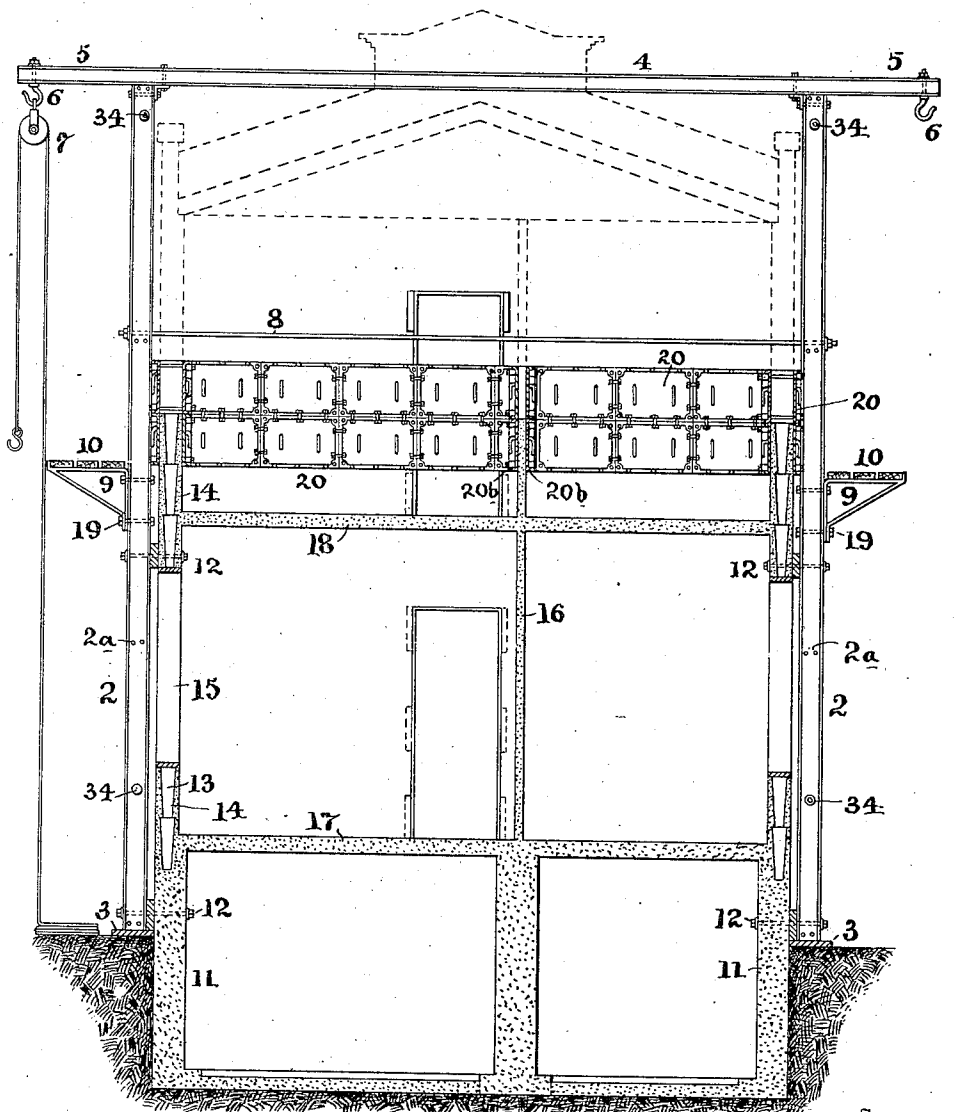


P. WEBER.
 APPARATUS FOR ERECTING CONCRETE STRUCTURES.
 APPLICATION FILED FEB. 11, 1909.

976,960.

Patented Nov. 29, 1910.

3 SHEETS—SHEET 1.



Inventor

FIG. 1

Peter Weber

Witnesses

Daniel Webster, Jr.
 R. M. Kelly.

By

[Signature]

Attorney

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3 SHEETS-SHEET 2.

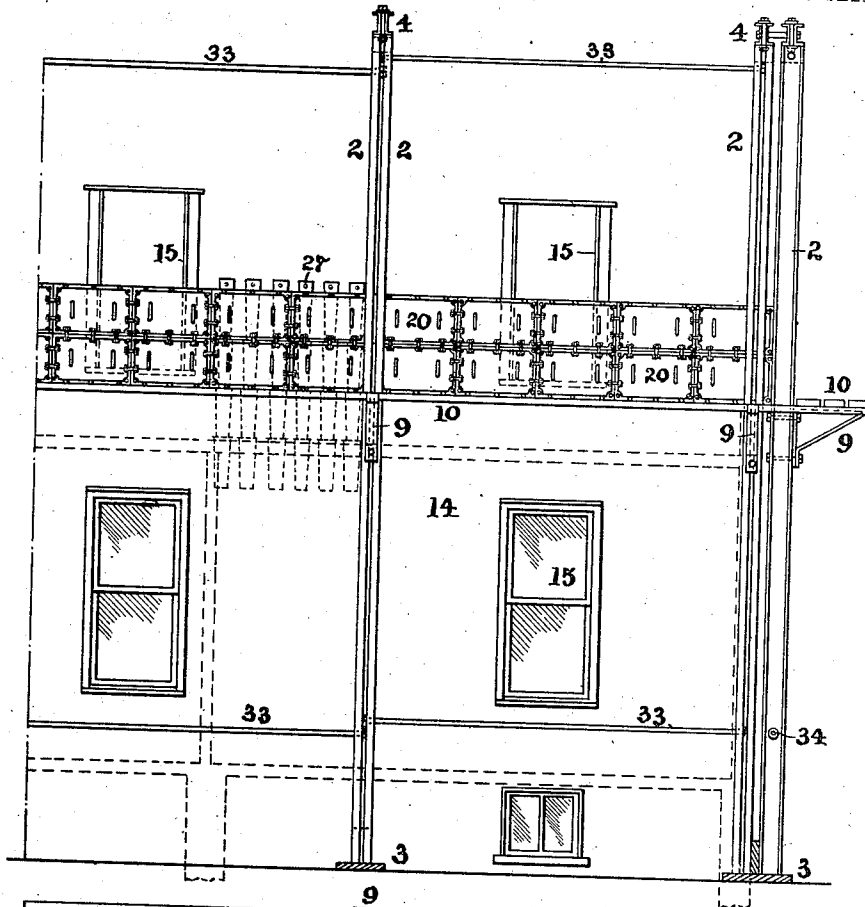


FIG. 2

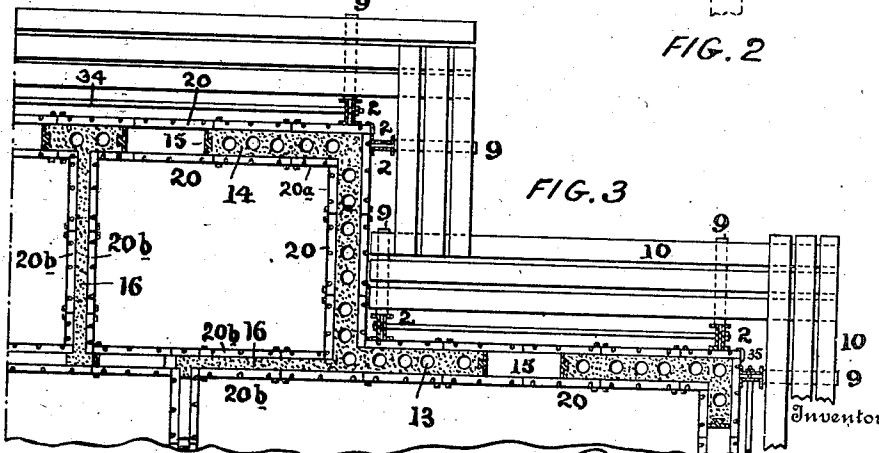


FIG. 3

Witnesses

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 R. M. Kelly

Peter Weber

By

[Signature]

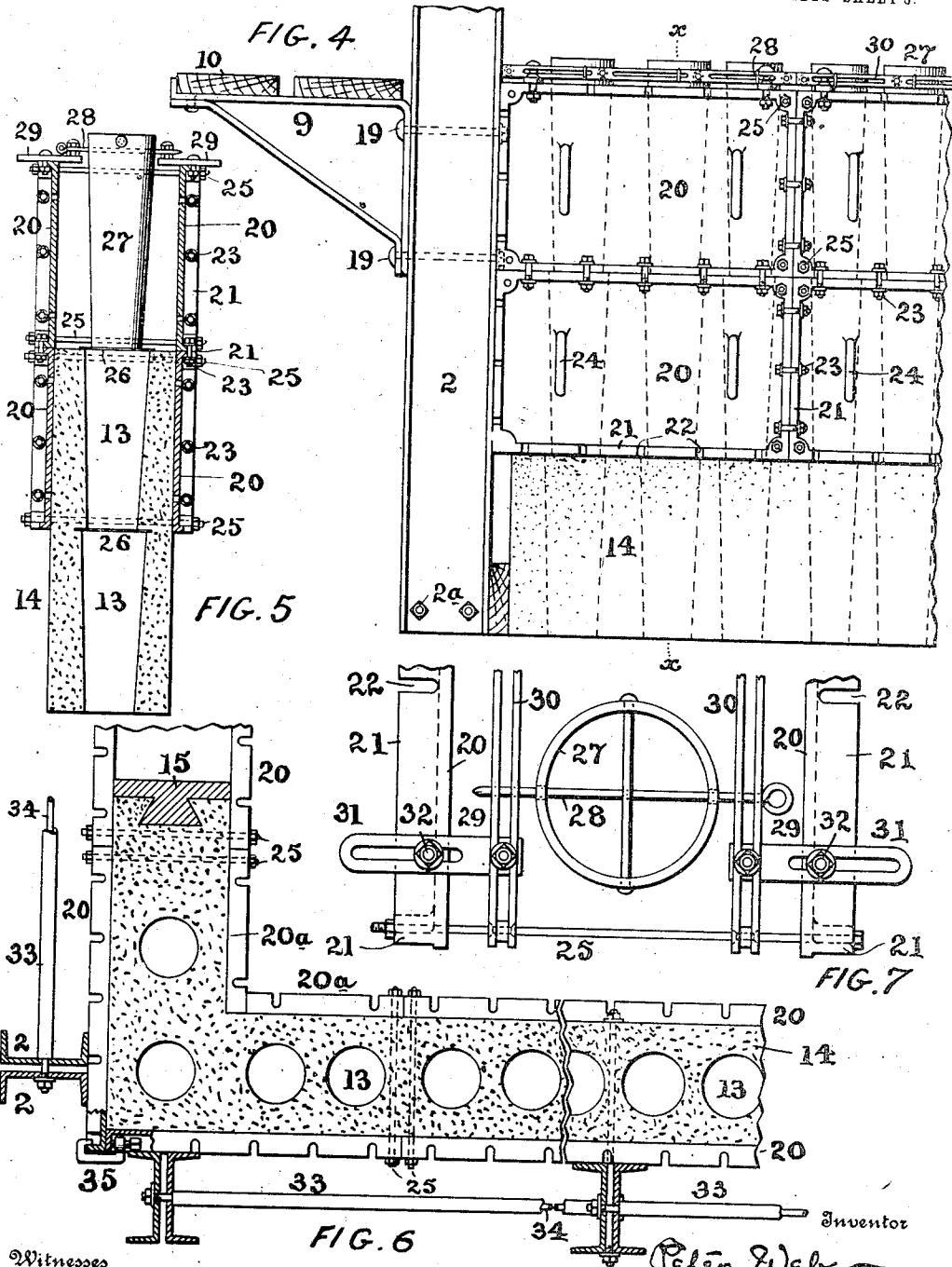
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3 SHEETS—SHEET 3.



Witnesses
 Daniel Webster, Jr.
 R. M. Kelly.

384

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UNITED STATES PATENT OFFICE.

PETER WEBER, OF ORANGE, NEW JERSEY.

APPARATUS FOR ERECTING CONCRETE STRUCTURES.

976,960.

Specification of Letters Patent. Patented Nov. 29, 1910.

Application filed February 11, 1909. Serial No. 477,338.

To all whom it may concern:

Be it known that I, PETER WEBER, a citizen of the United States, and resident of the city of Orange, county of Essex, State of New Jersey, have invented an Improvement in Apparatus for Erecting Concrete Structures, of which the following is a specification.

My invention has reference to apparatus for erecting concrete structures, and consists of certain improvements which are fully set forth in the following specification and shown in the accompanying drawings which form a part thereof.

The object of my invention is to enable the construction of concrete buildings in an accurate, and at the same time, inexpensive manner, and more particularly to obviate the necessity for employment of skilled labor in the actual work of forming the walls.

My invention has further for its object the provision of apparatus which may have such a construction that it may be assembled to suit various designs or shapes of buildings to be erected, whereby the cost heretofore required for special forms or molds and wasteful scaffolding may be largely eliminated, and the finish of the surface of the walls be more perfect and uniform.

In carrying my invention into practice I first erect upon the ground, upon which the building is to be erected, a temporary metal frame-work having a series of vertical guide members suitably braced together by ties and beams, and these guide members are so disposed as to location that they will be parallel and close to the outer surface of the walls which are ultimately molded in concrete. Adjustably supported upon these vertical members are brackets which support foot-ways or platforms, upon which the workmen stand and by which they are enabled to follow up the work from the outside of the building. In conjunction with this temporary framework I employ a large number of metallic mold plates which are temporarily bolted together to constitute flat mold forms adjacent to the vertical members of the inclosing frame structure, and to conform to what will be the outer boundary surface of the walls. In conjunction with the said mold plates I provide a second set of mold plates likewise bolted together and

parallel to the outer set and connected to them by suitable transverse bolts so as to provide a vertical space between said mold plates which shall equal the thickness of the wall to be formed in concrete. Between these mold plates are also placed the frames for the doors or windows, as the case may be, and up to and in contact with which the concrete is cast. In such cases the frames would constitute ends to the molds. Where it is desired to make the walls hollow, I provide removable tapered cores, or cores of other forms, which are temporarily placed between the mold plates and about which the concrete is cast, these tapered cores being withdrawn when the concrete is set. In the case of the formation of the inner or division walls between the rooms, the spaces between the mold plates may be less, and the mold plates themselves, will be coupled and connected in a similar manner to the mold plates in the outer wall. The mold plates when coupled together may constitute a mold of approximately five feet high so that each cast of concrete may extend the wall to a higher elevation equal to two and one-half feet, beginning at the bottom of the foundation.

The mold forms are made in sections and arranged in tiers two high, to enable the following operation in the building up of the walls to be followed, namely: Assuming one layer of forms to be in proper position and bolted together by the transverse bolts, the cement is first cast to the height of approximately two and one-half feet and around the transverse bolts. When this is done, the tapered core tubes (where the wall is to be hollow) are removed and the second set or tier of mold plates is placed upon the first set or tier and bolted in position, and the inner and outer sets of plates are likewise bolted together by transverse bolts to prevent spreading. The tapered cores are again placed in position between the upper set of form plates, and the second casting is made, raising the concrete wall to the extent of a further height of two and one-half feet. When this is done, the lower mold plates are disconnected from each other and from the upper plates, the transverse bolts withdrawn and said plates are arranged above what were the upper tier of mold plates in the previous casting. After the mold plates of

the upper tier are bolted together and to the plates of the lower tier, and the inner and outer mold plates connected by transverse bolts, the casting of the concrete is repeated 5 and so on, until the proper height of the wall is secured. During these casting operations the transverse bolts of the tier below coupled with the friction of the lower mold plates upon the concrete, support the said mold 10 plates as well as the second set or upper tier of mold plates erected above them. In this manner the concrete itself is relied upon to support the mold plates, not only for the outer walls, but also for the inner walls, and 15 the vertical members of the frame structures not only enable the workmen to be always supported in proper working position, but also act as guides to insure the proper vertical building up of the walls by the mold 20 plates. With respect to the inner division walls, the workmen may reach them by walking upon boards or planks extending from the outer mold plates to those constituting the molds for the inner walls. It is also 25 evident that during these building operations provision may be had for forming the floors and ceilings in concrete, but this invention will be confined to the means for the erection of the walls themselves, leaving 30 the structure of the ceilings, floors and roofs to be made in any suitable manner that may be preferred.

While the foregoing general statement of the nature of the invention defines the general features of my improvements, my invention comprehends details of construction which, together with the above general features, will be better understood by reference to the drawings, in which:

40 Figure 1 is a cross sectional elevation of a concrete structure and apparatus for its construction embodying my improvements; Fig. 2 is a side elevation of a portion of the same; Fig. 3 is a sectional plan view of a 45 portion of the same; Fig. 4 is an enlarged elevation showing my improvements in detail; Fig. 5 is a sectional elevation of the same on line $x-x$; Fig. 6 is a plan view of the same, and Fig. 7 is a plan view of details on a larger scale showing the manner of 50 supporting the tapered mold tubes or cores.

A selection having been made upon which to erect the house, a suitable excavation is made and the concrete foundations built 55 thereon in any suitable manner, as indicated at 11 in Fig. 1. When this is done, there is erected about the said foundations an upright frame work or scaffolding of steel beams and rods. More specifically, this 60 superstructure consists of upright channel beams 2 secured together at intervals by spacing bolts 2^a, or otherwise, so that there is a slot between the two uprights as indicated more fully in Fig. 6. These upright 65 channel irons 2 may rest upon foot plates 3

of stone, wood or metal. The uprights 2 are arranged at a distance of about three inches from the outer face of the concrete wall. They may be connected or braced by longitudinal tie-bolts 34 inclosed in spacing tubes 70 33, and also by transverse temporary tie-bolts 8 (Fig. 1), which latter are employed and adjusted adjacent to the actual work of casting the wall, as more fully explained hereinafter. To the extreme upper ends of 75 the upright beams 2 may be secured cross beams 4 extending entirely across the building and providing overhanging portions 5 to which hooks 6 may be attached as a support for block and tackle devices 7 of any 80 suitable character for lifting the materials to the level where they are to be employed. To provide platforms upon which the workmen may stand during the operation of building the walls, brackets 9 may be ad- 85 justably bolted to the upright beams 2 at 19, and these brackets may support or be secured to timbers 10 which extend from bracket to bracket, and constitute platforms for the workmen. The bolts 19 extend 90 through the slots between the adjacent beams 2, so that said brackets may be adjusted vertically to any position desired so as to follow the work upward as it progresses. In Figs. 1 and 2 the concrete build- 95 ing is completed about two-thirds upward and consists of the outer concrete walls 14, the inner concrete walls 16 dividing the rooms, and the combined floors and ceilings 17 and 18. The parts 15 represent doors or 100 windows and constitute framings which are held in place by the concrete. The parts 13 represent hollow parts or spaces within the walls for lightening them, and at the same time for forming vent passages from the 105 bottom to the top. To prevent the upright beams 2 from spreading at the bottom they may be bolted to the concrete foundation by bolts 12 and suitable spacing blocks between, as clearly indicated in Fig. 1. As the work 110 progresses upward, and where the casting of the concrete is at considerable distance above the ground, the upright beams may, if desired, be tied to the concrete walls by additional bolts and spacing blocks 12, as 115 also clearly indicated in Fig. 1. In this manner the upright beams 2 are maintained in vertical form by being held against springing outward under any outward strains which might be put upon them. The man- 120 ner of molding the walls is the same from the foundation upward, and therefore, a description of the manner of molding at the levels indicated in Figs. 1 and 2 will suffice for all portions of said walls, as the build- 125 ing up of the wall is accomplished by repetitions of the same molding operations.

20 represents mold plates which are all substantially alike, and are bolted together to form an outer shell which would be guid- 130

ed against the inner faces of the upright beams 2 and corresponding in plan to the irregularities of the house as shown in Fig. 3. Parallel to the outer shell form of the plates 20, there would be formed an inner shell by similar plates 20, but in those cases where there would be also constructed inner concrete walls 16 between the rooms, the inner shell of the plate 20 will be combined with similar plates 20^b to form molds in which to cast the inner wall 16, as will very clearly be understood by reference to Figs. 1 and 3. All of the plates 20 and 20^b are of similar construction, and the shorter plates 20^a are also of similar construction excepting as to their length, and consequently, it is only a matter of adjusting these plates one to the other and bolting them in position to enable the mold in which to cast the concrete to be made to suit any general plan of the building. These various mold plates 20, 20^a, and 20^b consist of flat or other surfaced plates provided on their outer edges with flanges 21 having notches 22, so that said plates may have their flanges butted together and be secured in built-up forms by bolts 23 placed in the notches 22. By employing notches it is not necessary to remove the nuts from the bolts when it is desired to detach the plates. These mold plates may be provided with handles 24 of any suitable construction by which they may be lifted or adjusted by the workmen. These mold plates are, during the casting operation, built in two tiers, as indicated in the various figures, and from Fig. 5 it will be seen that the lower tier will be inclosing the concrete wall 14 last cast, and it will also be noted that this lower tier of plates 20 will be held to the concrete and supported by it by transverse bolts 25 which pass entirely through the concrete at the corners of the plates 20. It is evident that these bolts might be arranged to pass through any other portion of the plates 20 if so desired. It will also be observed from Fig. 5 that the upper tier of mold plates 20 are bolted upon the lower tier by bolts 23 and constitute an open mold in which the fresh concrete is to be cast. No matter how high up on the wall the casting operation is being carried on, the upper tier or mold will be supported upon the lower tier, and the concrete wall itself. After the concrete is cast to the level of the upper part of the upper plates 20, and set so as to firmly support the said plates, the bolts 23 connecting the lower plates with the upper plates are removed, and also the bolts 23 connecting the adjacent lower plates. The nuts of the bolts 25 are then removed and the lower plates 20 withdrawn and then placed on top of what were the former upper plates and secured in position to form a new mold for another section of the wall. When this last adjustment

is accomplished, the parts will be in the position indicated in Figs. 4 and 5. It is, of course, understood that after plates 20 have been placed in the elevated position to form a new mold above the concrete wall the transverse bolts 25 may be driven from the concrete and again placed in position between the opposite plates 20 and the nuts applied to prevent them spreading, and also to provide proper support for said plates after casting and when removing the lower plates to build up the mold once more.

Where it is desired that the walls 14 shall be made hollow, this may be accomplished by inserting in removable core pieces around which the concrete is cast. In the particular form preferred, because of its simplicity, I make these cores of tapered tubes 27 and support them in rows between the inner and outer plates 20, and about which cores the concrete may be cast. When the concrete is sufficiently set these tubular cores may be withdrawn. The same cores 27 may be used over and over again with each new casting of the upper section of the wall. To prevent the flow of the concrete into the hollow spaces 13 and below, and previously formed by the same cores, I may provide thin sheet metal plates 26 covering the previously formed holes 13 at the top. It is, of course, evident that these plates may be solid, and thereby give to the wall a cellular structure or they may be perforated to enable the space 13 to have communication from the bottom to the top of the wall.

As a simple means of adjusting and supporting the tapered cores I may provide the top of the upper plates 20 with adjustable frames 29 consisting of longitudinal slotted bars 30 adjustably clamped to slotted brackets 31 bolted by bolts 32 to the slotted portions of the upper flanges 21 of the plates 20; and provide further, transverse pins 28 extending through the opposite slotted bars 30 and upon which pins are suspended or supported the tapered tubular cores 27. This construction for supporting the cores is fully illustrated in Figs. 4, 5 and 7.

While I have shown the simplest form of cores, it is to be understood that cores, collapsible or otherwise, may be employed for forming hollow walls if so desired, and therefore, while preferring the form of core shown I do not restrict myself thereto. It is also evident that by the construction of core and support therefor herein illustrated, I may form the tubular spaces 13 as close together or far apart as desired, to suit the requirements as to lightness and ventilation.

Where the outer plates 20 meet to form the corner of the building, it will not be convenient to bolt them together, and consequently at these plates I prefer to connect them by suitable clamps 33 by which the flange on one of the plates may be clamped

against the molding face of the other plate as clearly indicated in Fig. 6.

In those spaces of the walls, whether the outer walls 14 or the inner walls 16, where the windows or doors are to be provided, I form the frame of the window or door, whether of wood or metal, of the width of the wall, so that it is clamped between the inner and outer plates 20 or between two opposing plates 20^b, as indicated in Figs 2, 3 and 6, and cast the concrete up against the said frame as an end of the mold. Dove-tailed portions may extend from the said window or door frames around which the concrete may flow and set to hold them rigidly to the concrete as shown more fully in Fig. 6, and as indicated in dotted lines in Fig. 1. It will be understood that the bolts 8 for connecting the opposite vertical beams 2 would be adjusted from time to time so as to be at all times just above the mold plates and adjacent to the fresh concrete being cast, as indicated in Fig. 1, the function of said bolts being to take up the outward strain which might be put upon the upright beams 2 due to the outward pressure of the concrete and the strains which would be caused by the heavy mold plates where they extend entirely across the building in forming the inner walls.

It will be understood that by use of my improved apparatus, a building of any reasonable height may be constructed and without the necessity of employing an excessively large plant for mixing and supplying the concrete, nor in requiring the employment of a large number of men, as is necessary where the complete walls of the house are all cast at one operation. Furthermore, by employing a systematic arrangement of parts whereby accuracy and adaptability of the same may be had to suit any shaped house, it is possible to secure the finest results with the employment of the least number of men, and moreover, with men of less skill since it is practically impossible to make an error in erecting the walls of a building with the employment of devices of the character herein set out.

By the employment of a superstructure or frame-work within which and by means of which to carry on the construction of the concrete walls, the cost of such construction is greatly reduced and the accuracy of the work is insured. Furthermore, this outer frame-work eliminates the necessity of erecting costly and undesirable scaffolding which has heretofore been necessary. When the building is completed this outer framing is dismantled and carefully taken down and used indefinitely for erecting other buildings, and consequently the only cost is in the preliminary erection and removing of this framework. The great advantage of its use lies in the fact that it not only insures accu-

racy in the erection of the building, but also facilitates such erection and, in connection with the mold plates and the method of manipulation, permits the employment of less experienced labor than otherwise would be necessary in accomplishing the erection of any given building.

While I have described the construction of apparatus which I prefer, it is to be understood that the details thereof may be modified without departing from the spirit of the invention.

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

1. In apparatus for erecting concrete structures, the combination of a temporary framing comprising a series of upright members forming vertical guides connected and braced together and arranged to provide an unobstructed space bounded by the said temporary framing within which the building is to be constructed, and mold forms arranged within the said space bounded by the upright members and guided and supported thereby and consisting of two tiers of molds, each tier composed of a series of detachable mold plates connected end to end, and the plates of the two tiers connected respectively by their tops and bottoms and arranged to be alternately secured to and above each other as the concrete wall is increased in height.

2. In apparatus for erecting concrete structures, the combination of a temporary framing comprising a series of upright members forming vertical guides connected and braced together and arranged to provide an unobstructed space bounded by the said temporary framing within which the building is to be constructed, vertically adjustable brackets adjustably secured to the upright members of the temporary framing upon the outside of the upright supports upon which the mold forms are guided, platforms supported by the brackets, and mold forms arranged within the said space bounded by the upright members and guided and supported thereby and consisting of two tiers of molds, each tier composed of a series of detachable mold plates connected end to end, and the plates of the two tiers connected respectively by their tops and bottoms and arranged to be alternately secured to and above each other as the concrete wall is increased in height.

3. In apparatus for erecting concrete structures, the combination of a temporary framing comprising a series of upright members forming vertical guides connected and braced together and arranged to provide an unobstructed space bounded by the said temporary framing within which the building is to be constructed, vertically adjustable platforms extending from and supported by said

upright guide members in an outward direction away from the framing as a whole, and adjustable sectional mold forms arranged within the space bounded by the temporary framing and guided in a vertical direction upon the upright members thereof.

4. In apparatus for erecting concrete structures, the combination of a temporary framing comprising a series of upright members forming vertical guides connected and braced together and arranged to provide an unobstructed space bounded by the said temporary framing within which the building is to be constructed, vertically adjustable platforms extending from and supported by said upright guide members in an outward direction away from the framing as a whole, adjustable sectional mold forms arranged within the space bounded by the temporary framing and guided in a vertical direction upon the upright members thereof, and additional mold forms for the interior walls of the building extending across the space bounded by the uprights of the temporary framing and connected at their ends to the mold forms guided upon the said upright members.

5. A mold plate for molding concrete walls which consists of a rectangular cast metal plate flat on one face and bounded by outwardly extending top, bottom and side flanges directed away from the flat face, each of said flanges being provided with notches opening to the edges thereof for detachably receiving the clamping bolts in the general plane of the plate as a whole, and said plate also having transverse holes extending through its flat surface at a distance from each corner for receiving transverse bolts.

6. In apparatus for erecting concrete structures, a temporary framing arranged about the building being erected and consisting of a series of upright members acting as vertical guides for the mold forms each comprising oppositely facing channel irons secured together so as to provide a slot between them, tie bolts connecting the adjacent upright members, a series of mold plates connected end to end and guided in a vertical direction against and by the inner flanges of the channel iron uprights, a second set of mold plates connected end to end and arranged parallel to the first mentioned set of mold plates to form a space to be filled by concrete corresponding to the thickness of the wall to be formed, and bolts extending through the two sets of mold plates and also through the vertical slot formed in the upright members for sustaining the mold plates from the uprights and permitting of vertical adjustment during the molding operation.

7. In apparatus for erecting concrete structures, a temporary framing arranged

about the building being erected and consisting of a series of upright members acting as vertical guides for the mold forms each comprising oppositely facing channel irons secured together so as to provide a slot between them, tie bolts connecting the adjacent upright members, a series of mold plates connected end to end and guided in a vertical direction against and by the inner flanges of the channel iron uprights, a second set of mold plates connected end to end and arranged parallel to the first mentioned set of mold plates to form a space to be filled by concrete corresponding to the thickness of the wall to be formed, bolts extending through the two sets of mold plates and also through the vertical slot formed in the upright members for sustaining the mold plates from the uprights and permitting of vertical adjustment during the molding operation, and adjustable brackets and platforms arranged upon the outer part of the upright members and secured in vertical adjustment by clamping bolts which extend through the slotted portions of the upright members and clamp the brackets upon the outside faces thereof.

8. In means for forming concrete walls in the erection of buildings, the combination of inner and outer sets of mold plates forming a wall mold between them, inwardly directed adjustable brackets clamped to the upper edges of the mold plates and extending over the space to be occupied by the wall, longitudinally slotted bars adjustably clamped upon the ends of the brackets, transverse pins extending between the slotted bars and supported thereby, and a series of core tubes suspended within the space between the mold plates by means of the transverse pins and about which the concrete wall is formed.

9. In concrete molding structures, the combination of outer mold plate sections detachably connected side by side to form the outer surface of the outer wall of the building, inner mold plate sections detachably connected side by side and arranged parallel to the outer mold plates so as to form the inner surface of the outer wall of the building, detachable transverse bolts extending through and connecting the opposing parallel mold plates whereby said mold plates are sustained against spreading apart during the casting of the concrete wall after being formed between them, and open frames forming the windows and doors having a thickness equal to the space between the inner and outer mold plates and directly clamped between said plates to form ends to the molds to limit the flow of the concrete and subsequently left in position to form door or window frames when the mold plates are removed from the wall.

10. A mold plate for molding concrete

walls consisting of a rectangular plate flat
on one side and having bounding flanges
extending from the other side adjacent to
its edges and shaped to receive clamping
5 bolts, and said plate also having transverse
holes through its body near each corner and
also having handle portions extending from
the body of the plate opposite to its flanged

face and within the space bounded by the
flanges.

In testimony of which invention, I here-
unto set my hand.

PETER WEBER.

Witnesses:

E. L. AIKEN;
CHAS. SCHIFFEL.