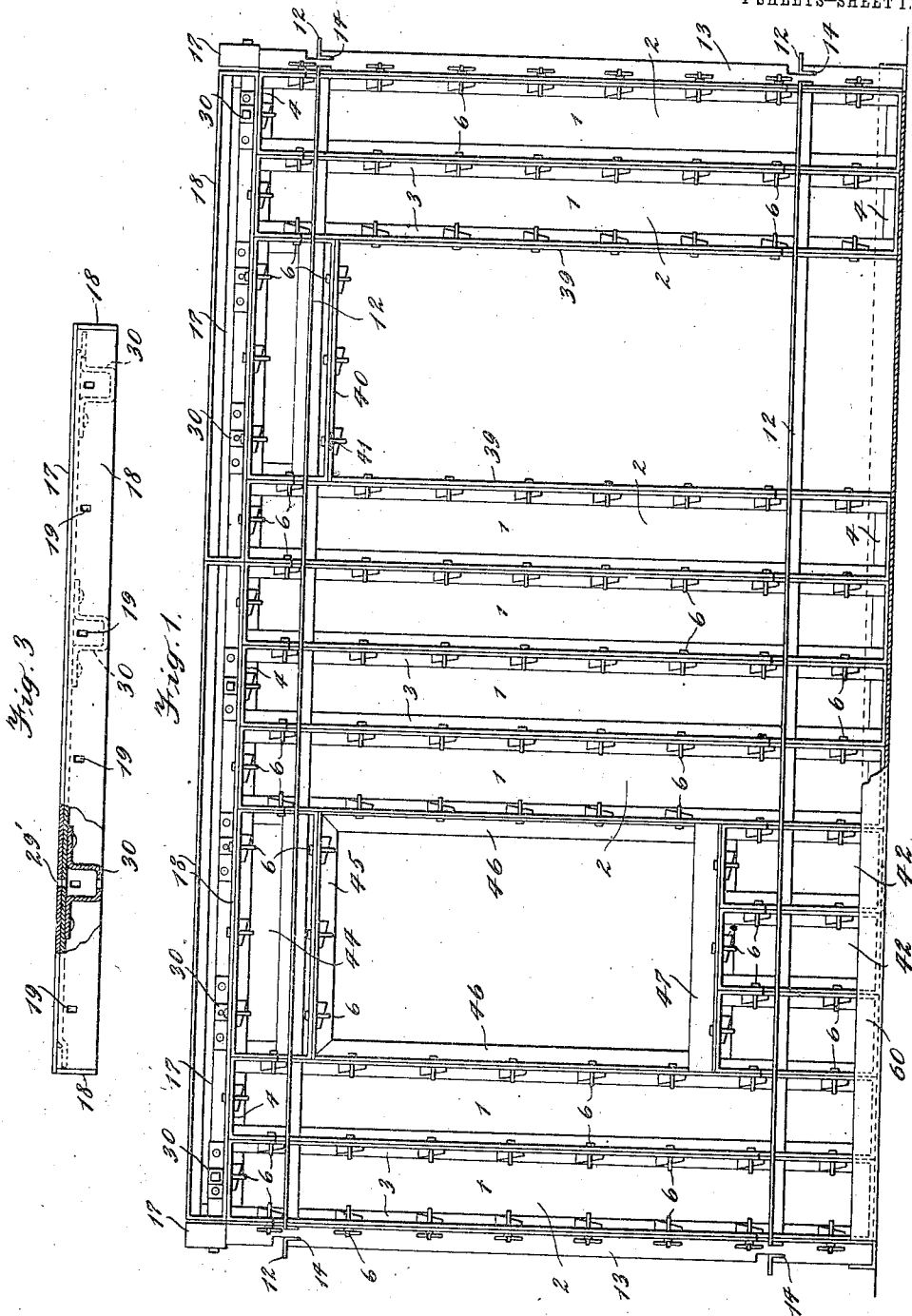


F. D. LAMBIE.
MOLD FOR BUILDING MONOLITHIC HOUSES.
APPLICATION FILED JULY 16, 1913.

1,122,771.

Patented Dec. 29, 1914.

4 SHEETS—SHEET 1.



Witnesses:
John C. LeMay
Henry M. M. M.

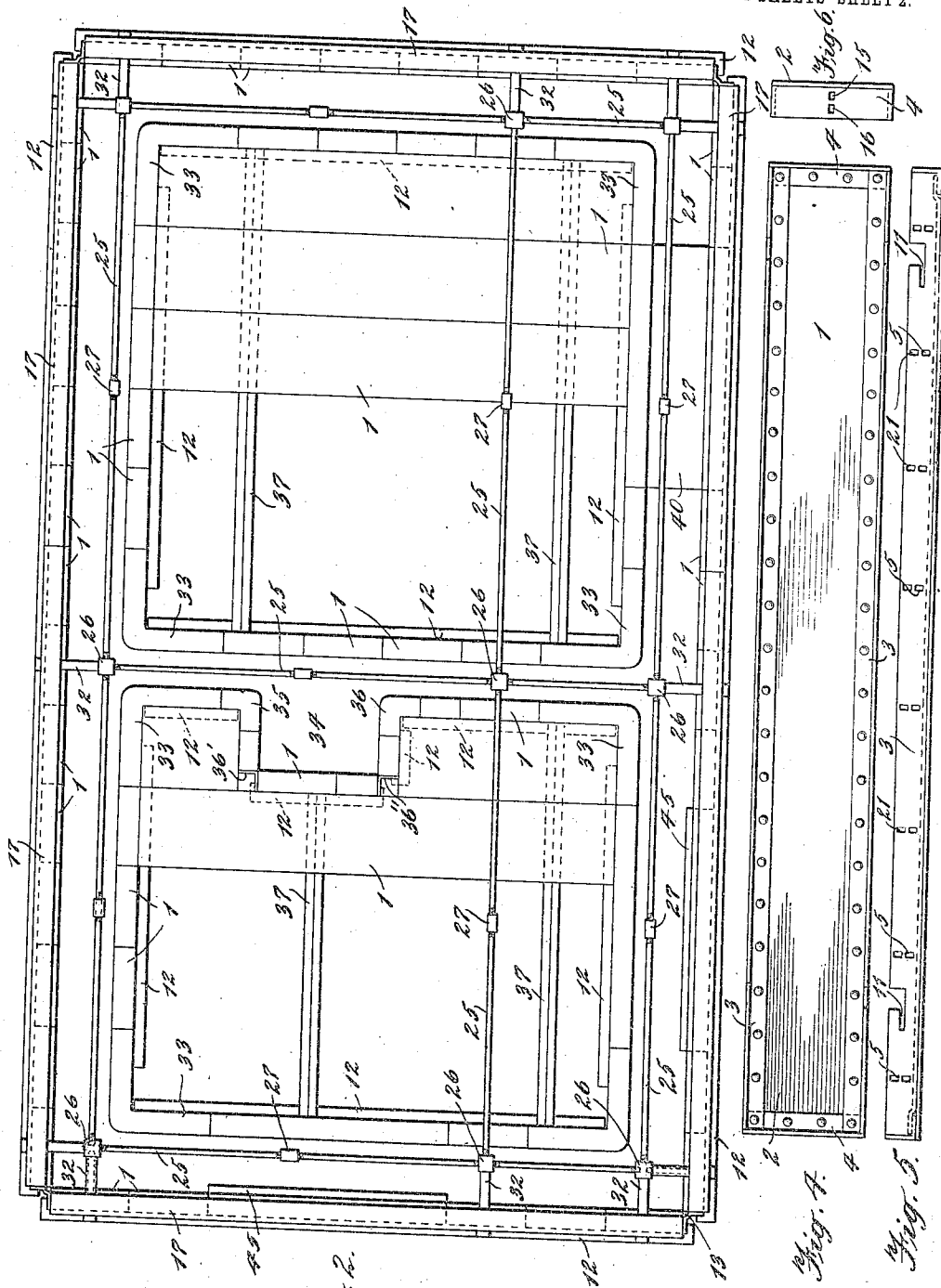
Frank D. Lambie Inventor
By his Attorneys
Rosenbaum & Stockbridge

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4 SHEETS—SHEET 2.



Witnesses:
Geo. C. Cheney,
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Fig. 2.

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Fig. 4.

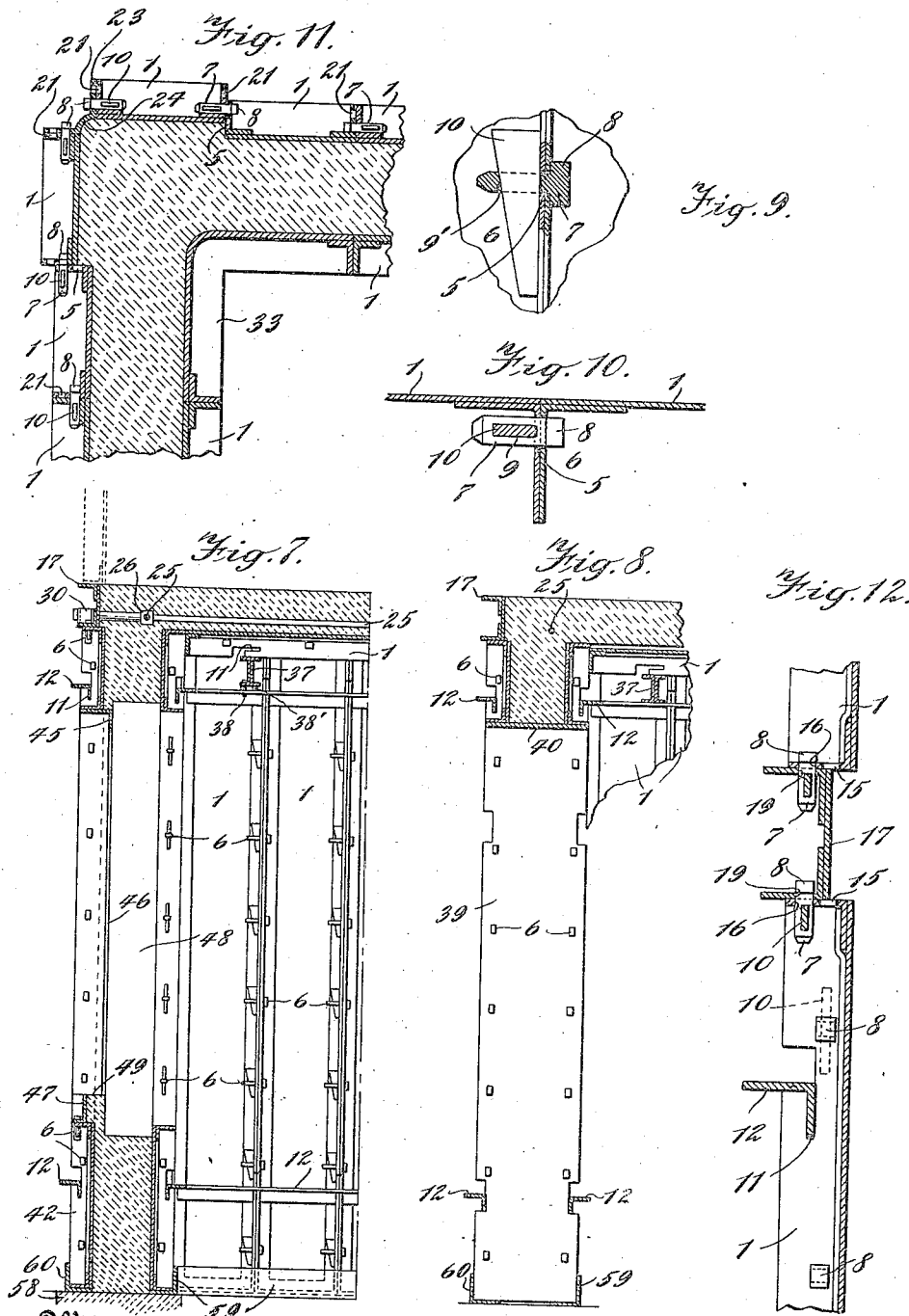
Fig. 5.

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4 SHEETS—SHEET 3.



Witnesses:
Geo. C. Cheney
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UNITED STATES PATENT OFFICE.

FRANK D. LAMBIE, OF UPPER MONTCLAIR, NEW JERSEY, ASSIGNOR TO LAMBIE BROTHERS CORPORATION, A CORPORATION OF NEW YORK.

MOLD FOR BUILDING MONOLITHIC HOUSES.

1,122,771.

Specification of Letters Patent.

Patented Dec. 29, 1914.

Application filed July 16, 1913. Serial No. 779,267.

To all whom it may concern:

Be it known that I, FRANK D. LAMBIE, a citizen of the United States, residing at Upper Montclair, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Molds for Building Monolithic Houses, of which the following is a full, clear, and exact description.

10 This invention relates to molds for the construction of concrete structures such as houses, buildings and the like, and has for its primary object the provision of a knock-down mold composed of metal panels or
15 mold plates which may be assembled in an entirely simple and expeditious manner to receive the concrete for casting one complete story of a building, including a floor, at a single pour.

20 Another object of the invention is to provide mold-plates which may be used interchangeably in the mold as wall or ceiling plates, or in the formation of the pilasters, cornices, belting courses and other various
25 ornamental features of the building, the standard plates being of uniform size and shape so that a building of any desired proportion and design may be readily constructed of standard plates which will automatically line as the exterior and interior
30 mold frames are assembled so that the proportions of the concrete buildings will be true and the supervision of a skilled engineer in the setting up of the mold frames
35 unnecessary.

Still other objects of the invention is the provision of means whereby the exterior and interior mold frames may be supported entirely independently of each other, the interior frame rigidly supporting itself by
40 virtue of the character of the mold plates used and the manner in which the plates are secured together, the exterior frame being supported by a minimum number of tie-rods connecting the opposite sides of the frame,
45 which tie rods are embedded in the floor of the house when the same is cast, whereby the use of numerous tie-pieces or rods, which are ordinarily used to connect the interior and
50 exterior frames is avoided; the provision of horizontal belting course plates which extend across and connect a plurality of the wall plates, the tie rods which support the exterior frame passing through these belting
55 course plates; and the provision of

means whereby the wall plates of the exterior frame which form the first story of the house, may be removed after the concrete walls for the first story have set and these plates used in the construction of the upper
60 stories of the house.

To clearly bring out the novel features of the construction I have shown and described a mold for constructing one complete story
65 of a two-room house, the door and window construction being claimed in my divisional application, Serial No. 822,741 filed Mar. 5, 1914.

Other objects of the invention will hereinafter appear, and the novel features thereof
70 will be pointed out in the claims.

In the drawings which form a part hereof, Figure 1 is a side elevation of the front outer wall of a mold frame for one story of
75 a two-room house; Fig. 2 is a plan view of the same; Fig. 3 is a side elevation partially in section of a belting course plate; Fig. 4 is an inner face view of a standard plate; Figs. 5 and 6 are side and end elevations of
80 Fig. 4; Fig. 7 is a vertical section through the interior and exterior molds showing the window construction; Fig. 8 is a vertical section through the interior and exterior molds showing the door construction; Figs.
85 9 and 10 show the fastening means employed for locking the plates together; Fig. 11 is a detail showing the pilaster corner and corner plate; Fig. 12 is an enlarged detail view showing the formation of the off-set
90 belting course; Figs. 13 and 14 are fragmentary details of the cornice construction; Fig. 15 is a fragmentary detail showing the supporting rods for the outer wall.

Like characters of reference designate like parts throughout the several views.
95

The exterior frame of the mold, as shown in Fig. 1, is composed principally of standard plates designated broadly 1. Each of these plates comprises a body 2 of sheet material, preferably steel, to which are riveted
100 or otherwise secured angle irons or L's 3 and 4, forming flanges of sufficient strength to withstand crushing in ordinary use. In practice, it is customary for me to make these plates 8 ft. by 1 ft. with an extending
105 flange of 3 inches, this size being chosen for convenience in lining up the outer and inner frames of the mold to bring the door openings and the like in exact alinement, as will be hereinafter described.
110

At intervals along the side flanges 3 are square apertures or holes 5 which are uniformly spaced in all of the plates so that the holes in abutting plates register when the surfaces of these plates are flush with each other. Through these holes fastening wedges 6 are passed, the same consisting of rectangular blocks or gibs 7, each of which has an enlarged head 8 and an elongated slot 9, one wall of which is beveled as at 9'. A wedge or key 10 is driven through the slot 9 in either direction. This action serves to draw the flanges together so that a close joint is formed between the flanges of two abutting plates, sufficiently water-tight to prevent ridges from forming in the wet concrete as the wall is being cast.

Substantially L-shaped notches 11 are cut in the side flanges 3, near their upper and lower ends, into which liner locks 12 are adapted to fit. These liner locks consist of rigid strips of angle-iron of the proper length to engage in the notches of the plates extending in a straight line, thus alining the plates and holding them in exact alinement. After the liner locks 12 have been applied the fastening wedges 6 are utilized for locking the parts of the mold structure rigidly in place.

The plates forming the corners of exterior frame are joined together by right-angled L's 13 having apertures 13' and notches 14 spaced uniformly with the apertures 5 and the notches 11 in the standard plates 1; the L's 13 being fastened to the plates by the wedges 6 and the liner locks 12.

The horizontal belting course is formed by belting course plates 17 each of which are superposed upon and extend across a plurality of the standard plates 1 forming the mold for the lower story of the house. These plates are constructed similarly to the standard plates 1 and have flanges 18 provided with square apertures 19, spaced at the same distance from the respective surfaces of the plates as are the apertures 5. As it is usually desirable to offset the belting course from the exterior wall of the house, two holes 15 and 16 are provided in the top and bottom flanges of each of the standard plates 1. The belting course plates are laid so that the holes 19 will register with the holes 16, two-part wedges 6 being used to firmly secure the plates together. The holes 16 are spaced at a greater distance from the surface of the respective plates in which they are formed than are the apertures 19, so that when the second row of standard plates is superimposed upon the plates 17, the desired offset is obtained, and as the holes 16 in each of the plates 1 are spaced equidistant from the surfaces of the respective plates, the outer wall of the first and second stories of the house will be in alinement.

If no offset is desired, the belting course plates are laid with their apertures 19 registering with apertures 15. These apertures 15 are located at the same distance from the surface of the plate, as are the apertures 5 in the side flanges of the plate, so that these apertures 15 and 5 may also be used when it is desired to fasten the plates together end to end with the respective surfaces of the plates flush.

The corners of the house may be cast to give a pilaster effect or the exterior walls may be ornamented with half columns by adding a second row of square apertures 21 (see Figs. 3 and 4) to the side flanges of some or all of the standard plates, which apertures are spaced from the apertures 5 a sufficient distance to give the required offset. When pilaster corners are constructed, it is evident that the two outer corners of the plates will not meet, which necessitates the use of a special corner L, 23 (see Fig. 11), the same being provided with a concave corner 24 having a radius corresponding to the distance which these plates are offset, thus giving a rounded corner which adds to the finished appearance of the building.

The means for rigidly supporting the exterior frame against spreading or lateral displacement comprises sectional tie-rods 25 extending longitudinally and transversely of the frame, the sections of the rods being connected by tie-blocks 26. Turn buckles 27 are threaded on the rods by which they are tightened after the frame has been completely set up. Short length sections 28 are connected to the tie-rods 25 adjacent the belting course plates 17 by the tie-block 26 (see Fig. 15). The outer ends of these sections pass through openings 29' in the belting course plates 17 which are provided with U-shaped strips 30 surrounding these openings, the strips 30 reinforcing the plates and preventing interference by the flanges of the plates when the heads 31 are being tightened. The rods 25 passing as they do from opposite sides of the exterior frame, will rigidly hold the same against lateral displacement while the concrete walls are being cast. After the walls have set, the short length sections 28 are backed off or unscrewed from the tie-blocks 26 and removed, but the remaining portions of the tie-rods 25, remain permanently embedded in the concrete and thus act as reinforcements for the concrete floor. A sleeve 32 surrounds each of the short length sections 28 and prevents the concrete from sticking to it thus permitting the ready removal of said section; the hole formed by the sleeve 32 being afterward filled with concrete. In practice, these rods 25 are spaced about 4 feet apart and are of small diameter, so that the holes when filled are practically invisible.

ble. The belting course plates and the tie-rods after the concrete has set are permitted to remain in position and form a supporting structure for the second tier of wall plates after the wall plates of the first story have been removed, as will be later referred to.

Referring to the construction of the frame for the interior casing which conforms to the general outline of the room and forms the inner surface of the walls and ceiling thereof, this casing is composed of standard plates 1, similar to those used in the construction of the outer casing of the mold, and corner plates 33. Each of the corner plates 33 is made of sheet metal having its surfaces at right angles to each other and provided with flanges corresponding to the flanges used in the standard plates. In practice, where standard plates a foot wide are used, I have found it desirable to make these corner plates either 6 inches or 15 inches wide on a side. These corner plates as well as the standard plates used in the construction of the interior casing are each provided with L-shaped notches for the reception of liner locking L's 12, similar to those used on the exterior of the frame. As each of the standard plates in a determined straight line is interlocked with a corner plate 13 which is rigid, it is evident that a rigid structure which is substantially a rectangular box having an open top and bottom, is formed which will not require any further means for rigidly sustaining the structure other than the liner locks 12 and the wedges 6. If desired, a space for chimneys may be left, as indicated at 34, which is formed of inside corner angle plates 35 and 36 and standard plates 1 which are joined together by outside corner L's 36' and 36'', respectively, each of the sections being interlocked with the others by means of liner locks 12. The core of the chimney would consist of fire tiling (not shown) which is adapted to remain permanently embedded in the concrete.

The ceiling is supported by means of I-beams 37 the ends of which are adapted to rest on the upper row of liner locks 12 and are held in place thereon by means of loose bolts 38 passing through holes in the liner lock 12 and the flanges of the I-beam. In practice, the holes in the liner locks are spaced about four feet apart, and the I-beams are laid parallel to each other. Upon these I-beams are laid the ordinary standard plates 1, the distance between the two walls of the casing being determined so that a number of standard plates will fit nicely between the flanges of the plates forming the inner surface of the wall.

Where one complete story, including the ceiling, is to be cast at a single operation, no provision has heretofore been made for the removal of the interior casing after the

concrete has set. In order to overcome this difficulty, I have made the distance between the top of the I-beams when they are in place on the top of the liner locks and the top of the standard wall plates of a distance slightly greater than the depth of the flanges of a standard plate, so that if the plates are laid directly upon the I-beams, the upper surface of the ceiling plates will not be flush with the top surface of the flanges forming the inner walls of the room (see Fig. 8). Blocks 38' of a thickness sufficient to raise these ceiling plates flush with the top surface of the I-beams, are therefore inserted beneath the ends of each of the I-beams, (see Fig. 7). After the concrete has set, these blocks are removed, permitting the I-beams to fall upon the liner locks and the ceiling plates to drop away from the concrete ceiling, after which the ceiling plates and I-beams may be readily removed.

Referring now to Figs. 1 and 7, which show the door construction, it will be seen that the same comprises side door plates 39 and top door plates 40, which are secured to the flanges of the plates of the interior and exterior frames by two-part tightening wedges 6 passing through square apertures 41, and apertures 5 in the exterior and interior frame forming a water-tight box around which the concrete will spread upon the pouring of the same, so that after the plates are removed, a door opening having finished walls will be produced. The door opening also has the added function of leaving an opening through which access may be had to the interior casing at all times, and through which the plates forming the side walls and ceilings of the interior casing may be removed after the concrete has set.

For the window openings and sills, short length plates 42 (shown in Fig. 1) are aligned and locked with the standard plates in the usual manner and a special window plate 44 is placed horizontally and flush with the top surface of the wall plates 1. Top and side reveal plates 45 and 46 are fastened to the side flanges of the standard plates, these plates being right angle L's formed with the free leg of the L extending into the wall space as shown in Fig. 7. A bottom reveal plate 47 is fastened to the top of the plates 42 and is of less width than the width of the flanges of these plates, thus providing an offset which forms the lip projection of the window sill. A window frame 48, such as is commonly used, is placed between the interior and exterior mold frames and is held in place by screws passing through the top and side reveal plates 45 and 46. When the concrete is poured, it will pack solidly around the window frame and hold it in place after the removal of the mold. Due to the offset of the

bottom reveal plate, a small space or opening 49 is left through which in the casting of the walls the concrete is poured to fill the intervening U-shaped space which would otherwise occur under the window frame, due to the tendency which the concrete has to pack when it is forced upwardly by the mass of concrete above and on both sides of it. Sufficient concrete is added to bring the concrete level with the top of the bottom reveal plate where it is troweled off, forming a projecting window sill, offset from the main wall of the house.

The cornice of the house is formed as shown in Figs. 13 and 14. A plurality of angularly shaped brackets or scaffolds 52 consisting of two lengths of angle iron pivoted together are spaced around the exterior frame about 4 ft. apart. Apertures or bolt holes are provided in the lower flange of the belt course plates and in the side flanges of the wall plates. Corresponding bolt openings are provided in the free ends of the legs of the scaffold which are placed in position so that corresponding openings will align and be held firmly in place by bolts 53 and 54. Standard plates 51 are fastened together in the usual way and are secured to a row of belting course plates 56 to give the desired width and thickness to the cornice. The horizontal arms of the scaffold brackets 52 are formed of just sufficient width to bring the top surface of the plates 51 flush with the top flanges of the belting course plates 17. It is evident that where standard plates are joined together in this manner, a small space 57 is formed by the junction of the plates which may be filled in any desired manner before the concrete is poured. The cornice may be constructed of any desired dimensions depending upon the number of standard wall plates and belting course plates used.

The method of constructing the mold frame is to assemble the interior casing before the exterior wall frame is placed in position. First the usual footing course 58 is constructed of concrete of dimensions to correspond to the architect's plans. Footing course angle L's or plates 59 (see Fig. 7) are laid upon the footing course and leveled up, forming rectangles of a size corresponding to the desired room, with the up-standing legs of the L's facing inwardly. Preferably an inside corner plate 33 is first placed in position and the standard plates are then placed along the footing course L with the surfaces of the plates facing outwardly, the liner locks 12 are then positioned in the notches 11 in the top and bottom of the plates, which will insure that the outer surfaces of the plates are in exact alignment and the plates securely locked together by the wedges 6. Other sections of the frame of the interior casing are

assembled in the same manner, forming a rigid box open at the top and bottom, which needs no additional supporting means from the outside to insure its rigidity. Similar footing course angle L's 60 are provided for the outer frame which are leveled up as before and upon which the standard plates 1 are assembled. The inner plates acting as guides for properly positioning the outer plates, due to the fact that all of the plates are standard size. For example, if a 9-inch wall is desired, it is only necessary to align the edge of the second plate with the edge of the 15-inch corner plate which leaves 9 inches for the wall. The window and door openings are aligned in the same manner, for after the first plate adjacent a corner is properly aligned, then the window openings and door openings are properly formed by using similar plates on the interior and exterior frame. After the wall sections of the exterior casing have been properly set up, the belting course plates and the supporting tie-rods 25 are firmly secured in place, giving a rigid exterior frame which is entirely independent of the interior casing. Scaffolds 52 are then erected on the exterior frame and a temporary platform of standard plates placed thereon, upon which the workmen stand to place standard plates on the supporting I-beams 37 which have been positioned in place from the interior of the casing, the blocks 38 having been placed beneath the I-beams as has been previously described. Obviously where the window frame and door plates have been assembled as described, the mold is ready to receive the concrete to cast one complete story including the floors, door openings, windows, sills and the like in one pour. Concrete is then poured into the mold and over the ceiling plates almost flush with the upper flanges of the belting course plates, where it is troweled off leaving the edge of the belting course projection above the level of the concrete a slight distance, which in practice is usually about $\frac{1}{8}$ of an inch. The concrete is allowed to set, and if it is desired to build a second story, standard wall plates are secured by tightening wedges to the top flange of the belting course plates 17 as has heretofore been described, and since the holes are at uniform distances, the surface of the upper set of wall plates will be flush with the surface of the concrete wall which has been cast. It may here be stated that the wall plates which are used in the exterior frame for the second story may be the same as those which are used in the first story, since by removing the footing course angles 60, the wall plates of the first story may be removed and superposed upon the belting course plates in the manner described. Since the belting course plates are rigidly sup-

ported against the concrete walls after the same has been cast by the tie rods, these belting course plates will form a supporting structure of sufficient strength to sustain the wall plates of the second story in position. Thus it will be seen that to construct a house of several stories, practically the same number of wall plates is required for constructing a house of one story which will materially reduce the initial cost of the molds, since a materially less number of plates need be provided, which, owing to their construction, are relatively expensive. Footing course angle L's are then laid upon the newly formed concrete floor and it is for this reason that the floor is not brought into exact level with the upper edge of the belting course plates, the distance between them corresponding to the thickness of the footing course angle L's which will bring the top surface of the outer and inner plates in exact horizontal alinement. A new interior casing is built as before, except in this instance the outer frame plates act as guides to insure the alinement of the plates of the inner frames, which, being standard size, will aline as before. The ceiling pilasters and cornices are added in the manner already described, and other ornamental features may be if desired.

In removing the interior casing, the blocks 38 beneath the I-beams 37 are first removed, permitting the ceiling plates to rest loosely on the I-beams which are then removed by turning them obliquely to the liner locks upon which they rest. The ceiling plates then fall and are removed. To remove the side walls, the footing course angle L's are first knocked from beneath the bottom of the plates, which will give sufficient play to the side wall plates to permit them to be tilted sidewise and removed through the door or window openings. The manner in which the exterior is removed is obvious from the preceding description.

Having thus described my invention, I claim:—

1. In a knock down mold for concrete structures, a plurality of separable units adapted to be assembled to form a mold frame, means for securing said units together, each of said units comprising a mold plate having marginal flanges, said flanges having alined locking notches therein adapted to receive a liner lock.

2. In a knock down mold for concrete structures, a mold frame comprising a plurality of mold plates having flanges abutting, means passing through said flanges for securing said plates together, said abutting flanges having registering locking notches therein and a liner lock fitting into said notches for locking the plates against relative lateral movement.

3. In a knock down mold for concrete

structures, a mold frame comprising a plurality of wall plates having marginal flanges, said plates being arranged with their flanges abutting, the abutting flanges having registering L-shaped locking notches therein and a liner lock comprising a strip of L-shaped angle-iron fitting into the notches of a plurality of plates and holding the same against relative lateral movement.

4. In a knock down mold for concrete structures, a mold frame comprising a plurality of mold plates having marginal flanges and arranged with their flanges abutting, the abutting flanges having registering apertures, means passing through said apertures for drawing the flanges of said plates together to form a tight joint between the same, said abutting flanges having locking notches therein, and a liner lock fitting into the notches of a plurality of plates for maintaining said plates with their surfaces in a fixed relation to each other.

5. In a knock down mold for concrete structures, a mold frame comprising a plurality of mold plates having marginal flanges and arranged with their flanges abutting, said abutting flanges having registering apertures, means passing through said apertures for drawing the flanges of said plates together to form a tight joint between the same, said abutting flanges having locking notches therein, and a liner lock fitting into the notches of a plurality of plates for maintaining said plates with their surfaces in a fixed relation to each other, said locking notches being arranged to bring the surfaces of the plates flush.

6. In a knock down mold for concrete structures, a mold frame comprising a plurality of vertically-disposed rectangularly-shaped mold plates having marginal flanges, said plates being secured together with their side flanges abutting, the top flange of each of said plates having a plurality of apertures therein arranged at different distances from the surfaces of said plates, and a horizontally-disposed plate extending across and connecting several of the vertically-disposed plates, said horizontally-disposed plate having marginal flanges with apertures therein which apertures are adapted to register with the apertures in the top of the vertically-disposed plates to form a belting course flush or offset with respect to the surface formed by the vertically-disposed plates.

7. In a knock down mold for concrete structures, an exterior frame for completing one story of a building including the cornice, said frame being composed of a plurality of vertically-arranged standard plates having marginal flanges, means passing through said flanges for securing said plates together, horizontally-disposed flanged belting course plates mounted on said vertically-disposed plates and extending across and

connecting several of the vertically-arranged standard plates, other standard plates having marginal flanges arranged at right angles to the wall plates and abutting the belting course plates for forming the cornice of the building, and means for supporting said plates forming the cornice.

8. In a knock down mold for constructing one complete story of a monolithic building, an exterior frame composed of a plurality of rectangularly-shaped vertically-disposed plates of a height to form substantially one story of the building, horizontally-disposed belting course plates extending across several of said vertically-disposed plates and rigidly secured thereto, means for securing a second row of wall plates to said belting course plates in vertical alinement with the wall plates of the first story.

9. In a knock down mold for constructing one complete story of a monolithic building, an exterior frame composed of a row of vertically-disposed wall plates having marginal flanges, a horizontally-disposed plate extending across several of said vertically-disposed plates, said horizontally disposed plate having marginal flanges secured to the top of said wall plates along one of the side flanges thereof, the opposite flange of said horizontally-disposed plates adapted to support a second row of vertically-disposed plates and means for securing a second row of plates to said horizontally-disposed plate with the surfaces of the plates in the two rows in alinement.

10. In a knock down mold frame for constructing one complete story of a monolithic building including a floor, an exterior frame composed of vertically-disposed rectangularly-shaped mold plates of sufficient height to form one story of a house, an interior casing having walls composed of similarly disposed mold plates and ceiling plates supported by said wall plates, the interior frame having substantially the form of an inverted box, belting course plates extending across and secured to the top of several of the mold plates of the exterior frame, and tie-rods passing through said belting course plates above said ceiling plates and adapted to hold the exterior frame against displacement, said interior frame being self-supporting and entirely independent of the exterior frame.

11. In a knock down mold for constructing one complete story of a monolithic con-

crete building, an exterior frame composed of a plurality of vertically-disposed rectangularly-shaped mold plates rigidly secured together in substantially the form of a hollow rectangle, horizontally-disposed belting course plates extending across and secured to the tops of several of said wall plates, and means comprising tie-rods connecting the belting course plates of different sides of the frame said tie-rods being adapted to be permanently embedded in the concrete floor of the building when cast.

12. In a knock down mold for constructing one complete story of a monolithic building, an exterior frame having substantially the shape of a hollow rectangle and composed of vertically-disposed rectangularly-shaped mold plates rigidly secured together, belting course plates extending across and secured to several of said wall plates, a self-supporting interior mold frame having substantially the form of an inverted box and composed of separate mold plates rigidly secured together, said frame being adapted to support the concrete floor when cast, tie-rods connecting the belting course plates of different sides of the frame, said tie-rods being permanently embedded in the concrete floor of the building upon the casting of the same and rigidly supporting the belting course plates against the wall of the building.

13. In a knock down mold for constructing one complete story of a monolithic concrete building including a floor at a single cast, an exterior frame comprising alternate rows of vertically disposed wall plates and horizontally disposed belting course plates extending across several of said wall plates, said wall plates initially supporting said belting course plates, and separate means for supporting said belting course plates adapted to be embedded in the concrete of one story of the building when cast, said belting course plates being adapted to support the succeeding row of wall plates whereby the row of wall plates below the same may be removed and used in the construction of the upper stories of the building.

In witness whereof, I subscribe my signature, in the presence of two witnesses.

FRANK D. LAMBIE.

Witnesses:

WALDO M. CHAPIN,
JULE ZELENKO.