13:

Figs. 15–20, elevations of the exterior face of a wall formed by use of the invention showing various possibilities of finished design which may be produced:

Fig. 21, a top perspective view of the invention applied to a circular wall: and

Fig. 22, a detail in section in perspective of a form double wall.

Like characters of reference indicate like parts throughout the several views in the drawings.

Owing to the extreme flexibility of construction permitted by the invention, the forms to be employed may assume quite a few different constructions. In general, however, a form will be set up of individual units placed side by side in a horizontal row, each individual form to have an exterior wall with an interior core spaced from that outer wall.

Referring principally to Figs. 1–4, a form unit is constructed to have an outer fiber board wall 25, in the form herein shown as a rectangle. A core, generally designated by the numeral 26, is formed in any suitable shape herein shown as triangular in cross section. As indicated in Figs. 2–4, the core 26 is formed from one piece of corrugated fiber beard having an end 27 anchored to the wall 25 in a manner hereinafter explained. The one piece of board extends inwardly from the end 27 to the vertical line 28 as the apex of the triangle formed by the core, and thence outwardly from the line 28 to the corner 29, which forms the juncture with the outer wall 30 of the core, the board being bent to form the corner 29 and continuing therefrom in one piece to form the wall 30 parallel to but spaced inwardly from the wall 25. The wall 30 continued to the other corner 31 of the core and is then bent inwardly to have an end 32 contact the inside of that part of the wall extending from the end 27 and there secured by any suitable means herein shown as by rivets 33.

The corner 29 is spaced inwardly from the wall 28 by means of a length of fiber board 34, the inner end of which is bent and lapped over the outer side of the wall adjacent to the corner 29 and there secured by any suitable means herein shown by rivets 35. The board 34 then extends from the corner 29 diagonally outward to the end of the wall 25 where it is connected and secured to the wall 25 in the same manner as is the board end 27.

The board end 27 and the outer end of the board 34 are engaged respectively to the ends of the wall 25 by means of a cloth or paper tape 36 being attached to the inner side of the board by any suitable means such as an adhesive, the tape lapping over on a vertical flange 37 inturned from the end of the board 25. Also a tape 38 is secured on the outer side of the board adjacent its end and carried outwardly and around the outer side of the vertical flange 37. In this manner, the core 26 is supported by the wall 25 and spaced inwardly therefrom so as to leave space between the outer wall 25 and the core wall 30 to be filled with concrete. The portions of fiber boards spacing the core 26 from the wall 25 are provided with windows or openings 39 formed therein so as to permit bonding of concrete between the adjacent forms, as indicated in Fig. 4.

Referring now to Figs. 1 and 2, a number of these units hereafter designated generally by the numeral 40, are placed in a horizontal row on any suitable foundation 41, Fig. 1, so as to have in vertical abutment, one flange 37 against the other and to have the outer faces of the walls 25 in a common vertical plane. In order to insure the vertical alignment, suitable skeleton framework is set up, herein shown as comprising the vertical studding or posts 42. Each of the posts 42 is spaced one from the other to have a post cover the vertical joint between the adjacent units 40. Maintaining this spacing and also to cover the horizontal joints between the upper and lower units 40, are blocks 43. These blocks 43, however, are not brought into use until after the first horizontal row of forms 40 have been set and poured.

As has been indicated, one row of these units 40 is placed along one side of the foundation 41. A second row in the same horizontal course is placed on the opposite side of the foundation 41 to have the cores 26 dropped in between the cores 26 of the first named row. The units 40 on the other side of the foundation are brought into abutment to have the vertical joints staggered or spaced midway between the vertical joints or units 40 on the other side so as to properly space apart longitudinally in the wall these respective, oppositely directed cores 26. In the preferred form, the wall 25 of each of the units 40 not only has the inturned flanges 37 but also is provided with upper and lower inturned flanges 44 and 45 extending a full horizontal length of the wall.

Preferably, although not necessarily so, one horizontal course of the units 40 is positioned entirely around the foundation 41 and then poured full of concrete 46 before the next upper course of units 40 is set in position and poured.

Referring to Figs. 1 and 2, when the inner and outer rows of units 40 are placed in position to form a horizontal course, concrete is poured into the spaces left between the outer wall 25 and around the cores 26, between adjacent cores as well as between the cores and the outer walls. As above indicated, the concrete may flow through the windows 39 so as to form a continuous wall therethrough.

For convenience, an implement such as indicated in Fig. 1 may be employed to facilitate pouring of the concrete without dropping it into the cores 26. This implement may take the form of a cover 47 to fit over the open end of the cores 26 and a rear upturned board 48 resting on top of the wall 25 spacing the cover 47 by means of suitable bars 49 and 50.

Following the pouring of the first course as above indicated, another row of units 40 may be placed in position in vertical alignment each above a lower unit as indicated in Fig. 1. This course may be then poured as before shown until the complete height of the concrete wall is reached. It is to be noted that as the units 40 are placed one above the other, the cores 26 come into respective alignment with the cores below so as to leave continuous vertical cores in the finished wall.

As above indicated the concrete contacting face of the fiber board in each unit 40 may be made waterproof so as to prevent any great degree of wetting when the concrete is poured. However, it may be an advantage in permitting these fiber boards to become wetted up to the point where they will not become distorted in order to hold the moisture in the outer portions of the concrete. When the wall has been properly cured, the outer fiber form walls 25 may be pulled away from the concrete, the extending ends of the tapes 36 and 38 cut off and the wall then left as it appears with the vertical and horizontal grooves displayed therein as formed by the inturned flanges 37, 44 and 45. The fiber board forming the core 26 is preferably left in position so as to form an insulating wall which is particularly effective when the corrugated or cellular fiber board is employed. Of course, where the core is to form a vertical conduit to be used for service wires or pipes or conduction of air currents, the core walls in this instance may be made of sheet metal to prevent deterioration.

It is possible, and in many cases desirable to employ that form of unit as is shown in Figs. 5–7 wherein the outer wall 25 supports the core 26, not by fiber boards but by an open mesh or foraminated piece of metal extending from each of the respective two corners of the core to the vertical edges of the wall 25. This metal, hereinafter referred to by the numerals 55 and 56 designating the two strips employed, is herein shown as being in the form of a fabricated metal. The essential feature is, however, that the metal have a sufficient number of openings sufficiently large as to permit the concrete to flow through to form a continuous wall. The metal in this form not only serves to initially space the core 26 from the wall 25 but also serves as a reenforcing element, the metal of course remaining permanently imbedded in the concrete.

Where the metal spacers 55 and 56 are employed, they may be interconnected with the wall 25 in some such manner as indicated in Fig. 7, wherein two vertical flanges 37 of abutting walls 25 are shown as having an inner tape 57 and an outer tape 58 secured to the flanges 37 and carried inwardly to have the tapes attached to the metal by any suitable means such as the rivets 59. Of course, when the wall is finished, the fiber board walls 25 will be pulled away together with the flanges 37 and the tapes 57 and 58 cut off at the inner corners of the vertical groove formed in the concrete by the flanges.

It is possible for the inner core to be separate from the outer wall. In this instance, the core could assume the form as shown by Figs. 8 and 9 wherein the core **26** is provided with a lower projecting lip **60** preferably made of the same cellular fiber board as that of the core itself. The lip **60** is in reality an offset continuation of each of the three walls of the core, and is provided for the purpose of telescoping into the core below. In this manner, the vertical alignment of one core above the other is insured. The lip **60** may be produced by forming it in a separate length of board and telescoping this length within the lower end of the core **26** and there securing it by any suitable means such as by an adhesive.

However, the simplest and most economical form unit would take the form as shown in Figs. 10–12, wherein the wall **25** is formed devoid of any horizontal and vertical flanges, and carries the core **26** spaced inwardly therefrom simply by four metal straps **61**, to attach at the top of the board and at the bottom of the board. A simple form of attachment is to have the strap **61**, Fig. 12, initially formed in a U-shape, to have one end of the strap extend up and over the inside of the wall **25** across the edge and down on the outer side, to have an inturned barb driven into the board. In the same manner the other end of the strap **61** extends up, over, and down about the edge of that wall of the core **26** which is parallel to the wall **25**. Preferably, each of the straps **61** is formed to have a reduced cross sectional area adjacent the wall **25** to form the neck **62**. The purpose of forming this neck is to permit the wall **25** being pulled away from the finished concrete wall and the easy cutting or breaking off of the strap **61** at the surface of the concrete.

While the foregoing description has referred to cores having triangular cross sections it is, of course, possible to employ cores in different cross sectional shapes. For example, in Fig. 13, a rectangular form is shown although it is produced in a slightly different manner than are the cores above indicated. In this form, as shown in Fig. 13, the outer rectangular walls **25** are used as before. Then spaced the desired distance inwardly from the wall **25** is a wall **63**. This wall **63** has inturned ends **64** and **65**. These ends **64** and **65** respectively turn from their ends to each have a short length parallel to the wall **25**, and then turn back outwardly in a direction toward the wall **25**. These outturned ends of the ends **64** and **65** are secured to and supported by the vertical ends of the wall **25**, herein shown, Fig. 13, by means of vertically disposed strips of foraminous metal **66** and **67**, being secured to the wall **25** through the vertical flanges of the wall. Thus the unit so far described presents a form providing for a wall of concrete that will have an outer thin vertical wall with inturned integral legs. These individual units are then disposed in horizontal courses as indicated in Fig. 13 whereby vertical openings **68** are left in the wall. It is to be noted that in this particular form the inner and outer wall sections do not unite or bond one with the other but actually constitute two separate walls spaced apart by the thickness of the fiber board wall **63** and the parallel end sections of the inturned wall ends of the opposite unit. This has an advantage in that there is no transfer of heat or moisture directly from one wall to the other by reason of the intervening insulation.

In the form shown in Figs. 13 and 14, the outer wall **25** may have the horizontal as well as vertical flanges the same as in the other forms above described. The form-unit shown in Figs. 10–12 may or may not have the vertical and horizontal flanges, the drawings showing the wall **25** without flanges. In this event, there will be no grooves formed in the concrete wall. Where the concrete wall is formed by positioning the forms in horizontal courses and pouring each course completely, the above course may be bonded to the lower course if desired by any of the now well known processes, one of which employs iron dust or filings.

Where the form wall **25** is provided with the vertical and horizontal flanges the concrete wall after the form walls **25** have been removed will have an appearance as indicated in Fig. 20. The appearance of the wall may be changed by filling in the horizontal grooves between the vertical grooves to give the effect as shown in Fig. 15 where the dash lines indicate the filled in grooves. With the vertical grooves filled in between the horizontal grooves, the wall would have the appearance as in Fig. 16. A variation may be had by filling in the vertical grooves alternately as indicated in Fig. 17 to simulate a block or brick wall. Other possible modifications or suggestions are shown in Figs. 18 and 19. Of course, the fiber board wall **25** may be embossed with suitable designs which will leave their imprints in the concrete to be visible upon the removal of the fiber board walls **25**.

Where the invention is to be employed in extremely light walls, such as partition walls, the desired thinness of wall may be secured by employing a pair of fiber board walls **25** see Fig. 1 spaced apart the required distance to carry cylindrical cores **75** therebetween by metal straps **76** gripping the ends of the cores and the ends of the wall **25**. The cores **75** may be spaced apart one from the other by means of metal straps **77** likewise engaging over the ends of the adjacent cores. These cores **75** are preferably made out of fiber board either solid or in the cellular form. In order to vertically align one of these form units above a lower one, the side walls **25** may carry a thin strap of metal **78** along the outer side at the upper edge of each wall to extend upwardly therefrom a sufficient distance so as to permit the telescoping between the straps **78** of the lower ends of the walls **25** of the next above unit so as to have the lower ends of those upper walls **25** rest directly on the upper ends of the lower walls **25**. The straps **78** are preferably turned outwardly from the walls **25** near the vertical edge so that two adjacent walls **25** in a horizontal course may be pulled into compressive contact along their vertical edges by means of some connecting element drawing the outturned strap ends one toward the other. The element herein shown, Fig. 1, consists simply of a wire **79** inserted through holes in the strap ends and then twisted to draw the ends toward each other. In addition, a metal strap **82** is secured along one vertical edge of the wall **25** to overlap the adjacent wall and thereby cover the intervening vertical joint.

In further reference to that form shown in Figs. 10–12, the straps **61** at the top of the unit may be secured to the wall **25** by rivets **80**, Fig. 1, and have their outer ends turned upwardly to terminate in vertically disposed fingers **81** serving as guides and aligning means for the next above unit **40**. When the horizontal inturned flange **44** is employed, the straps **61** would come

thereunder and extend through the wall 25 as indicated in Fig. 1.

The invention may be applied to curved walls as well as straight, as indicated in Fig. 21, wherein the cores 26 would have curved outer walls, and likewise, the walls 25 would be curved to the required curvature.

Referring again to the question of curing of the concrete poured within the mold defined by the fiber board, when the concrete is first poured, the fiber board when not waterproofed will absorb water from the concrete to effect a quick setting thereof. Then the board will retain that absorbed moisture adjacent the face of the concrete to aid in completing the cure. The rate of absorption of water by the board may be controlled by making the fiber board partly water resistant, that is, by applying or creating a semi-waterproofing to or in the fiber board.

In respect to this curing aspect of the invention, a single form wall may be utilized—that is a wall built up in the usual manner to have the inner and outer fiber sheets with the intervening spacing corrugated spacer. In this construction, the inner sheet would become wetted together with some wetting and deformation of the corrugated spacer. The outer sheet would, preferably waterproofed, then be relied upon to retain the wall shape.

However, where the form wall is to be utilized to aid in the setting and curing of the concrete, the better practice would be to employ a double form wall as indicated in Fig. 22, where the inner form wall 25', is used as the moisture absorbent and retainer, while the outer wall 25 gives the structural strength. The moisture does not penetrate beyond the first or inner form wall.

While I have herein shown and described my invention in the various forms in detail, it is possible that structural variations may be employed without departing from the spirit of the invention and I therefore do not desire to be limited to these precise forms beyond the limitations imposed by the following claims.

I claim:

1. A form unit for a building wall comprising an outer vertical wall, a vertical core triangular in cross section, and wall extensions supporting and spacing the core from said wall, said extensions being formed to permit flow and bonding of concrete therepast.

2. A form unit for a building wall comprising an outer vertical wall, a vertical core, and means supporting and spacing the core from said wall, said means being formed to permit flow and bonding of concrete therepast, said wall and core being made of fiber board, the wall being removable from said means following filling of the form, and said core being triangular with integral extensions permanently anchored to the finished wall by said means.

3. A form for a building wall to be poured comprising a plurality of individual form-units set up in horizontal courses and in vertical alignment one unit above another in adjacent courses; each unit consisting of an outer form wall and at least one wall-core carried by and spaced inwardly from the form wall; and means for maintaining the units in horizontal and vertical alignment, said units being triangular in cross section and arranged in each course in a double row to have the core of one unit in one row spaced between adjacent cores carried by units in the other row.

4. A form for a building wall to be poured comprising a plurality of individual form-units set up in horizontal courses and in vertical alignment one unit above another in adjacent courses; each unit consisting of an outer form wall and at least one wall-core carried by and spaced inwardly from the form wall; and means for maintaining the units in horizontal and vertical alignment, the form walls and cores of said units being triangular in cross section and made of cellular fiber board, said means permanently anchoring the core to the finished poured wall by extending walls of the triangle therethrough.

5. A form for a building wall to be poured comprising a plurality of individual form-units set up in horizontal courses and in vertical alignment one unit above another in adjacent courses; each unit consisting of an outer form wall and at least one wall-core carried by and spaced inwardly from the form wall; and means for maintaining the units in horizontal and vertical alignment, the form walls and cores of said units being made of cellular fiber board, said means comprising a wall extension of the core permanently anchoring the core to the finished poured wall by extending therethrough, said core being triangular in cross section with one face thereof parallel to said unit wall.

6. A form unit for constructing a wall to be poured comprising an outer vertical form wall, a vertical wall core, means for spacing and supporting the core from said form wall comprising a wall extension of the core, said means comprising metal pieces gripping the edges of the form wall and core wall extension respectively.

7. A form unit for constructing a wall to be poured comprising an outer vertical form wall, a vertical wall core, means for spacing and supporting the core from said form wall comprising a wall extension of the core, said means comprising metal pieces gripping the edges of the form wall and core wall extension respectively and being located and formed to pass through the poured building wall and permanently attach the core to that wall but permitting removal of the outer form wall.

8. A form unit for a building wall comprising an outer vertical wall, a vertical core, and means supporting and spacing the core from said wall, said form wall and said core being made of fiber board, and said means comprising perforated fiber board extensions from sides of said core.

9. In a concrete mold form, an inner water absorbent member and an outer water retaining member, said two members comprising fiber sheets, and a cellular spacer between said members all bent into tubes triangular in cross-section with the water absorbent member outside.

10. In a concrete form, an outer wall structurally rigid to support poured concrete therebehind without distortion, and an inner fiber board wall of a water absorbent nature, each of said walls comprising an inner and outer fiber sheet separated and spaced by a fiber corrugated sheet the inner wall being formed into a series of tubes triangular in cross-section.

11. A concrete wall comprising an outer wall having juxtaposed V-shaped units with inturned legs, parts at least of which legs are bonded one to the abutting leg of an abutting unit, and an inner wall of the same structure as said outer wall and having its inturned legs staggered in position between the legs of the outer wall with air cells left therebetween, the inner sides of each of said units being covered with a lining and the inner and outer walls being separated thereby across the ends of said legs.

12. In a concrete wall mold, a pair of outer form walls held in spaced apart parallel relation to each other and core walls V-shape in cross section having their angles alternately adjacent opposite form walls and having their legs fastened to the form wall farthest from the wall at the angle.

13. In a concrete wall mold, a pair of outer form walls held in spaced apart parallel relation to each other and core walls V-shape in cross section having their angles alternately adjacent opposite form walls and having their legs fastened to the form wall farthest from the wall at the angle, and walls connecting the legs to form triangular cores spaced from the respective outer form walls.

14. In a concrete wall mold, a pair of outer form walls held in spaced apart parallel relation to each other and core walls V-shape in cross section having their angles alternately adjacent opposite form walls and having their legs fastened to the form wall farthest from the wall at the angle, and walls connecting the legs to form triangular cores spaced from the respective outer form walls, said legs having openings between the last two walls for the passage of concrete.

15. That process of setting and curing a poured concrete wall which comprises pouring the wet concrete, removing excess of water from the wall, preventing evaporation of the removed water into the atmosphere and returning the removed water to the face of the concrete to induce a better curing of the wall.

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