June 26, 1934. N. GARRETT 1,963,978

APPARATUS FOR BUILDING WALLS

Filed Sept. 5, 1931

FIG. 1

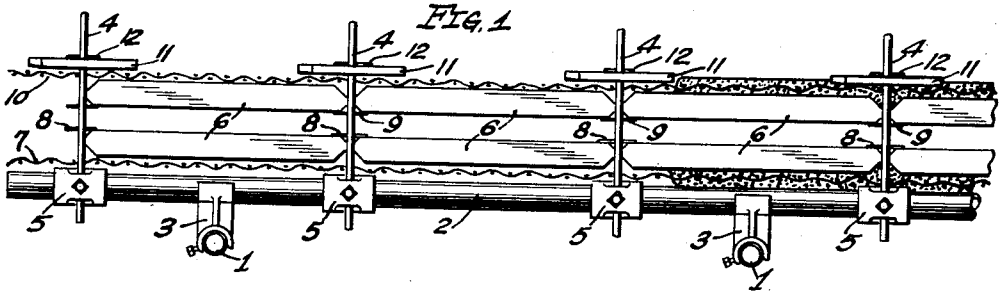


FIG. 2

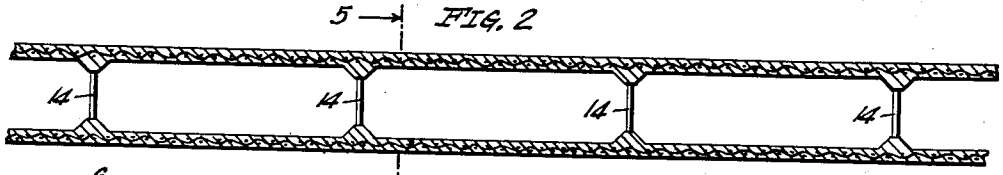


FIG. 3

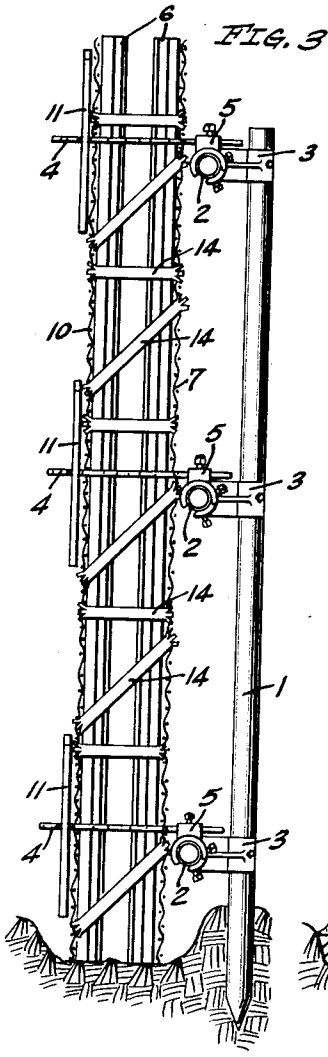


FIG. 4

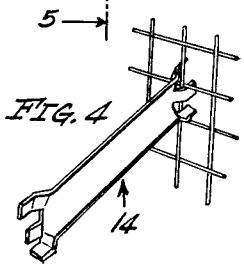


FIG. 5

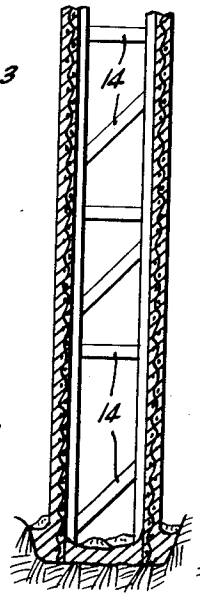


FIG. 6

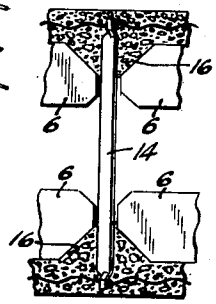


FIG. 7

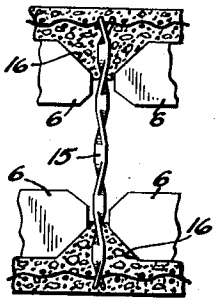


FIG. 8

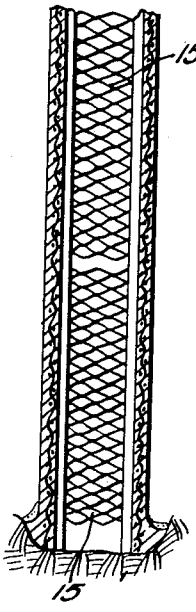
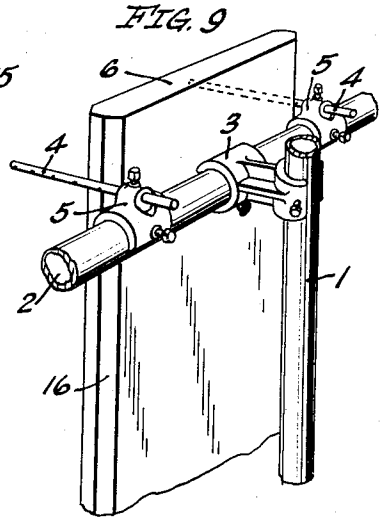


FIG. 9



INVENTOR

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Patented June 26, 1934 1,963,978

UNITED STATES PATENT OFFICE

1,963,978

APPARATUS FOR BUILDING WALLS

Neal Garrett, Glendale, Calif.

Application September 5, 1931, Serial No. 561,392

12 Claims. (Cl. 25—131)

This invention relates to apparatus for making reinforced cementitious structures and more especially to apparatus for making those structures characterized by spaced reinforced cementitious slabs joined together at spaced intervals by slab connecting members.

The subject matter of this invention has particular reference to the types of inventions described and claimed in my co-pending applications Serial Nos. 155,699, filed December 18, 1926; 257,357, filed February 27, 1928; 561,393, 561,394 and 561,395, filed September 5, 1931; and 566,958, 566,959, 566,960, 566,961 and 566,963, filed October 5, 1931.

An object of my invention is to provide an extremely simple and inexpensive apparatus by which cementitious structures can be erected with facility and dispatch. The invention provides an apparatus that is easily set together with a minimum of tedious operations, such as tying or nailing elements together, and is easily removed from the completed structure. A particular purpose of the invention is to provide an apparatus which is easily set up on irregular ground.

In the drawing

Fig. 1 is a plan view of assembled apparatus for building a wall and a portion of a wall formed thereon;

Fig. 2 is a horizontal section of a completed wall;

Fig. 3 is an end elevation of the apparatus of Fig. 1;

Fig. 4 is a perspective view of a slab connecting member;

Fig. 5 is a vertical section of the wall on line 5—5 of Fig. 2;

Fig. 6 is an enlarged fragmentary plan view of the apparatus and wall formed thereon at a gap in the form panels;

Fig. 7 is a view similar to Fig. 6 showing a foraminous slab connecting member;

Fig. 8 is a view similar to Fig. 5 showing foraminous slab connecting members;

Fig. 9 is a fragmentary perspective of a form panel and adjoining apparatus.

Referring to the drawing, vertical pipes 1 are driven in the ground at a definite distance from a predetermined position of a wall. Pipes 2 are provided extending along one side of the predetermined wall position and are supported on pipes 1 by clamps 3. Rods 4 are held in place to extend transversely of the area to be occupied by the wall by clamps 5 on pipes 2. Clamps 5 are spaced to provide the rods 4 arranged in vertical rows at horizontally spaced intervals so that the horizontal space between the rods is the width of a form panel 6. The pipes, clamps and rods erected as described form the alining system.

Reinforcing 7 is placed over and supported by rods 4. Backing is provided behind reinforcing 7 by placing panels 6 between vertical rows of rods 4 and pressing them against the reinforcing 7, thereby forcing the same tightly against clamps 5. Pins 8 are placed through holes in rods 4 and hold the panels against the reinforcing.

If just a single slab is to be erected, cementitious material is plastered over the reinforcing 7 and against the form panels. After the cementitious material has hardened the pins 8 are removed, the rods 4 are released in clamps 5 and withdrawn, and the form panels and alining system are removed.

If it is a double wall that is to be built, instead of performing the plastering operations at this time, pins 9 are placed in holes of rods 4 which are suitably spaced from those used for pins 8 so that pins 9 engage the backs of a second row of panels to space and aline the same as desired with respect to the first erected row of panels. Reinforcing 10 is supported on the ends of the rods 4 and held flat against the form faces by strips 11. Each of these strips is narrow so as to form a minimum of obstruction to the plastering operation but is wide enough to include a hole to receive a rod 5. Each of these strips 11 is held in place by a pin 12 passing through a hole in rod 4. These strips are inclined so as not to obstruct the passage of material between the gaps of adjacent form panels while holding a vertical width of reinforcing flat against the forms. Both rows of form panels may be set up prior to the erection of the reinforcing and then the reinforcing may be arranged over both sides of the form.

It is intended that instead of pipes 1 supported as shown, any suitable upright members may be used and supported by any method desired. Pipes 1 or other suitable members are easily set up on the roughest of ground. The rest of the apparatus for supporting the form panels is supported on pipes 1 and is therefore erected easily regardless of the roughness of the ground. Each individual panel is slidably held at its vertical edges so as to be vertically independent of the rest of the apparatus and adapted to rest directly on the ground.

To extend the form work to a height greater than the length of individual panels the panels are placed on top of each other and held in ver-

tical alinement in the same manner as the panels on the ground.

A slab connecting member, hereinafter referred to as a tie 14, is formed from sheet metal strips into a shape providing a curved cross section to provide rigidity. Tie 14 has deformed ends and is shown engaging a portion of reinforcing in Fig. 4.

After the reinforcing is in place over the panels, and before the cementitious material is applied, the ties 14 are inserted through openings of the reinforcing into the position between the form panels illustrated in Fig. 6. Each tie 14 is supported at its ends by engagement with reinforcing 7 and 10. Ties 14 are placed both horizontally and inclined, as illustrated in Figures 3 and 5, to provide a web-like structure to coact with wall slabs in providing a wall adapted to act as a series of vertical trusses.

Reinforcing 7 and 10 is preferably a foraminous sheet material, such as wire mesh or expanded metal of a type adapted to reinforce layers of plastered material.

After the slab connecting members and layers of wire mesh are in place, cementitious material is plastered over the form faces to embed the reinforcing 7 and 10. the cementitious material is forced into the recesses formed by the beveled faces 16 of adjoining panels so as to securely embed the ends of the ties. The shape of faces 16 and the space between adjoining panels forms a ridge that is not so large as to slump when using cement mortar of average stiffness. The provision of the proper character of apparatus at the gaps to function as herein stated is an important feature of the invention and the preferred form of panels for use in accomplishing this feature of the invention may be referred to as having vertical recess-forming edges at the gaps, the same being correlated to act as backing for protruded portions of material of manually-plastered slabs. The words "manually-plastered slabs" are used to include slabs that are formed by spreading cementitious material against a backing by means of a plasterer's trowel or the like, and said words are used to exclude slabs that are formed by pouring or by cement-gun methods. Recesses of such size as to utilize the beveled faces 16 as backing for protruded portions of material of manually-plastered slabs are also of such size as to become filled with small portions of cementitious material spread across the recesses with the strokes of plasterer's trowel and thereby enable the cementitious material to be spread a substantial distance along the faces of the form panels with each stroke of the trowel across the recesses and enable the plastering operation to be performed substantially with the same facility as upon a flat surface.

The vertical ridges formed on the backs of the slabs provide sufficient bracing for the slabs so that a wall may be made without the use of the slab connecting members. Such a wall is more sound proof and to be desired for some cases where the added strength derived by placing the slabs together is not necessary.

The nature of the aligning system is such that the scratch coat may be completed past the pipe 2 and the clamps 5 at a single application of cementitious material. As soon as the cementitious material has set pins 12 and strips 11 are removed.

The panels are left in place until the plastered material has obtained sufficient strength for the wall to stand alone. Rods 4 are then released in clamps 5 and rotated to drop pins 8 and 9. This releases the panels so that they are free to move away from the wall slabs. The panels are then withdrawn from between the wall slabs.

Outwardly flaring portions of the wall slabs are formed in contact with the ground. After the forms are removed, cementitious material is poured between the slabs to form a transverse portion of cementitious material integrally joining the slabs and closing the space between the slabs at the ground. If desired to form a solid wall, the space between the slabs is filled with cementitious material.

The rod 4 is provided with holes at suitable intervals so that the form panels may be held the desired distance apart to form a wall of any desired thickness. A wall of any height or length may be made by discontinuing the plastering operation where desired.

To build a floor according to this invention the apparatus is set up in a horizontal position instead of in a vertical position as illustrated for the walls. The apparatus is preferably set so that the reinforcing 7 is on the under side. In order to facilitate the formation of the slab on the under side of the forms, it is preferable that reinforcing 7 be an expanded metal or some other type of reinforcing especially adapted to hold the cementitious material from falling. When this structure is used as a floor of a second story, the under slab forms the ceiling of the first story; and when this structure is used to provide the ceiling of the upper story, the upper slab may be inclined to serve as the roof slab.

Many important features of this invention are retained in a variational form of the invention wherein a light and inexpensive backing is provided behind the foraminous materials to take the place of removable form panels and to be left in place.

The slabs are thin enough to be sufficiently yieldable to coact with the systems of webbing to provide a resilience to impact loadings. These slabs do not cause as large dead load stresses in buildings as thicker walls do. Comparatively low stresses are developed during an earthquake on account of their relatively small inertia. Such slabs require bracing such as is afforded by the arrangement of slab connecting members herein described and are herein referred to as relatively thin slabs.

This construction differs from conventional construction in that, instead of first erecting permanent structural stress bearing frame members and later covering the frame members with plastered slabs, the structure is formed progressively, tying the slabs together as they are plastered, and causing the slabs and the slab connecting members to form a structure that takes the place of the conventional type of construction.

The slab connecting members effect sufficient bracing of the slabs so that a substantial portion of the compressive strength of the slab material is developed before failure from compressive stresses.

The type of vertical systems of webbing used in my invention consists of spaced apart and superimposed slab connecting members. This is a distinction from the prior art in which it was considered necessary to include between plastered slabs in building wall construction some type of pillars or studs which were of a continuous construction coextensive in height with the wall.

The formation of plastered slabs against the exterior faces of removable forms has the distinguishing feature over the forming of walls by pouring against removable cores or molds in that a special type of reinforcing must be provided which is adapted to be incorporated in a layer of plastered material and is adapted to hold the plastered material from slumping.

It is considered impossible to form by the pouring method, at one continuous operation, a structure having the proportions of a structure that can be formed at one continuous operation by the method herein described. Poured slabs contain air bubbles and water pockets which are not to be found in slabs formed by trowelling cementitious material against vertical form faces. Plastered slabs are generally formed by a plurality of laterally applied layers in which a richer film of cementitious material is brought to the surface of each layer, thereby producing slabs much less brittle and more resistant to shocks than in a wall formed by the pouring method.

It is contemplated that features of this invention will be used in the construction of buildings where cementitious material is plastered on permanent backing.

Although many of the important features of this invention relate to the use of plastering methods, the invention includes features which are to apply to poured concrete work.

The term cementitious material is used to refer to any material in a soft state which is capable of hardening, or to any material which was at one time in a soft state and has hardened.

While I have described preferred forms of my invention, it is to be understood that the drawing and the decription thereof are to be considered as illustrative of, rather than limitative upon, the broader claims because it will be apparent to those skilled in the art that changes in apparatus may be made without departing from the scope of my invention.

I claim:

1. In apparatus for constructing walls, a pair of substantially parallel rows of form panels, and means co-operable with the panels of the respective rows for maintaining a relative rigid relationship of one row to the other and including means co-operable with the panels of the respective rows to confine reinforcing materials against the outer faces of the panels of said respective rows, as and for the purpose set forth.

2. In apparatus for constructing walls, two sets of sectional forms positioned relatively to expose the outer faces thereof, and means for maintaining a relatively rigid relationship of one set with respect to the other thereof and including transversely adjustable means adapted to be operatively associated with sheet reinforcing material for obtaining positions of applied adjustment thereof against the outer faces of the two sets of forms.

3. In apparatus for constructing walls, a pair of substantially parallel rows of removable form panels wherein the panels of each row are in edge to edge relation and spaced apart to provide gaps therebetween, an independently removable supporting structure extending along one side only of the rows of panels, and transverse means extending through the gaps and detachably secured in place by means of the supporting structure, said means being co-operable with the panels for holding one row thereof spaced apart from the other row and for establishing relative transverse alinement of the gaps of one row with those of the other row.

4. In apparatus for constructing walls, a pair of substantially parallel rows of vertical form panels wherein the panels of each row are in edge to edge relation and spaced apart to provide vertical gaps therebetween, an independently removable supporting structure extending along one side only of the panels, and vertical rows of transverse means extending through the vertical gaps and detachably secured in place by means of the supporting structure, said means being co-operable with the panels for holding one row thereof spaced apart from the other row and for establishing relative transverse alinement of the vertical gaps of one row with those of the other row.

5. In apparatus for constructing walls, a pair of substantially parallel, laterally spaced-apart rows of removable form panels wherein the panels of each row are in edge to edge relation and spaced apart to provide gaps therebetween, and an independently removable panel alining system including means exteriorly of the rows of panels, rods extending transversely through the space between the said rows of panels and adjustably secured in place by the aforementioned means, and spacing means on the rods and separable therefrom for holding the rows of form panels laterally spaced apart.

6. In apparatus for constructing walls, a pair of substantially parallel rows of vertical rectangular form panels wherein the panels of each row are in edge to edge relation and spaced apart in a horizontal direction to provide vertical gaps therebetween, and a panel alining system including transverse means co-operable with the panels adjacent to the vertical edge portions thereof for holding adjacent panels in relatively vertically shiftable relation to facilitate the setting of vertical extremities of adjacent panels at positions of applied adjustment and for holding the panels horizontally spaced apart and for establishing relative transverse alinement of the gaps of one row with those of the other row.

7. In apparatus for constructing walls, a pair of substantially parallel rows of form panels wherein the panels of each row are in edge to edge relation, and a panel alining system including a plurality of rotatable panel-engaging means for providing outward bearing against surfaces of the panels to hold one row thereof spaced apart laterally from the other row, each of said means being rotatable as a unit and being co-operable with the panels for disengagement therefrom by rotation of said means to facilitate inward collapsing of opposed panels of the respective rows.

8. In apparatus for constructing walls, a pair of substantially parallel rows of form panels wherein the panels of each row are in edge to edge relation, and a panel alining system including panel-spacing means having rotatable rods extending crosswise with respect to the rows of panels and pins held in engagement with the panels by the rods for holding one row of panels spaced apart from the other row, said rows of panels being provided with vertical gaps at positions in which the pins are adapted to be brought by rotating the rods, and said means being co-operable with the panels at the gaps for dropping the pins by rotating the rods.

9. In apparatus for constructing walls, a row of vertical form panels arranged in edge to edge relation to provide a vertical form face, and a

panel alining system having means co-operable with the panels for holding sheet reinforcing material against the form face at spaced intervals and for providing space for the passage of cementitious material between the alining system and the form face.

10. In apparatus for constructing walls, a row of vertical form panels arranged in edge to edge relation to provide a vertical form face, and a panel alining system including rods extending between adjacent panels and crosswise with respect to the form face, and strips detachably secured to the rods for holding sheet reinforcing material against the form face.

11. In apparatus for constructing walls, a row of vertical form panels arranged in edge to edge relation to provide a vertical form face, said panels having vertical recess-forming edges to provide vertical recesses in the form face, and a panel alining system including means co-operable with the panels for holding sheet reinforcing material against the form face at positions in alinement with said recess-forming edges of the panels and for providing space for the passage of cementitious material between the alining system and the form face.

12. In apparatus for constructing walls, a pair of substantially parallel rows of vertical form panels wherein the panels of each row are in edge to edge relation to provide vertical joints therebetween, and a panel alining system comprising spaced-apart vertical series of rods passing through adjacent vertical joints and provided with means at their ends for engagement with structural materials to confine same against the outer faces of panels of the aforementioned parallel rows.

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