June 26, 1934. N. GARRETT 1,963,980

STRUCTURE

Filed Sept. 5, 1931

FIG. 1

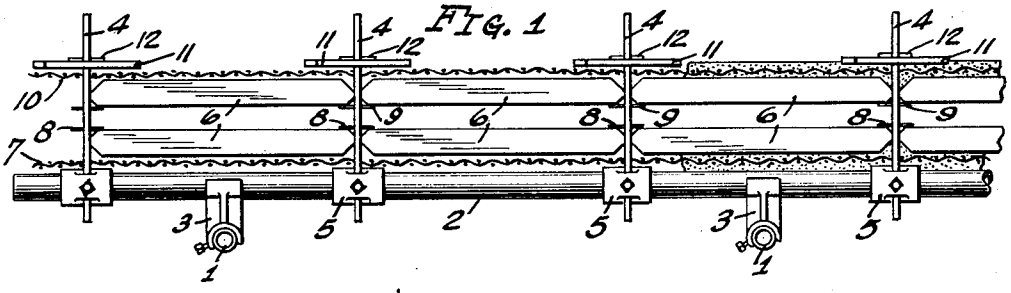


FIG. 2

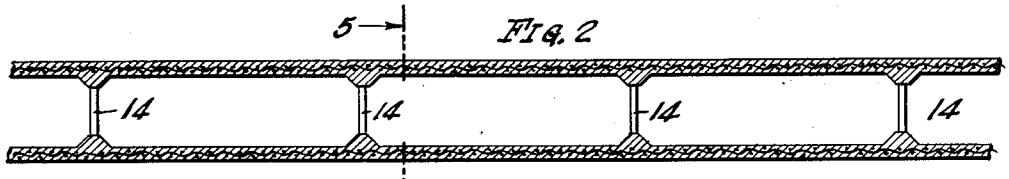


FIG. 3

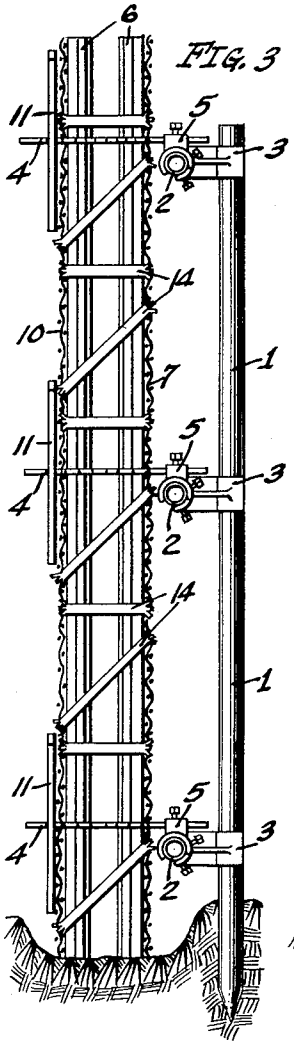


FIG. 4

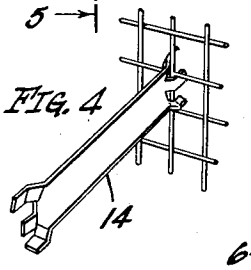


FIG. 5

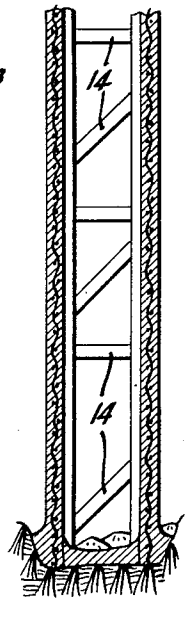


FIG. 6

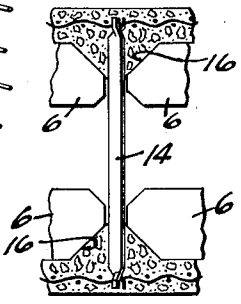


FIG. 7

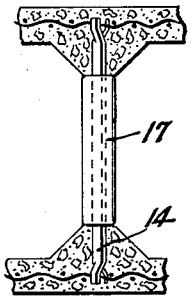


FIG. 8

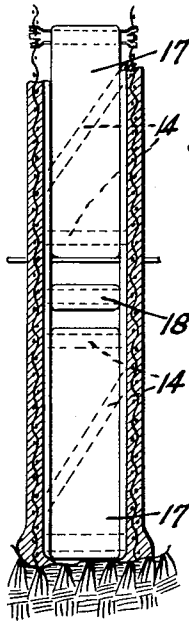
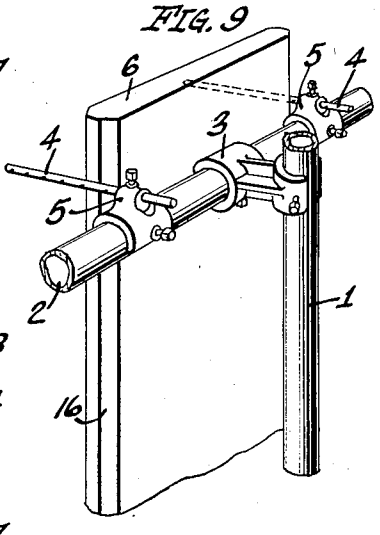


FIG. 9



INVENTOR

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UNITED STATES PATENT OFFICE

1,963,980

STRUCTURE

Neal Garrett, Glendale, Calif.

Application September 5, 1931, Serial No. 561,394

10 Claims. (Cl. 72—48)

This invention relates to reinforced cementitious structures and more especially to those structures characterized by spaced 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; 561,392, 561,393 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 a structure comprised of relatively thin layers of fireproof materials thoroughly reinforced and webbed together to provide a very light and substantial structure possessing sufficient elasticity and yieldability to be resistant to earthquake shocks.

A further object of my invention is to provide a structure characterized by relatively thin, cementitious slabs and in which the conventional frame members, such as studs, beams and joists, are eliminated by the use of light transversely extending slab connecting members arranged at horizontally spaced intervals to provide superimposed groups thereof integrally joining and bracing the slabs together.

A still further object of my invention is to provide a structure that can be made by plastering methods, that utilizes the strength of plastered slabs, and that is adapted for floors, walls and roofs.

It is an important object of my invention to provide a sound-proof structure.

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 variational form of slab connecting member;

Fig. 8 is a view similar to Fig. 5 showing variational forms of 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 7.

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 4. 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 formwork to a height greater than the length of individual panels the panels are placed on top of each other and held in vertical 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. The deformed ends of members 14 are preferably in the form of finger-like projections, certain of which are adapted to be extended through respectively different openings in an adjacent one of the sheets of reinforcing. When thus extended, said certain projections straddle an element of which the sheets of reinforcing are constituted. Said certain projections are preferably of lengths to extend through the sheets of reinforcing to points exteriorly of the latter to provide parts of the projections in positions to become bonded at points exteriorly of the two sheets in portions of cementitious material during an application of the latter over the sheets of reinforcing. 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.

A variational form of wall connecting member 17 is illustrated in Figures 7 and 8. In this case one or more of the ties 14 are embedded in a block of plaster or similar material so as to form a unit. When using these blocks, the form work is erected as before, except that, before the reinforcing 10 is erected, the second row of form panels is temporarily held in place and the blocks are inserted in the spaces between the panels and pushed into engagement with reinforcing 7. When the final layer is erected it is pushed into engagement with the deformed ends of ties 14 of members 17. The plaster blocks are supported upon the ground and upon rods 4 as shown in Fig. 8. Spaces too small to take a large block may be filled by using smaller blocks 18, containing a single tie 14. In order to improve the acoustic properties of the wall the material forming the blocks of members 17 and 18 is preferably some type of sound-proofing plaster.

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 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 bracing the slabs together is not necessary.

The nature of the alining 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 material 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 connecting members 14 co-act with the slabs to take the stresses heretofore carried by expensive studs and therefore eliminate the necessity of using studs or other preformed vertical-stress bearing structures between plastered layers of bearing walls. The members 14 must take compressive stresses between the slabs and it is therefore important to embed substantial portions of the relatively long, thin, continuous, stiff portions of said members in the cementitious material of the slabs, and thereby fix the ends of said members with the same type of rigidity as is effected by embedding the end of a post or column in a concrete abutment. The words "relatively long, thin, continuous, stiff portions" are herein used to designate portions of slab connecting members such as that portion of a member 14 which is adapted to act as a post or column as contrasted to the deformed ends. The proper embedding of substantial portions of the relatively long, thin, continuous, stiff portions of the connecting members makes possible the use of very light connecting members because, when such is the condition at abutments, the proper effective length to be used in any formula for design of the members 14 as columns may be taken as one half of the distance between embedding abutments which is one half the length that should be used for a column not rigidly fixed at its ends.

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 description 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 structure may be made without departing from the scope of my invention.

I claim:

1. A wall comprising two spaced cementitious slabs and vertical systems of webbing connecting the slabs at spaced intervals, said systems of webbing consisting of two sets of metallic elements and sound proofing material embedding the central portions thereof, said elements and said sets having the elements in one set inclined with respect to the elements in the other set.

2. A supporting wall comprising two substantially parallel and vertical, plastered slabs in definitely spaced-apart relationship, and vertical systems of webbing connecting the slabs at horizontally spaced intervals, each of said systems of webbing being comprised of superimposed and vertically spaced-apart connecting members, each of said members having a relatively long, thin, continuous, stiff portion disposed transversely with respect to the slabs and having substantial parts at the ends thereof embedded in the slabs.

3. A supporting wall comprising two substantially parallel and vertical, plastered slabs in definitely spaced-apart relationship, and vertical systems of webbing connecting the slabs at horizontally spaced intervals, each of said systems of webbing being comprised of superimposed and vertically spaced-apart connecting members, each of which is characterized by a single strip of sheet metal shaped to provide a relatively long and thin, transversely curved portion extending transversely with respect to the slabs and having substantial parts at the ends thereof embedded in the slabs.

4. A supporting wall comprising two substantially parallel and vertical, relatively open and light, metallic, plaster-slab-reinforcing sheets in definitely spaced-apart relationship; vertical systems of webbing connecting the sheets at horizontally spaced-apart intervals, each of said systems of webbing being comprised of superimposed and vertically spaced-apart connecting members extending transversely with respect to the sheets, each of said members having a relatively long, thin continuous, stiff portion and a plurality of deformed portions at each end thereof, the deformed portions at each end being extended through respectively different openings in an adjacent one of the sheets; and hardened plastered layers of cementitious material thoroughly embedding the sheets, the deformed portions of said members and substantial parts of the first mentioned portion of each of said members.

5. A supporting wall comprising two substantially parallel and vertical, relatively open and light, metallic, plaster-slab-reinforcing sheets in definitely spaced-apart relationship; vertical systems of webbing connecting the sheets at horizontally spaced-apart intervals, each of said systems of webbing being comprised of a plurality

of sets of superimposed and vertically spaced-apart connecting members extending transversely with respect to the sheets, the members of one set being angularly related to the members of another set, each of said members having a relatively long, thin, continuous, stiff portion and deformed portions at each end thereof, the deformed portions at each end being extended through an adjacent one of the sheets; and hardened plastered layers of cementitious material thoroughly embedding the sheets, the deformed portions of said members and substantial portions of the first mentioned portion of each of said members.

6. A supporting wall comprising two substantially parallel and vertical, relatively open and light, metallic, plaster-slab-reinforcing sheets in definitely spaced-apart relationship; vertical systems of webbing connecting the sheets at horizontally spaced-apart intervals, each of said systems of webbing being comprised of a plurality of superimposed and vertically spaced-apart connecting members extending transversely with respect to the sheets and being angularly disposed in positions with respect to each other corresponding to relative positions of web members of a structural truss, each of said members having a relatively long, thin, continuous, stiff portion and deformable portions at each end thereof, the deformable portions at each end being extended through an adjacent one of the sheets and upset against one side thereof; and hardened plastered layers of cementitious material thoroughly embedding the sheets, the deformed portions of said members and substantial portions of the first mentioned portion of each of said members.

7. Means for permanently supporting two plastic facings in spaced-apart relation to each other comprising two spaced-apart sheet materials constituted substantially of a multiplicity of metallic elements formed and arranged to become substantially embedded and incorporated in plastic facings during application of the latter to the two spaced-apart sheet materials, and means interposed between said sheet materials and comprised of a plurality of spaced-apart members, each of said members having a relatively long, thin, continuous, stiff portion disposed transversely with respect to the sheet materials, said members being formed at their respective ends with portions formed and arranged for connection with the sheet materials in a manner to expose parts of said portions exteriorly of the two sheet materials, and said members being connected to the sheet materials by the last-mentioned portions in a manner to dispose said parts of said portions in positions to become embedded in the plastic facings at points exteriorly of the two sheet materials during application of said facings to said sheet materials.

8. As a new article of manufacture, a device for connecting together two spaced-apart reinforcing sheets of a type characterized by a multiplicity of substantially identical openings extending transversely therethrough, comprising a slender member whose transverse dimension is such that the member is adapted to be passed endwise through an opening in one of the sheets from a point exteriorly thereof, the length of said member being approximately equal to the distance between the sheets to be connected, and said member having substantially identical end portions formed thereon and arranged for engagement with portions of the respective sheets in a manner to support the member in a predetermined position between the sheets preparatory to an application of plastic material over said sheets.

9. As a new article of manufacture, a tie and compressive stress transmitting device for use as a web member in the formation of a truss-like structural portion of a wall and for application to foraminous, spaced-apart, reinforcing materials and for maintaining said materials in relatively definite positions with respect to opposite faces of forms during construction of the wall, comprising a relatively long, thin, metallic member of a proportion transversely adapted to be passed through an opening in a foraminous reinforcing material and said member being adapted to be adjusted in a transverse direction to span an intervening space between said reinforcing material and a corresponding reinforcing material, said metallic member being of material of sufficient stiffness to enable the member to be manipulated by gripping same at one end during application thereof as aforementioned, and said metallic member being provided with substantially similar, claw-like extremities adapted for use in maintaining said reinforcing materials in relatively definite positions with respect to form faces, each of said extremities having parts adapted to be extended through said reinforcing materials, as and for the purpose set forth.

10. As a new article of manufacture, a device for connecting together two spaced-apart reinforcing sheets of a type characterized by a multiplicity of transverse openings, comprising a slender metallic member formed at each of its ends with finger-like projections engageable with said sheets for supporting the member therefrom, certain of the said finger-like projections at each end thereof being adapted to be extended through respectively different openings in an adjacent one of said sheets, and the said certain projections being of lengths to extend to points exteriorly of said two sheets, as and for the purpose set forth.

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