C. W. ROBERTS.

BUILDING CONSTRUCTION.

APPLICATION FILED NOV. 22, 1909.

1,053,646. Patented Feb. 18, 1913.

Fig. 1.

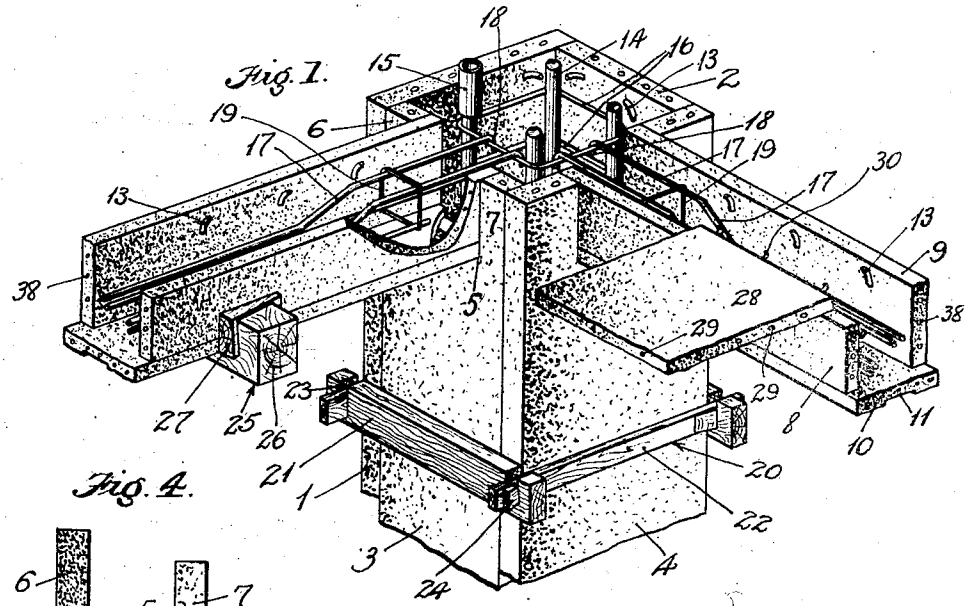


Fig. 4.

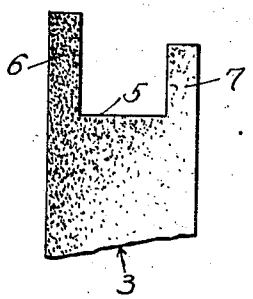


Fig. 2.

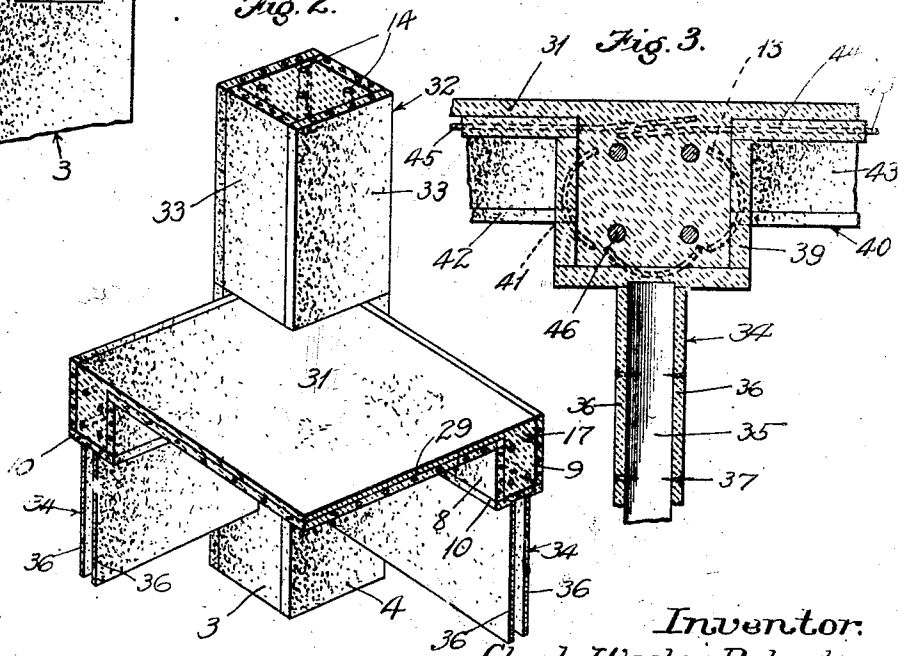
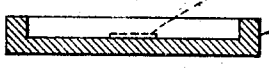


Fig. 3.

Fig. 5.



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UNITED STATES PATENT OFFICE.

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BUILDING CONSTRUCTION.

1,053,646. Specification of Letters Patent. Patented Feb. 18, 1913.

Application filed November 22, 1909. Serial No. 529,252.

To all whom it may concern:

Be it known that I, CHARLES WESLEY ROBERTS, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Building Construction, of which the following is a specification.

This invention relates to the art of building, and particularly to the construction of buildings of concrete, cement or similar material.

The method usually adopted in constructing buildings of concrete or similar material involves the use of forms of wood which are set up so as to produce the columns, girders, beams, etc., and these forms are filled with concrete or cement which is allowed to harden. When the concrete has hardened as suggested, the forms are removed. The removal of these forms entails considerable labor and represents a large item of expense in the erection of buildings and other structures of this class.

The object of the present invention is to provide an arrangement whereby forms can be set up which will perform the functions of the ordinary wood forms referred to, but which can be allowed to remain in place so as to obviate the expense of removing the forms as is necessary when wooden forms are employed.

In the drawing annexed hereto which fully illustrates my invention, Figure 1 is a perspective view showing a portion of a column form, and indicating the manner in which the girders and floors are formed. Fig. 2 is also a perspective showing a portion of the complete structure. Fig. 3 is a vertical section taken through a girder and through a portion of the wall and showing the construction of the complete structure. This view is upon an enlarged scale. Fig. 4 is a front elevation showing the upper end of one of the slabs which are employed to form a column in accordance with my process. Fig. 5 is a cross section taken through one of the molds in which the slabs are made.

Before proceeding to a detailed description of the structure formed and the process, it will facilitate the disclosure to state that in practising my process I produce slabs which are formed of concrete or similar material in an ordinary open, flat mold. These slabs are afterward set up so as to form columns, girders or beams of skeleton form, and in this way these slabs are made to form molds for reinforced concrete with which I fill the interior of the columns and the interior of the beams and girders. The concrete or cement which fills the forms adheres to the inner side of the slabs and when it hardens it produces a monolithic structure, the slabs being, for all intents and purposes, a part of a solid column, girder or beam. In this way I produce a structure which has all the qualities of a solid cement or concrete reinforced structure in which all the parts are molded simultaneously, and in addition to this I obviate the necessity for removing the forms in which the structural elements of the building are formed. Furthermore, it is found that a frame work constructed of elements formed of concrete or cement constitutes a better form for the concrete than the ordinary wooden forms as now employed.

Referring more particularly to the parts and especially to Fig. 1, 1 and 2 represent the slabs which form the outside faces of a column. The column illustrated is supposed to be located at the corner of a building, and in connection with the column I have illustrated the manner in which the girders are formed, the ends of which are supported at the column. The inside faces of the column are formed of slabs 3 and 4. These slabs are formed in an elongated mold 12 such as that illustrated in cross section in Fig. 5. These molds may be of any length or width desired and of any desired depth so as to give a sufficient thickness to the slab to insure rigidity. In forming the inside slabs 3 and 4, the ends of the slabs disposed adjacent to the girders which will support the upper floor are formed with deep throats or gaps 5 as illustrated in Fig. 4. These throats or gaps are of rectangular form, and at the outer edges of the slabs the fork 6 forming one side of the gap is extended to a greater distance than the inside fork 7. These gaps or throats 5 are adapted to support the girder forms. In order to construct the girders I form side slabs 8 and 9 and bot-

tom slabs 10. These slabs are similar to the column slabs except that they are formed without throats. They may be produced in a mold similar to the mold shown in Fig. 5. In addition to this the bottom slabs 10 are formed on their under sides each with a longitudinally extending groove or channel 11. This channel is formed by employing a batten 12ª running longitudinally in the mold as indicated by the dotted line in Fig. 5. When all of the slabs are being molded they are provided with bonds or bond wires 13, the bodies of which are embedded in the slabs and the ends of which project from the inner faces of the slabs when the slabs are set together to form the columns and girders, as will be readily understood.

In forming a column and girders out of the slabs referred to, as elements, I erect a column form in the manner indicated in Fig. 1 setting the edges of the proper slabs together so that the throats 5 are presented on the sides of the column from which the walls extend. In the throats 5 the girder forms are supported, the bottom slabs 10 resting upon the bottoms of the throats or gaps and extending completely across the gaps as indicated. The slabs 8 and 9 which constitute the sides of the girder forms are set in place in a vertical position, their ends being arranged so that they are supported on their outer sides by the inside edges of the forks 6 and 7. In this way a hollow column form is erected and skeleton girders are produced, said girders being in the form of channels open on their upper sides. Attention is called to the fact that the inside slabs 8 of the girder forms are not of as great a depth as the outside slabs 9 and they correspond in height to the height of the forks 7. In this way the outside edge of the form is higher than the inside edge. In the interior of the column form I provide reinforcing rods 14 and at the point where a floor is to be formed these rods present abutting sections connected by couplings such as the coupling 15 shown in Fig. 1. These vertical reinforcing rods are tied together at intervals by the wires or cords 16. At the point where a floor is to be formed two of these tie wires are placed at a suitable height so that they may support horizontal reinforcing rods 17 which extend longitudinally in the channels at the column forms. These rods 17 are formed at their ends with hooks 18 which are hoked over the wires 16 as illustrated. At intermediate points along their length the rods 17 are connected by tie wires or cords 19 as shown.

The slabs which compose the column forms are securely held together by a clamp 20 which may be of the simple type shown presenting a pair of oppositely disposed main bars 21 which engage opposite sides of the column form, and wedge bars 22 which extend across the intermediate faces, the ends of the said wedge bars being received in notches 23 at the ends of the main bars. The wedge bars are securely held in position by wedges 24 received at the notches, and these wedges are driven into place so as to seat the clamp on the column slabs, as will be readily understood. The side slabs of the girder forms are held in position by means of a simple clamp 25 presenting a bar extending transversely under the bottom slab and having tapered end blocks 26 presenting wedge faces. Near the sides of the form, between these faces and the sides of the form, I apply wedges 27 and the inner faces of these wedges rest against the side edges of the bottom slab as well as against the side faces of the side slabs. In this way the side slabs of the girder forms are prevented from bulging outwardly.

When the column form and girder forms have been erected as described, with the reinforcements in place, I form a continuous floor of floor slabs 28. These slabs 28 are formed of reinforced concrete and the edges of the slabs are supported on the upper edges of the inside slabs 8. In this way I form a continuous floor in the structure, filling all the space between the beams and girders of the building. The floor slabs 28 are formed with reinforcing rods 29 and at the edges of the slabs adjacent to the girders the ends of these rods form projecting bonds or anchors 30.

After a continuous floor has been laid as described, I fill the interior of the column forms with concrete, cement or other suitable composition and I also fill the channels of the girder forms with the same composition until the level of the filling is brought up flush with the outer edges of the girder forms. As illustrated in Fig. 2, this filler will extend out over the floor slabs 28 so as to form a complete cementitious floor 31, and this floor extends out and forms the upper end of the column at this floor. If the building structure is to extend to another story the couplings 15 are permitted to project above this cement floor 31 so as to form a point of attachment for the upper sections of the reinforcing rods which will reinforce the next section of the column, that is, the column for the next story of the building.

In Fig. 2 I have shown a corner of a floor completed and representing the lower end of the column 32 which will be formed above this floor. This column is produced by means of a column form composed of slabs 33 similar to the slabs 1, 2, 3, and 4 described above.

In order to form the walls 34, I use the grooves or channels 11 in the lower sides of the bottom slabs 10, to retain the upper ends of studding 35 as illustrated in Fig. 3. The lower ends of the studding 35 are sup-

ported on the floor below. The sides of the wall are formed of slabs 36 of any suitable material secured to the opposite faces of the studding by ordinary wood screws 37 having counter sunk heads. To the outer face of the wall slabs 36, plaster or other finishing material can be applied.

In order to increase the rigidity of the slabs which form the elements of the column forms and girder forms, they are provided with longitudinal reinforcing rods 38 when they are molded.

The manner of forming the beams connecting the girders is similar to the manner of forming the girders connecting the columns. In this connection, referring to Fig. 3, it should be understood that this view is a section through an intermediate girder and not through an outside girder such as that shown in Fig. 4. In forming the structure at this point, the side slabs 39 are made of equal height, and on opposite sides where beams 40 are to be attached they are formed with notches or gaps 41 similar to the gaps 5. In these gaps 41, beam forms are produced by means of bottom slabs 42 and side slabs 43 forming open gutters or channels in all respects similar to the girder forms described above. In this case the floor plates 44 have their side edges laid flush with the inside faces of the side slabs 39, and their reinforcing rods 45 are arranged so as to overlap each other as shown. The interior of this girder form is provided with reinforcing rods 46 as indicated. The filler which forms the cement floor 31 at these points extends down into the interior of the girder forms and beam forms as will be readily understood. In this way a building may be erected story by story having a monolithic frame. When the filler hardens in the forms of the column girders and beams it will be evident that the bonds 13 form anchors securely holding the slabs upon the inner filler or core. In addition to this, the filler will adhere to the inner faces of the slabs so that when the structure is complete the slabs are, for all intents and purposes, integral with the fillers or cores.

When the structure is completed and the fillers have "set," the clamps of course can be readily removed, but the removal of these clamps entails practically no considerable labor. It will be evident that by the employment of my process a rigid reinforced concrete structure is formed without entailing the expense of removing the ordinary forms which are now employed in erecting structures of this class. Special attention is also called to the advantage of forming slabs of concrete or cement as compared with wooden forms for the reason that the wooden forms will absorb moisture and expand so as to form cracks in the concrete or cement before it is set. Furthermore, where boards are used to form columns they tend to bulge outwardly under the pressure from the interior so that in some cases the water and cement will leak out through the form leaving a column of loose stones.

Special attention is called to the fact that the slabs or members which constitute the form are rigid and self supporting, that is it is not necessary to employ braces to support the columns and girders after they have been set up to form molds as described, for the girders and the floors hold the columns erect and the columns support the girders and the floors. This greatly reduces the cost of erection of a building of this type and does away with the necessity of employing temporary supports for the molds or forms.

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

1. A reinforced structure, comprising surfacing slabs of cementitious material, some of said slabs being fitted to form columns and having recesses in their upper ends, the portions between the inner edges of said slabs and the said recesses being shorter than the portions of said slabs between the outer edges thereof and said recesses, some of said slabs being fitted to form the side and lower face of girders, the said slabs fitting into the recesses of the column slabs and the inner slabs being made of a less height than the outer slabs to accommodate flooring slabs, flooring slabs fitted to said girder and column slabs, the lower slabs of the girders having grooves formed therein, parallel wall slabs mounted adjacent to the columns and having their ends engaging the grooves in the girder slabs and a filling of cementitious material placed in said slabs in plastic form, the setting of said cementitious material operating to bind the columns, girders, walls and floors in one monolithic structure.

2. A structure of the class described having girders formed of slabs set together so as to form gutters, the outer slabs being arranged with their upper edges elevated with respect to the inner slabs to form a retaining edge for the floor material, floor plates laid on the upper edges of the inner slabs of said girders, and a cementitious filler in said gutters and covering said floor slabs to form a floor monolithically, and a monolithical core for said girders.

3. A reinforced structure, comprising surfacing slabs of cementitious material, some of said slabs fitted to form rectangular standards for producing columns and having recesses therein, while some of the slabs are arranged to form horizontal girders and adapted to fit in the recesses of the column slabs, the lower slabs of the girders having grooves formed therein, parallel wall slabs

mounted adjacent to the columns and having their ends engaging the grooves in said girder slabs and a filling of cementitious material placed in said slabs in plastic form, the setting of the cementitious filling operating to bind the columns, girders and walls into one monolithic structure.

In witness that I claim the foregoing I have hereunto subscribed my name this 17th day of November, 1909.

CHARLES WESLEY ROBERTS.

Witnesses:

F. D. AMMEN,

EDMUND A. STRAUSE.