Jan. 19, 1932. N. GARRETT 1,842,348

BUILDING WALL CONSTRUCTION

Original Filed Dec. 18, 1926 2 Sheets-Sheet 1

Fig. 1.

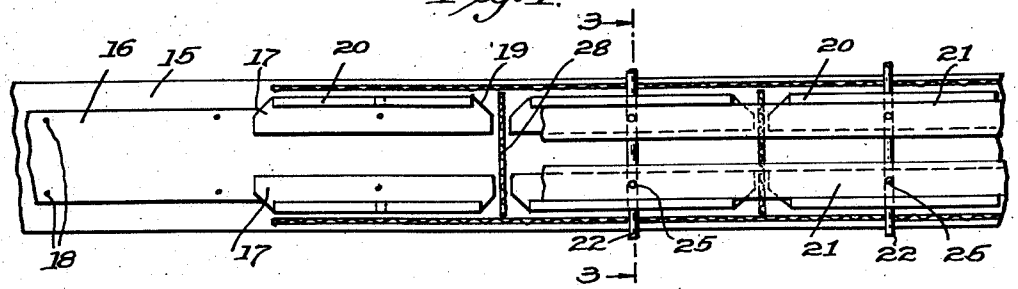



Fig. 2.

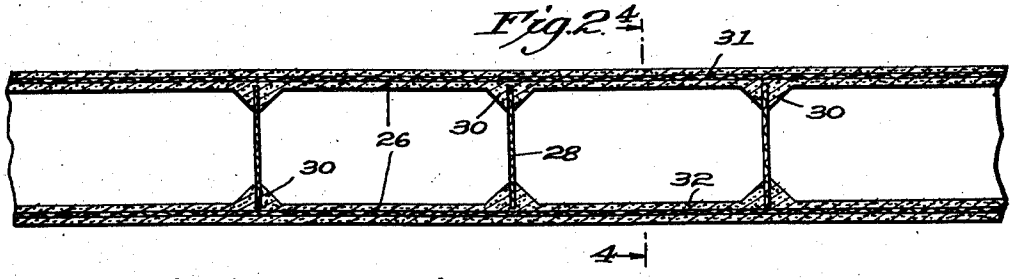



Fig. 3.

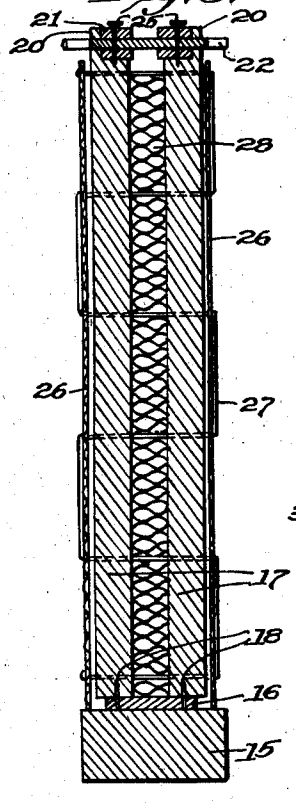



Fig. 4.

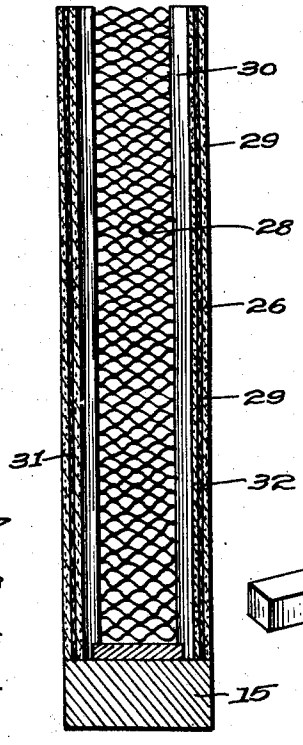



Fig. 5.

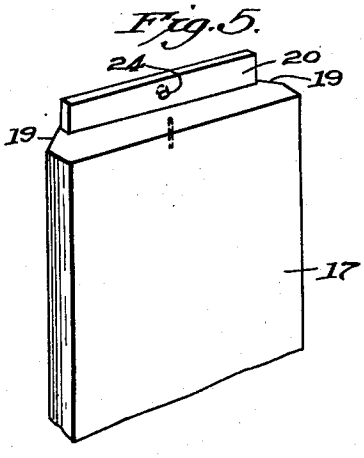
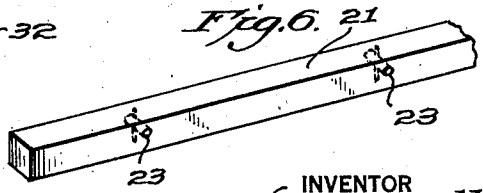



Fig. 6.

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BUILDING WALL CONSTRUCTION

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Fig. 7.

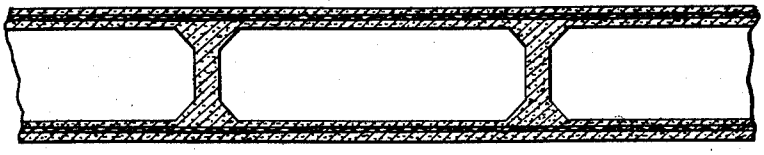


Fig. 8.

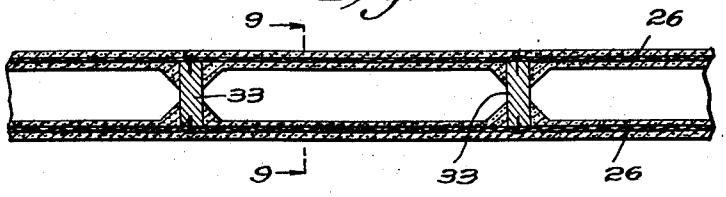
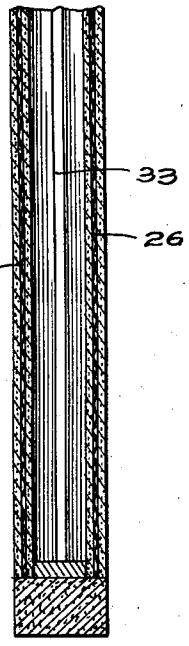



Fig. 9.

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# UNITED STATES PATENT OFFICE

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## BUILDING WALL CONSTRUCTION

Original application filed December 18, 1926. Serial No. 155,699. Divided and this application filed February 27, 1928. Serial No. 257,357. Renewed December 15, 1930.

My invention relates to building walls and is a division of my application, Serial No. 155,699, filed December 18, 1926, and same has particular reference to the types of inventions described and claimed in my co-pending applications Serial Nos. 170,377, filed February 23, 1927, and 561,395, filed September 5, 1931.

It is a purpose of my invention to provide a building wall construction, whereby permanent walls can be constructed of relatively thin layers of fireproof materials, thoroughly reinforced and webbed together so as to form a structure which is very substantial and possesses a sufficient elasticity so as to allow it to bend or yield without breaking or cracking in order that it may successfully resist earthquake shocks.

I will describe various building walls and methods of making the same, and two forms of apparatus, all embodying my invention, and will then point out the novel features thereof in the claims.

In the drawings,

Fig. 1 is a view showing in top plan one form of wall-building apparatus embodying my invention;

Fig. 2 is a fragmentary, horizontal, sectional view showing one form of building wall embodying my invention;

Fig. 3 is a vertical, sectional view taken on the line 3—3 of Fig. 1;

Fig. 4 is a vertical, sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is a fragmentary, detail, perspective view of one of the forms embodied in the apparatus shown in Figs. 1 and 3;

Fig. 6 is a fragmentary, detail, perspective view of one of the alining members embodied in the apparatus;

Fig. 7 is a view similar to Fig. 2, showing another form of wall embodying my invention;

Fig. 8 is a view similar to Fig. 7, showing a third form of wall embodying my invention;

Fig. 9 is a vertical, sectional view taken on the line 9—9 of Fig. 8.

Referring specifically to the drawings, and particularly to Figs. 1 and 3, I will describe an apparatus by which the wall embodying my invention can be produced, and this apparatus in the present instance comprises a base 15 formed of any suitable material and preferably having the cross-sectional contour of a rectangle. Upon the upper side of this base is a strip 16 of wood or other suitable material provided for the purpose of producing a level base upon which is adapted to be set a plurality of forms 17. These forms are arranged in upright position, with their lower edges provided with holes in which is received the upper ends of pegs 18 secured within the strip 16. In this manner the forms are held upon the base and in edge-to-edge relation, as illustrated in Fig. 1, in order to produce two form walls disposed in spaced, parallel relation. The forms 17 are placed upon the base so as to provide intervening gaps between the vertical edges of any two adjacent forms, with the vertical edges beveled, as indicated at 19, for a purpose to be described hereinafter.

In order to maintain the upper edges of the forms 17 in proper, spaced relation and in longitudinal alinement so as to effectively co-operate with the base pegs 18 in rigidly holding the forms in parallel, spaced relation, I construct the upper edges of the forms with upstanding flanges 20, offset with respect to the inner faces of the forms so as to provide ledges on which alining members 21 are seated. The alining members may be formed of wood of any suitable length, preferably of such length as to span a plurality of forms in the manner illustrated in Fig. 1. These members 21 are rigidly and detachably secured to the forms and to each other by means of pins 22 extended through openings 23 in the members and through registering opening 24 in the flanges 20.

Nails or other suitable fastening members 25 are extended vertically through the members 21 and the pins 22, as illustrated in Fig. 3, for the purpose of locking the members to the pins, so that thereby the alining members are maintained contiguously to the flanges 20, and that thus the upper edges of the forms 17 will be rigidly held in longitudinal alinement and in proper, spaced relation to the other series of forms.

The apparatus set up, as just described, is now ready for application thereto of reinforcing elements 26 which, in the present instance, consist of any suitable foraminous material, such as wire mesh. These strips or sheets of wire mesh are arranged at the outer sides or faces of the forms 17 and are secured in slightly spaced relation by means of cords 27 intertwined with respect to the mesh, as illustrated in Fig. 3, and extended through the gaps between the forms 17.

In order to securely brace together the two walls which are subsequently formed by the application of plastic material to the outer faces of the forms and in a manner adapted to form connections sufficiently elastic to allow the complete wall as a unit to bend or yield without breaking or cracking, I provide between the vertical edges of adjacent forms transversely disposed strips of webbing 28 which is preferably in the form of metal lath. The positioning of these webbings is clearly illustrated in Fig. 1, and it will be noted that they are of sufficient width to almost completely span the space between the reinforcing elements 26. The type of webbing shown in the drawings is preferably placed in its position in the forms before the reinforcing elements 26 are placed over both sides of the forms.

Cement, mortar, or other plastic material, indicated at 29, is now plastered against the outer faces of the forms 17 and over the reinforcing elements 26 so that, when the material has set, such elements will be embedded therein to thoroughly reinforce the resultant wall. The plastic material is applied laterally in such a manner as to form an even coat over the outer faces of the forms, the material at the gaps between the forms, because of the beveled edges 19, producing truncated projections 30 (Fig. 2), and these projections are coextensive in height with the walls and have the vertical edges of the webbing strips 28 embedded therein. After the plastic material has been allowed to set and sufficiently harden, the apparatus can be removed from the wall by first withdrawing the nails 25 to allow the removal of the pins 22, and then removing the alining members 21. With the latter removed, the several forms 17 can be lifted from their position between the confronting sides of the wall. The resultant structure thus formed is a double wall, the two parts of which are indicated at 31 and 32 in Figs. 2 and 4 and have a continuous dead-air space therebetween. It is important to note that in the finished wall the slabs 31 and 32 have the reinforcing elements totally embedded therein so that they are completely covered by the plastic material of which the slabs are formed. In this manner the reinforcing elements are protected against deterioration, while the slabs themselves are thoroughly reinforced throughout their entire areas. The strips or web members 28 serve to connect the slabs 31 and 32 at intervals and in such a manner as to transmit tension, compression and shearing between the slabs. They also brace the slabs against buckling under load. In building construction my wall gives absolute insulation against the weather and also gives effective insulation against the transmission of heat.

Slabs 31 and 32 are formed of one or more laterally applied layers of plastic material. Slabs that are formed by plastering methods are herein called laterally applied layers of plastic material or plastered slabs to distinguish them from poured or pre-cast slabs.

Slabs 31 and 32 are also relatively thin slabs. To obtain the advantages of the yieldable features of a wall embodying my invention, it is necessary that the slabs have such a degree of relative thinness as to be sufficiently yieldable to coact with the webbing to provide resilience to impact loadings. Such slabs are relativey light and do not cause as large dead load stresses in a building structure as thicker walls would. Comparatively low stresses are developed during an earthquake on account of their relatively small inertia. The use of very thin slabs accomplishes the purpose of providing a construction which has low cost. Slabs of that relative thinness necessary to accomplish the aforementioned purposes of my invention require bracing such as is afforded by webbing 28 to keep them from buckling when required to act as a reliable compression member in a building wall structure, and such slabs are herein referred to as relatively thin slabs.

The strips of webbing 28 are transverse members for the purpose of bracing relatively thin slabs to enable them to take substantially all of the vertical stresses in the wall structure. The slabs must take these stresses because the transverse members are yieldable to practically all the stresses except those developed in bracing the slabs.

The strips of webbing 28 are vertical systems of webbing and have been shown in the drawing as expanded metal. The expanded metal is comprised of those elements which form the boundaries between pairs of its adjacent apertures. In the metal lath shown in Figure 4 these elements extend along lines inclined to the horizontal at an angle of about thirty degrees. If all the elements inclined

one way with respect to the horizontal be considered as one group and the rest of the elements as the other group, there are two groups of spaced apart elements extending along lines transverse with respect to said slabs and each of these groups is inclined differently with respect to the horizontal. Any vertical system of webbing to be used to brace together relatively thin plastered slabs should be able to transmit stresses between the slabs and along lines inclined at different directions to the horizontal. The aforementioned elements of each of the webbings are positioned and adapted to efficiently transmit such stresses between the slabs and to provide a relatively open and light construction between the slabs. The portions of the slabs at each of the webbings and the webbing between those portions comprises a truss wherein the slabs are the chords of the truss and the elements of the webbing are the web members of the truss. The wall is made up of a series of these trusses standing vertically and being connected by the plastered slabs.

The effective unsupported vertical length of one of the slabs in my wall is the length of a column supported at the ends only, having the same cross section as one of the slabs in my wall, and being of such length as to have the same strength as the braced slab in my wall. The transverse members effect sufficient bracing of the slabs to cause the effective unsupported vertical length of the slabs to be sufficiently small so that the wall has the potential ability to develop a substantial portion of the compressive strength of the slab material before failing from vertical stresses. The materials from which plastered slabs are usually made develop such high compressive strength that it is possible to make a comparatively strong wall with thin plastered slabs and light transverse members.

It is important to note that in the webbing 28 shown in Figure 4 that each of all vertical cross sections thereof in the space between the slabs is characterized by a plurality of spaced apart cut surfaces. A general statement or description of this characteristic is as follows: A wall comprised of vertical, spaced apart plastered slabs and vertical systems of webbing connecting said slabs at spaced intervals, each of said vertical systems of webbing having each of all vertical cross sections thereof in the space between said slabs characterized by a plurality of spaced apart cut surfaces. In this description it is intended that any monolithic protuberances on the confronting faces of the slabs be considered as part of the slabs; that the cutting planes producing the sections referred to be those vertical planes which may be passed between the slabs; that the cut surfaces be the surfaces made by a cutting plane, be in the cutting plane and be not any surface shown in the section behind the cutting plane; that there be a vertical space between cut surfaces in any vertical alinement; and that such a section can not contain a continuous cut surface which is coextensive in height with the wall. This is a distinction to 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 would have one or more of its vertical cross sections in the space between the slabs present continuous cut surfaces coextensive in height with the wall.

By forming openings at different intervals in the pins 22, varying the width of the base strip 16, and setting the pegs 18 the desired distances apart, the apparatus can be adjusted to form a wall of any desired thickness. In order to set the forms for any length of wall it will be necessary, of course, to have forms of which the width may be varied an amount equal to the width of one of the forms. A wall of any height which is less than the height of the forms 17 may be made by discontinuing the plastering operation at the desired height. A wall of greater height than the forms can be made by first building a wall with one setting of the forms and then placing a base strip similar to the base 16 upon the tops of the reinforcing elements 26 and building a wall on the top of the strip thus set in a manner identical with the method previously described.

Many different materials may be used as tie members in place of the webbings 28. For example, a studding 33 may be inserted in each gap between the forms in place of the webbing 28, and the reinforcing elements 26 may be nailed upon the studding so that in the complete wall the studs will appear as illustrated in Figs. 8 and 9. In this adaptation the studding may be used to assist in holding and alining the forms. It is obvious that the studding may be erected, the reinforcement may be placed over them, and the forms may be subsequently inserted, this being an obvious variation of my method.

In making a relatively narrow wall, the employment of the webbings 28 may not be necessary, because it is possible to force the plastic material through the gaps between the forms and from the outer sides of the forms until the material from one side meets that of the other, thus forming a webbing of plastic material, as shown in Fig. 7.

Although I have herein shown and described various apparatus and walls embodying my invention, it is to be understood that further changes and modifications may be made without departing from the spirit of the invention, and the spirit and scope of the appended claims.

I claim:

1. A double, hollow wall comprising two, relatively thin, laterally appied layers of plastic material having metallic reinforcing elements totally embedded therein, and a plurality of yieldable web members extending edgewise between the layers and having their edge portions respectively embedded in said layers.

2. A hollow, double wall comprising two reinforced slabs, and tie members extending edgewise between the slabs and integrally united therewith at their edge portions in order to hold the slabs in definite, spaced relation, said tie members possessing a certain degree of elasticity for the purpose described.

3. A wall comprising spaced slabs of plastic material, and expanded and yieldable metal members extending edgewise between the slabs in order to hold the slabs in parallel, spaced relation.

4. A wall comprising spaced slabs of plastic material, and web members at horizontally spaced intervals edgewise between the slabs, said web members being of an elastic nature so as to allow the wall to yield sidewise in the neighborhood of the point of application of an impact stress, and consequently enabling the result of the impact to be transmitted over, and to be resisted by, the whole wall.

5. A wall comprising spaced slabs of plastic material, and web members at horizontally spaced intervals edgewise between the slabs, said web members being of an elastic nature so as to allow the wall to yield sidewise in the neighborhood of the point of application of an impact stress, and consequently enabling the result of the impact to be transmitted over, and to be resisted by, the whole wall, said web members being coextensive in height with the slabs.

6. A wall, as embodied in claim 4, wherein the members consist of metal webbing.

7. A wall comprising spaced slabs of plastic material having metallic reinforcing elements therein and truncated protuberances at corresponding points on the confronting sides thereof, and expanded, yieldable and metallic members having their edge portions respectively embedded in the protuberances and connecting corresponding protuberances.

8. A wall, as embodied in claim 7, wherein the protuberances and members are co-extensive in height with the slabs.

9. A hollow, double wall comprising plastered slabs having metallic reinforcing elements totally embedded therein, and a plurality of yieldable web members having edge portions thereof respectively embedded in the slabs.

10. A bearing wall comprising spaced, parallel, plastered slabs providing the outside surfaces of the wall, and vertical strips of expanded and yieldable metal lath having the edge portions thereof respectively embedded in the slabs and transmitting all sidewise stress between the slabs.

11. A hollow, double wall comprising two reinforced slabs, each including a relatively thin layer, and a metallic reinforcing element wholly embedded therein; and yieldable web members placed edgewise between the slabs and integrally united therewith at their respective edge portions in order to hold the slabs in a definite, spaced relation to each other, thus laterally bracing the slabs and distributing the stress over the wall.

12. A supporting wall comprised of two vertical, spaced-apart, confronting, monolithic, relatively thin slabs and transverse members connecting the slabs, said transverse members transmitting stresses between the slabs to brace the slabs laterally with respect to each other to effect resistance to buckling of the slabs, said transverse members being yieldable to other stresses in the wall structure to cause the slabs to take substantially all of the vertical stresses in the wall structure.

13. A supporting wall comprised of two vertical, spaced-apart, confronting plastered slabs and vertical systems of webbing connecting said slabs at spaced intervals and each of said vertical systems of webbing having groups of spaced-apart elements extending along lines transverse with respect to said slabs and having each of said groups inclined differently with respect to the horizontal to cause the wall to act as a series of connected vertical trusses.

14. A supporting wall comprising two spaced, relatively thin plastered slabs and transverse members connecting the slabs; said transverse members being adapted to brace laterally one slab against the other so that the effective unsupported vertical length of the slab thus braced is sufficiently small so that the wall will have the potential ability to develop a substantial portion of the compressive strength of the slab material before failing from vertical stresses.

15. A supporting wall comprising two vertical, spaced-apart, confronting plastered slabs and vertical sheets of transverse material connecting said slabs and each sheet having each of all vertical cross sections thereof in the space between the slabs characterized by a plurality of spaced-apart cut surfaces.

16. A supporting wall comprised of two vertical, spaced-apart, confronting plastered slabs and vertical systems of webbing connecting said slabs at spaced intervals and each of said vertical systems of webbing having each of all vertical cross sections thereof in the space between said slabs characterized by a plurality of spaced-apart cut surfaces.

17. In building construction, a supporting wall structure comprised of two vertical, spaced-apart, confronting plastered slabs and vertical systems of webbing connecting said slabs at spaced intervals, said vertical systems of webbing being adapted to coact with the slabs to prevent the wall from collapsing when subjected to vertical loads in building construction and said vertical systems of webbing having such yieldability to vertical loads as to cause the slabs to take substantially all of the vertical stresses in the wall structure.

18. In building construction, a supporting wall structure comprised of two vertical, spaced-apart, confronting plastered slabs; monolithic protuberances on confronting faces of the respective slabs; and transverse members connecting protuberances on one slab with the protuberances on the other slab, said transverse members being adaptel to coact with the protuberances and the slabs to prevent the wall from collapsing when subjected to vertical loads in building construction and said transverse members having such flexibility to vertical loads as to cause the slabs and said protuberances to take substantially all of the vertical stresses in the wall structure.

19. In building construction, a supporting wall structure comprised of two vertical, spaced-apart, confronting plastered slabs; portions of plastic material integral with one slab; portions of plastic material integral with the other slab and spaced from the first said portions of plastic material; and transverse members interposed between the slabs and each of said transverse members having a portion thereof embedded in one of the first said portions of plastic material and another portion thereof embedded in one of the second said portions of plastic material, said transverse members being adapted to coact with the said portions of plastic material and the slabs to prevent the wall from collapsing when subjected to vertical loads in building construction and said transverse members having such flexibility to vertical loads as to cause the slabs and said portions of plastic material to take substantially all of the vertical stresses in the wall structure.

20. A supporting wall comprised of two vertical, spaced-apart, confronting plastered slabs, monolithic protuberances on confronting faces of the respective slabs; and vertical systems of webbing connecting protuberances on one slab with the protuberances on the other slab and each of said vertical systems of webbing having each of all vertical cross sections thereof in the space between said slabs characterized by a plurality of vertically spaced-apart cut surfaces.

21. A supporting wall comprised of two vertical, spaced-apart, confronting plastered slabs, portions of plastic material integral with one slab; portions of plastic material integral with the other slab and spaced from the first said portions of plastic material; and vertical systems of webbing connecting the first said portions of plastic material with the second said portions of plastic material and each of said vertical systems of webbing having each of all vertical cross sections thereof in the space between said slabs characterized by a plurality of vertically spaced-apart cut surfaces.

Signed at Los Angeles, in the county of Los Angeles and State of California, this 14th day of February, A. D. 1928.

NEAL GARRETT.