S. I. BUSH.

METHOD OF CONSTRUCTING CONCRETE BUILDINGS.

APPLICATION FILED JAN. 23, 1915.

1,163,210.

Patented Dec. 7, 1915.

4 SHEETS—SHEET 1.

Fig. 4.

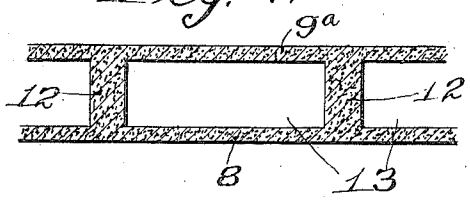


Fig. 1.

Fig. 2.

Fig. 5.

Witnesses:

R. F. Lunsdale

V. W. Whitman

Inventor.

Samuel I. Bush

By C. F. Bell

Attorney.

S. I. BUSH.

METHOD OF CONSTRUCTING CONCRETE BUILDINGS.

APPLICATION FILED JAN. 23, 1915.

1,163,210.

Patented Dec. 7, 1915.

4 SHEETS—SHEET 2.

Fig. 3.

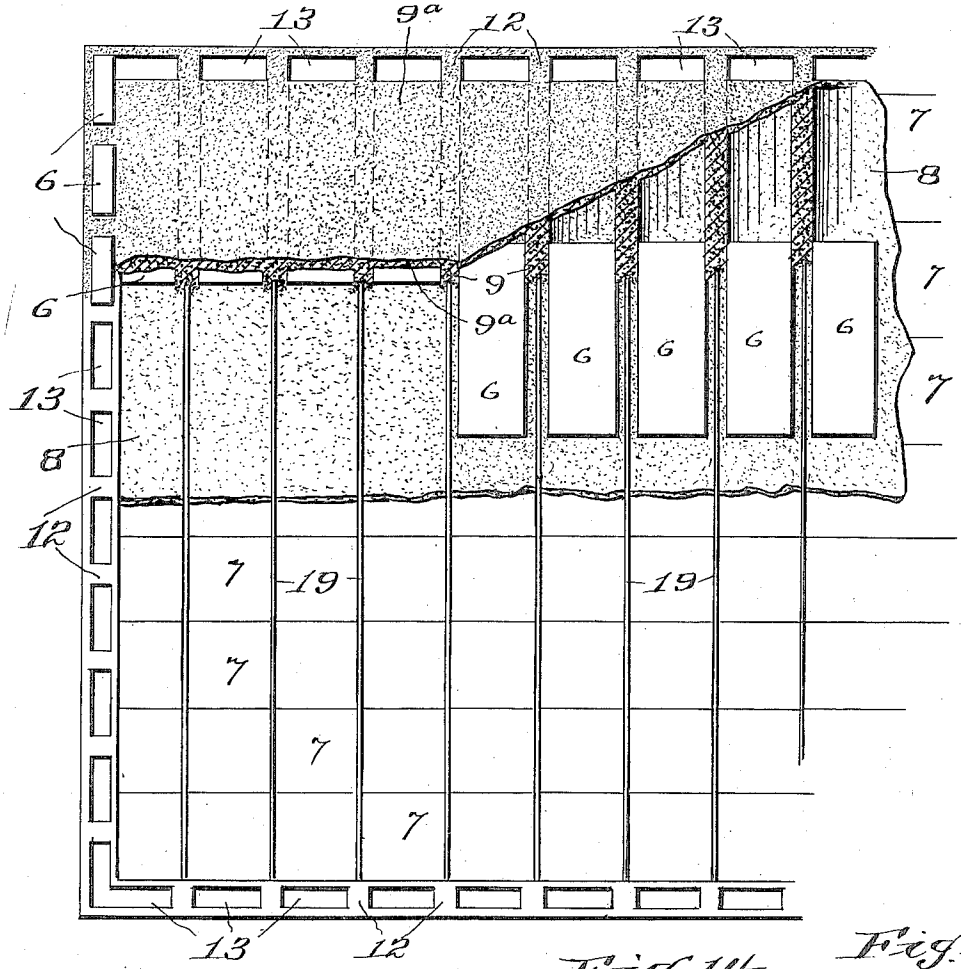


Fig. 14.

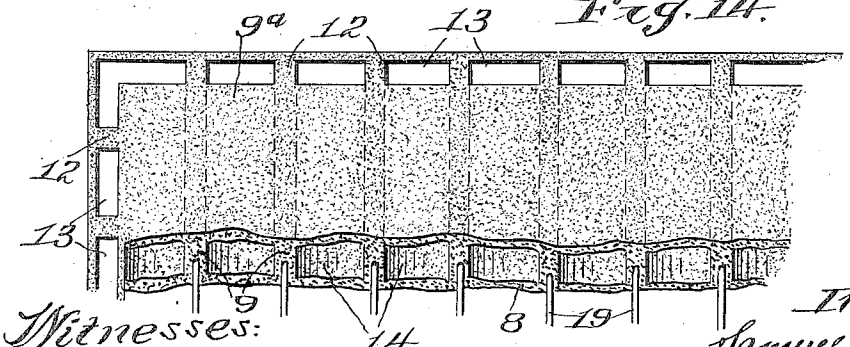
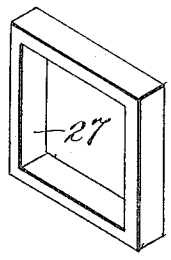


Fig. 13.



Witnesses:
R. F. Lansdale
W. F. Grossman

Inventor
Samuel I. Bush
By C. J. Beck
Attorney

S. I. BUSH.

METHOD OF CONSTRUCTING CONCRETE BUILDINGS.

APPLICATION FILED JAN. 23, 1915.

1,163,210. Patented Dec. 7, 1915.

4 SHEETS—SHEET 3.

Fig. 6.

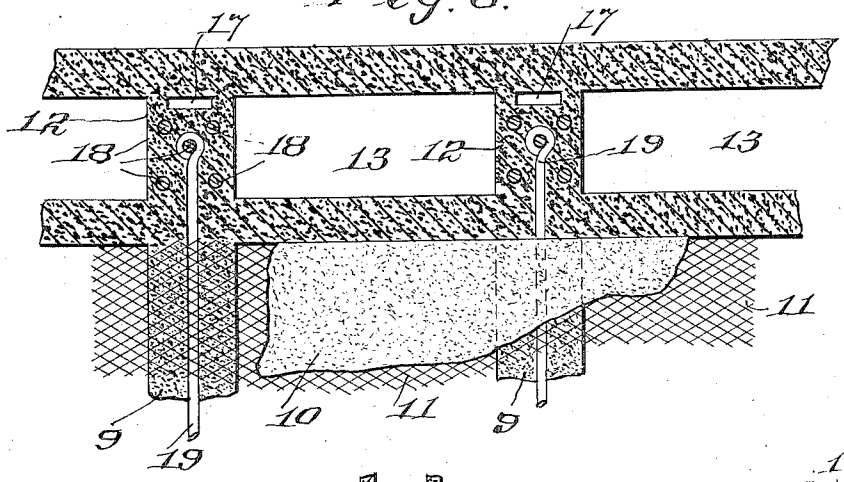


Fig. 7.

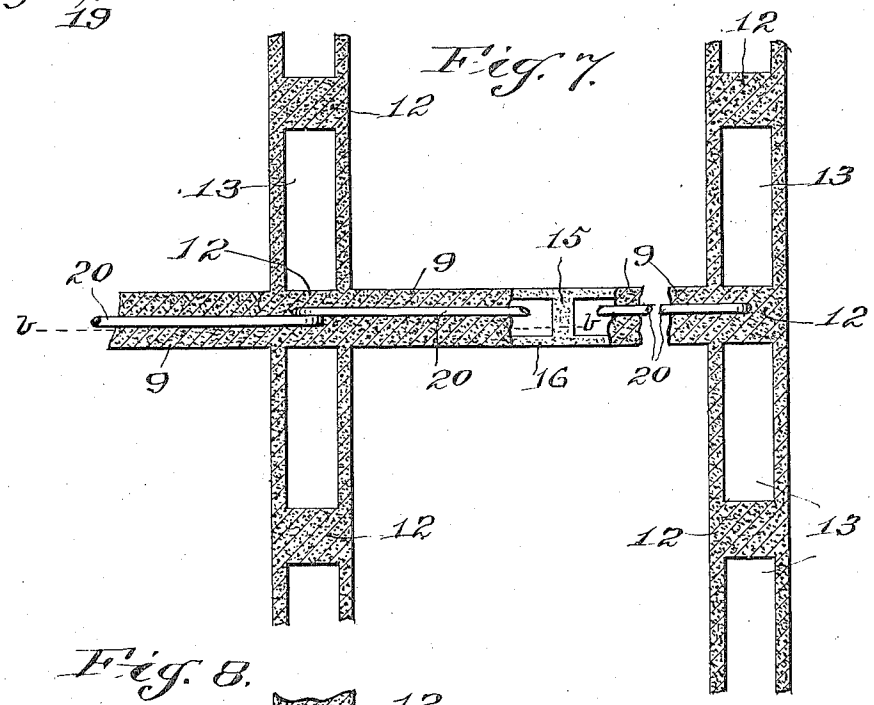
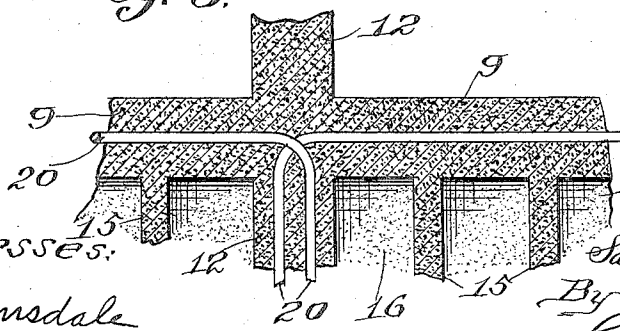


Fig. 8.



Witnesses:
R. F. Lansdale
V. H. Whiman

Inventor.
Samuel D. Bush
By C. J. Belp
Attorney.

S. I. BUSH.

METHOD OF CONSTRUCTING CONCRETE BUILDINGS.

APPLICATION FILED JAN. 23, 1915.

1,163,210.

Patented Dec. 7, 1915.

4 SHEETS—SHEET 4.

Fig. 9.

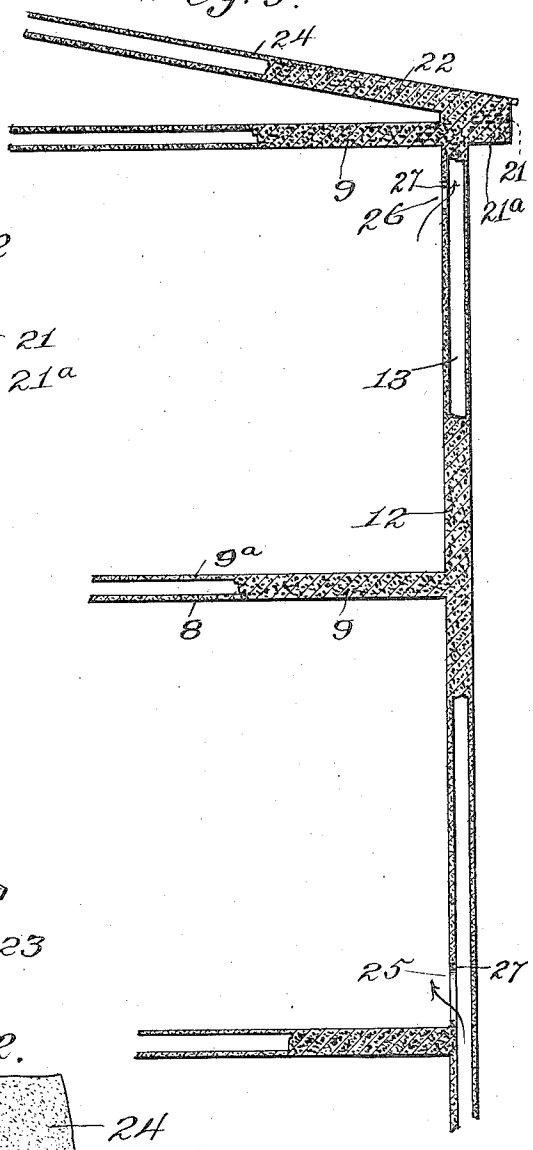


Fig. 10.

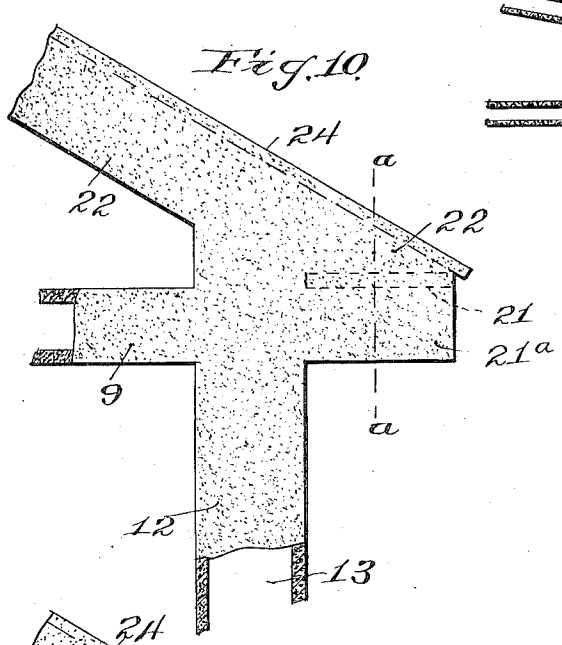


Fig. 11.

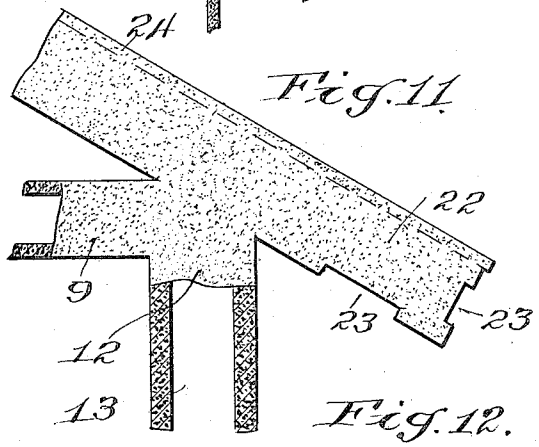
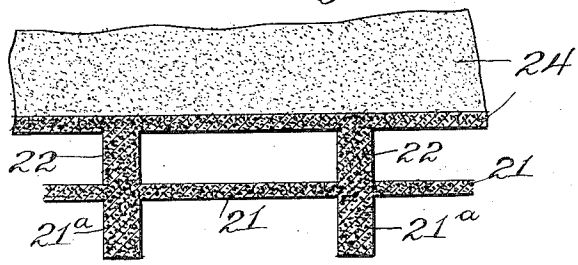


Fig. 12.



Witnesses:
R. F. Lansdale
W. Whitman

Inventor.
Samuel I. Bush
By C. F. Bell
Attorney.

UNITED STATES PATENT OFFICE.

SAMUEL I. BUSH, OF EDOM, VIRGINIA.

METHOD OF CONSTRUCTING CONCRETE BUILDINGS.

1,163,210. Specification of Letters Patent. Patented Dec. 7, 1915.

Application filed January 23, 1915. Serial No. 3,943.

To all whom it may concern:

Be it known that I, SAMUEL I. BUSH, a citizen of the United States, residing at Edom, in the county of Rockingham and State of Virginia, have invented certain new and useful Improvements in Methods of Constructing Concrete Buildings, of which the following is a specification.

This invention relates to hollow wall concrete buildings, and pertains especially to a method of constructing continuously poured concrete walls, joists, floors, ceilings and partitions, for dwellings and other buildings.

The object of the invention is to provide an improved method of forming hollow concrete outer walls, and partition walls which shall have continuous vertical piers throughout the height of the walls, said piers separating continuous vertical hollows extending throughout the height of the walls, and all of said walls, piers and hollows being formed by pouring the concrete between temporary wall boards and around temporary cores located central of the space between said boards, so that the various walls and piers shall constitute one continuous body of concrete.

A further object of the invention is to provide a simplified and expeditious method of constructing buildings with concrete simultaneously poured into walls, joists and floor positions so as to form alternate vertical hollows and solid piers in all the walls, and transverse floor hollows alternating with solid joists which constitute lateral extensions of certain piers, and the transverse hollows constituting lateral extensions of the vertical hollows throughout a building.

A still further object of the invention is to provide a method of constructing concrete buildings having hollow walls, hollow partitions, hollow floors, solid piers in the walls, solid piers in the partitions corresponding with the wall piers, and solid joists connecting certain of the wall piers, all of said parts being formed into an integral body by pouring the concrete continuously around the same set of cores with the latter placed and replaced in vertical and lateral positions, whereby all of said parts of a building progress together under the simultaneous concrete pouring.

Various other objects and improved results are attainable under the method hereinafter fully set forth.

In the accompanying drawings forming part of this application, Figure 1 is a perspective view, partly broken away, showing parts of a wall in course of construction. Fig. 2 is a similar detail view, showing part of a top joist protruding from a wall, with cores in position for laying the joists. Fig. 3 is a plan view, partly broken away, showing part of a building in course of construction. Fig. 4 is a detail cross section of a joist, floor and ceiling. Fig. 5 is a detail cross section of a joist having inlaid wooden strips. Fig. 6 is a detail section of part of a large wall, piers, joist and floor constructed according to my invention. Fig. 7 is a similar view, partly broken away, showing a partition under a joist. Fig. 8 is a sectional view taken on the dotted line *b*—*b*, Fig. 7. Fig. 9 is a vertical sectional view of part of a side wall, showing joist, floor, ceiling, and roof construction, a pier of the wall being partly broken away showing heating and ventilating flues. Fig. 10 is an enlarged detail view showing connection between wall, joist, rafter and protruding end of joist. Fig. 11 is a similar view showing a protruding rafter. Fig. 12 is a vertical sectional view taken on the line *a*—*a*, Fig. 10. Fig. 13 is a perspective view of a frame for the wall flues. Fig. 14 is a plan view showing part of a completed ceiling, floor and joists.

The same reference characters denote the same parts throughout the several views of the drawings.

In carrying out my method an inexpensive simple apparatus, such as may be available from the usual boards and scantling, the side boards 1, are held in position, the width of the wall desired, by a simple clamp composed of scantling or other suitable pieces 2, connected centrally by a tie piece 3, so as to leave both ends of the clamp free. In first applying the clamp, the lower ends engage a foundation 4, of such greater width than the wall to be made thereon as to afford a rest for the side boards, and a piece 5 of substantially the same width as the desired wall is forced between the upper ends of the clamp so as to parallel the clamping parts. I also employ cores 6, which are preferably made in box form out of any suitable or convenient material so as to have a length greater than the width of the side boards, and said cores may be of such size as

desired according to the thickness of the wall and size of the hollows as may be desired. The cores are first set upon the foundation central of the space between the side boards, and any number of cores may be used together and at the same time according to the length of the boards, so that the cores and boards shall be worked in sets. I use ordinary boards 7, temporarily supported by suitable trestles (not shown) for temporarily holding the concrete as it is poured on the boards 7 to form the ceiling 8 and the solid joists 9. In forming the ceiling and joists I use the same set of cores as used in the walls, only the cores are laid lengthwise instead of being set in vertical position for the walls. The floor 9^a, is formed by pouring concrete over the flat laid cores. In forming a concrete floor 10, I spread a wire cloth or mesh 11, over the concrete joists and pour a thin layer of concrete over the mesh.

In constructing an ordinary concrete dwelling according to my method, one set of wall boards and one set of cores having been placed in proper position, the concrete is poured to a height preferably about two feet or to within a short distance of the top of the cores, all the cores of said set are raised or partially withdrawn from the first poured concrete so that the lower end of the cores remain standing in the concrete, then a second set of wall boards are clamped in position and a second body of concrete is poured between said second set of boards and the said cores, preferably flush with the top face of the cores, this operation is repeated with the same set of cores and two or more sets of wall boards, until the wall is brought to a height where the joists and ceiling are to be added to the wall, then the temporary ceiling boards are covered with a thin layer of concrete flush with the top face of the vertical piers 12 between vertical hollows 13 and with the top surface of the last poured wall concrete, the same set of cores are removed from vertical wall position and laid lengthwise upon the ceiling concrete in line with and opposite the wall hollows so that the cores will extend in continuous lateral rows from each vertical wall hollow, and so that the space between the cores will be opposite the piers 12, such spaces being filled with concrete which forms the joists. After the joists and floor have been formed from one wall to another, the same cores are again used in vertical position as hereinbefore described for continuing the walls. Where concrete floors are desired the wire mesh is placed over the top edge of the concrete joists and a thin layer of concrete is poured upon the mesh which permits the floor concrete to join with the joist concrete into one solid mass and forming transverse floor hollows 14, communicating with the vertical wall hollows 13. The joists, with or without either the concrete floor and concrete ceiling, are made continuously laterally with certain of the vertical wall piers.

Partitions 16 are formed in with and at the same time of forming the side walls, by using a set of smaller cores, if desired so as to make the partitions thinner than the side walls. The cores and side boards for the partitions are operated together with the side wall apparatus, and the concrete for the said walls and partitions is poured together so that the walls, partitions and joists progress together, and harden into a connected solid mass of concrete. The partition walls may be worked in at any desired place or places, but the joists should be started at the piers so as to connect the piers from wall to wall, and for this reason the piers are preferably the same distance apart as the usual space between joists in ordinary buildings.

Referring to Fig. 6 of the drawings the piers are of increased thickness as for large structures or buildings, and these piers are provided with vertical air spaces 17, and with vertical tie rods 18, while the joists have embedded therein tie rods 19 connected with the rods 18.

Referring to Figs. 7 and 8 of the drawings, the partition walls are under the joists and the joists are provided with a pair of tie rods 20 bent from vertical to horizontal position.

Referring to Figs. 10, 11 and 12, the corner of a building is shown having the side wall, the joist and the rafters poured in a solid body of concrete. In Fig. 10, a plate 21 composed of concrete is poured on the joist ends 21^a of the joist so as to close the space between said ends and thereby form a cornice. Fig. 11 shows the end 22 of the rafters forming the cornice, and such ends may have notches 23, or other ornamentation as desired formed therein during the pouring of the concrete. Both of these forms are poured with the same cores as used in the floor, ceiling and walls, so as to form a concrete roof 24. Where wooden floors and ceilings are desired wooden cleats 28 may be embedded in the joist 29, having brace rods 19^a, as shown in Fig. 5.

I desire it to be understood that the wire mesh is used only where the joists are of unusual distance apart, but where the joists are of the usual space, a thin layer of concrete is poured over the cores from joist to joist so as to form the floor.

Heating and ventilating openings 25 and 26 respectively are formed in the walls during the process of concrete construction by pouring the concrete around suitable frames 27 set in desired positions, and these frames remain in said positions for attaching suit-

able registers and ventilators thereto. Obviously window and door frames may likewise be built in the walls.

After the concrete is poured between and over the cores as first laid in horizontal position, said cores are moved outwardly or slid out of said position horizontally so as to expose the greater portion of the cores for the next pouring, and this operation is continued with all the necessary cores for completing the joists and the floor. In this way the cores are successively moved or slid outwardly after each pouring between and over the cores, and when the opposite wall is reached, the last position of the cores is partly upon the wall, so that the cores are withdrawn from this last position, and no cores are left in the floor. The cores are operated in a similar way for making the rafters and roof. Such operation being similar to the vertical movement of the cores in pouring the vertical walls.

My method produces walls, joists, ceilings, floors, rafters, roof, and cornices, all together or simultaneously in one integral body, with the same set of cores, so that I form hollow walls, solid joists in and extending from the wall piers, hollows extending laterally from the wall hollows throughout the floor, a hollow roof, and a hollow cornice with the same set of cores. According to my method, the cores are first used successively for the vertical walls to a ceiling or joist height, the same cores are then used in horizontal position so as to permit pouring the concrete for the joists and floors bound to the vertical walls, the cores being progressed parallel and horizontally preparatory to each pouring therebetween and thereon for removal after the last pouring, then the cores are returned to vertical position whence they were first removed, and the vertical wall pouring continued, thereby making the ends of the poured joints in with the piers of the walls and the floor hollows opposite the wall hollows.

It will be seen that rafters for the roof may be formed of concrete in the same manner as the joists, ceilings and floors are formed, by using temporary sheathing for supporting the same and like cores as used in the walls during the pouring of concrete between the adjacent ends of parallel rows of cores.

It will be understood according to this method, that all outer walls, partitions, joists, floors, and ceilings are composed of concrete which is poured continuously from one to the other of said parts of a building so as to have all of said parts progress together, and that said parts when finished constitute one continuous mass or body of solid concrete, except for the hollows formed in the walls, partitions and floors.

It will be seen that I am enabled to provide inner and outer wall parts of less thickness than usual by providing substantial solid piers and having the solid joists connect the piers of one wall with the piers of the opposite wall. The piers and the joists all being molded into one continuous mass or body the wall parts or sections between the piers only need to be thick enough to form wall surfaces, as the piers and their bounding joists constitute the necessary strength and stability of the building.

It will be observed that the vertical hollows of opposite walls are connected by the floor hollows, whether the floors and ceilings are or are not composed of concrete, and that the piers of a partition wall are opposite or in alinement with the piers in the side walls which run parallel with the partitions, so that the partition piers will intersect the joists, thereby doubly bracing the partitions.

It will be further observed that all the component parts of a building constructed in accordance with my method are composed entirely of poured concrete, and that a complete concrete structure is furnished having hollow outer walls, hollow partitions, continuous vertical solid piers intervening the hollows of the walls and the partitions, and continuous solid joists connecting the piers of the walls and the partitions.

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

1. The herein described method of molding concrete floors and ceilings integral with side hollow walls having vertical piers, which consists in pouring a layer of ceiling concrete over a temporary support, placing the wall cores in parallel position opposite the wall hollows with a joist space between the sides of the cores and opposite said piers, filling the spaces with joist concrete, covering the exposed face of the cores and of the joists with floor concrete flush with the top of said walls, sliding the cores lengthwise so that one end thereof shall remain under the floor concrete, repeating said joist and floor pourings, and repeating the sliding of the cores after each pouring throughout the required length of the joists, and then withdrawing the cores over the opposite wall after the last pouring.

2. The herein described method of molding concrete floors and ceilings integral with side hollow walls having vertical piers, which consists in pouring a layer of ceiling concrete over a temporary support, placing the wall cores in parallel position opposite the wall hollows with a joist space between the sides of the cores and opposite said piers, filling the spaces with joist concrete, covering the exposed face of the cores and of the joists with floor concrete flush with the top of said walls, sliding the cores lengthwise so that one end thereof shall remain under the

floor concrete, repeating said joist and floor pourings, and repeating the sliding of the cores after each pouring throughout the required length of the joists, withdrawing the cores over the opposite wall after the last pouring, then placing the cores across the vertical wall hollows so that the cores overlap the vertical wall, and pouring concrete between the cores and over the top of the piers for forming top joists or rafters.

3. The herein described method of constructing concrete buildings with hollow vertical walls, solid joists, and hollow floors and ceilings, which consists in coring said walls vertically with vertically cored piers, pouring ceiling concrete upon a temporary support, utilizing the cores of the vertical walls by placing the cores in horizontal position upon the ceiling with a space between the cores corresponding with and opposite the piers, successively pouring the concrete over the cores and into said spaces and partially withdrawing the cores after each pouring for forming the joists and floor, then removing the cores, and replacing the cores in the vertical wall hollows for continuing the vertical walls.

4. The herein described method of constructing hollow concrete roofs integral with vertical concrete building walls having alternate hollows and piers, which consists in placing a temporary support in roof position, pouring a layer of concrete on the support, removing the cores from said walls when the latter reach a roof height, placing the cores upon the poured concrete with the first placed cores across the hollows of said walls and with a space lengthwise the cores corresponding with said piers, pouring concrete over the cores and into said spaces, partially withdrawing the cores, successively repeating such withdrawal and pouring, and finally removing the cores.

In witness whereof I hereunto set my hand in the presence of two witnesses.

SAMUEL I. BUSH.

Witnesses:
WARD SWANK,
J. B. BOWMAN.