July 2, 1940. J. C. MORRELL 2,206,233

BUILDING CONSTRUCTION

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Fig. 1.

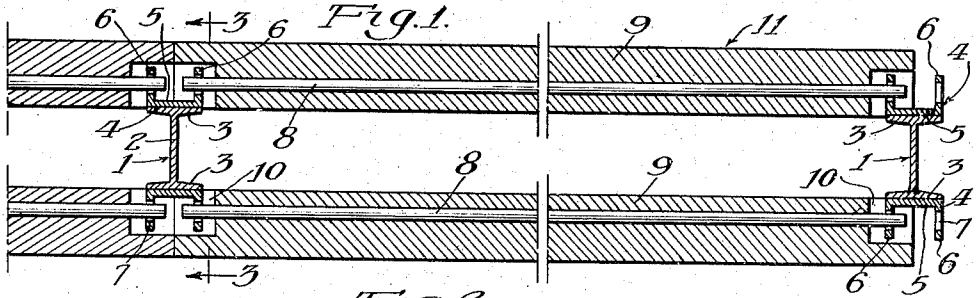


Fig. 2.

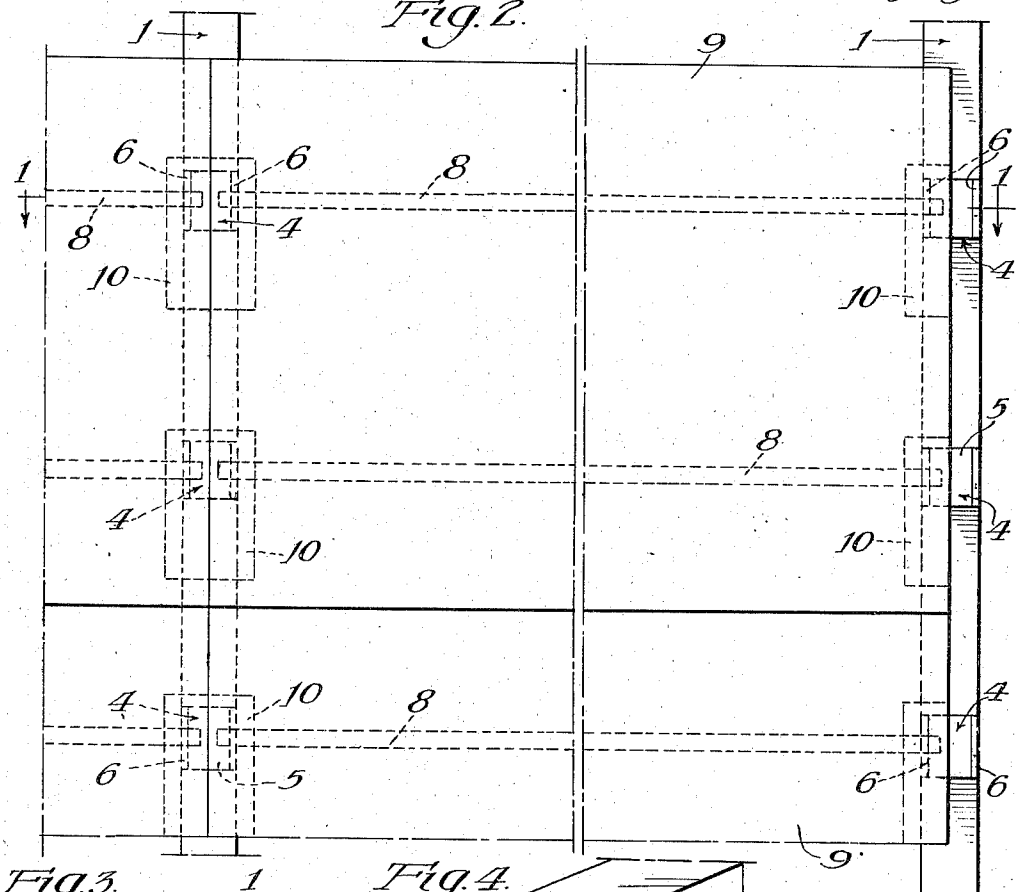


Fig. 3.

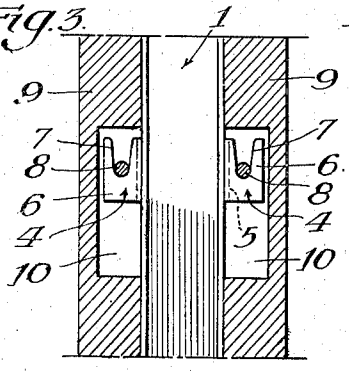
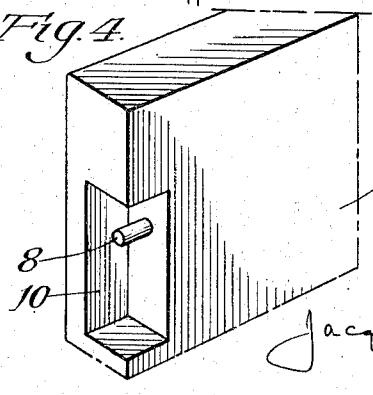


Fig. 4.



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Fig. 5.

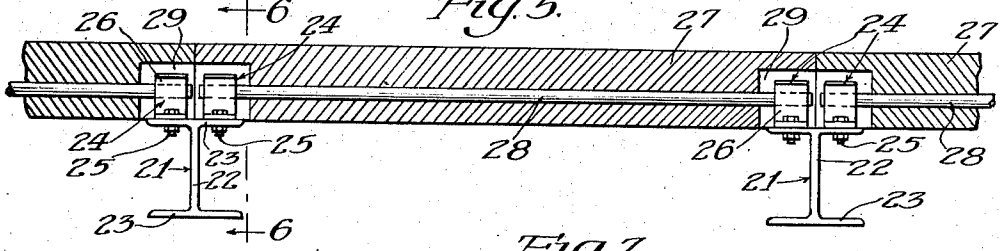


Fig. 6.

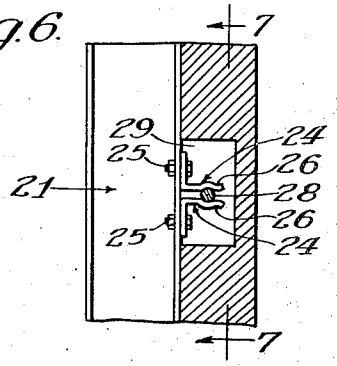


Fig. 7.

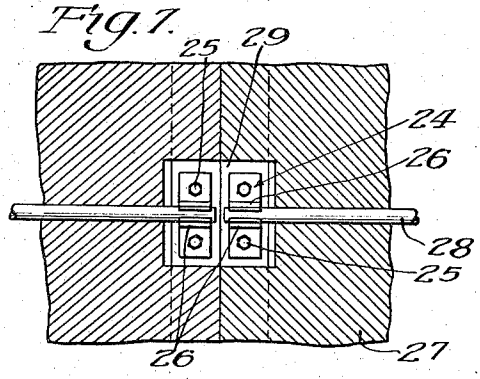


Fig. 8.

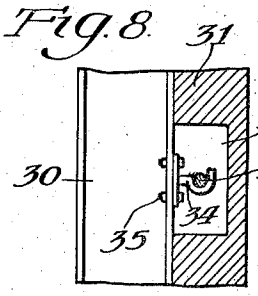


Fig. 9.

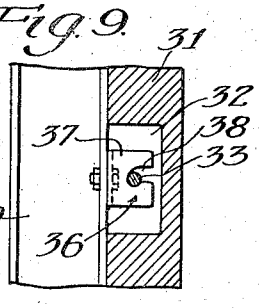


Fig. 10.

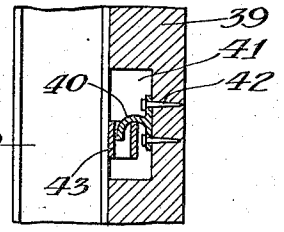


Fig. 11.

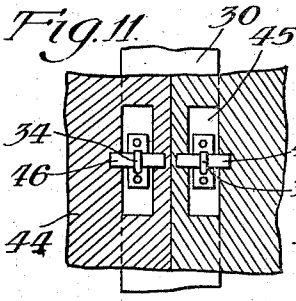


Fig. 12.

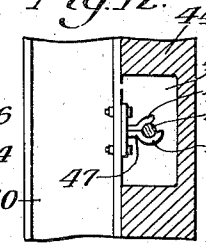


Fig. 13.

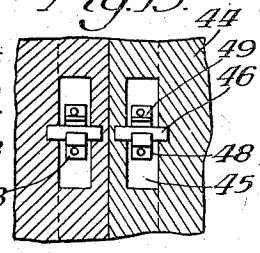


Fig. 14.

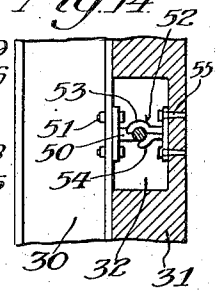


Fig. 15.

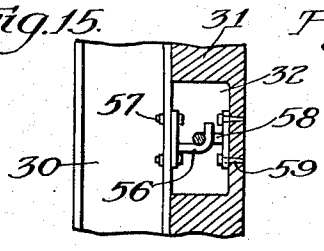
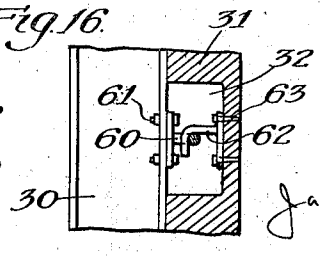


Fig. 16.



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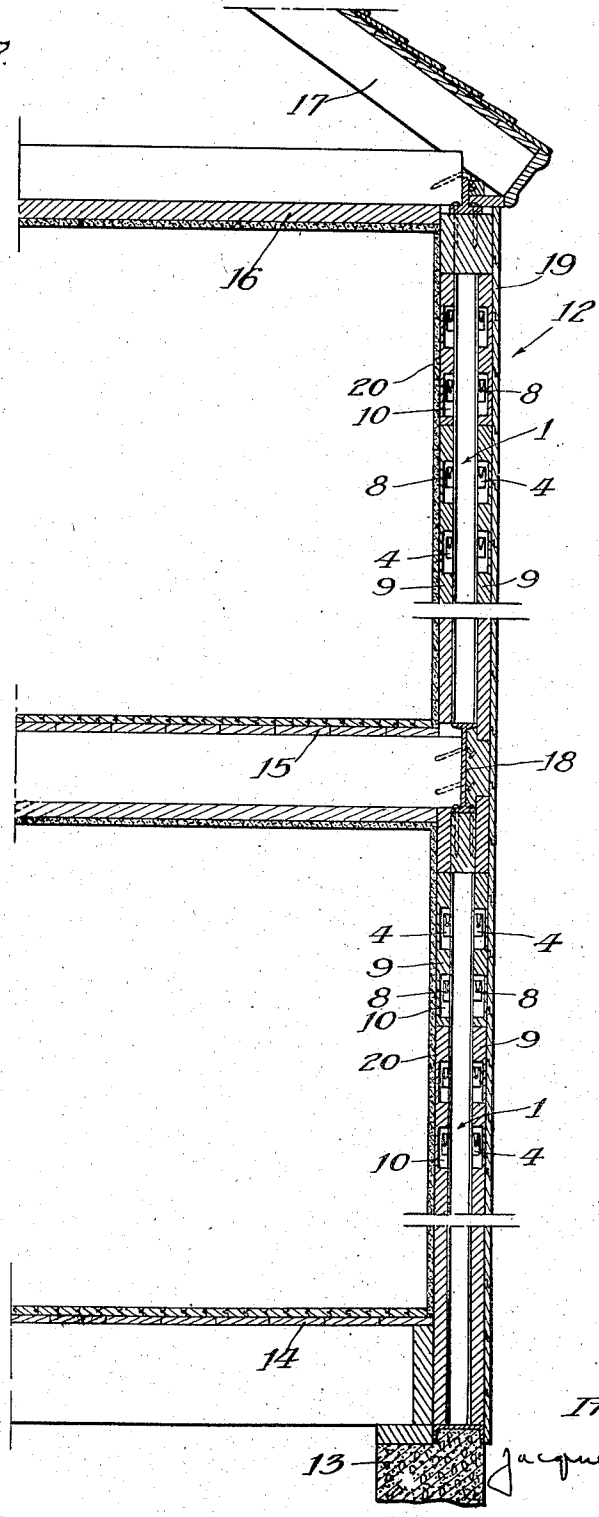
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Fig. 17.



Inventor:
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Patented July 2, 1940 2,206,233

UNITED STATES PATENT OFFICE

2,206,233

BUILDING CONSTRUCTION

Jacque C. Morrell, Oak Park, Ill.

Application November 7, 1938, Serial No. 239,281

5 Claims. (Cl. 72—16)

This invention is a continuation in part of my application No. 118,966, filed January 4, 1937, and particularly refers to an improved method and means of wall construction, especially adapted for use in buildings, such as residences, for example, wherein protection against heat and loss of heat is essential.

This invention is concerned principally with an improved method and means of installing and retaining building wall slabs or panels, preferably composed of material possessing good insulating qualities, in the walls of such a structure. These slabs are placed between spaced stud members in the outer walls of the structure and are permanently affixed to the adjacent studs and thus retained in place in the wall by various alternative but non-equivalent means which do not impair the good insulating characteristics of the slabs, or of the wall as a whole. Preferably the slabs are so placed in relation to the studs as to provide a layer or thickness of insulation between the outer faces or flanges of the studs and outer faces of the wall.

One specific embodiment of the invention, wherein the structural frame work of the outer walls of a building includes spaced wood or metal studs such as, for example, H-columns, I-beams, or channels having flanges substantially parallel to opposite faces of the wall, the slabs of wall or insulating materials or pairs of slabs of insulating material or in general wall material facing one another, are attached to the studs by members embedded in the slabs and are attached to the studs by suitable hanger-clips or brackets or by other means as hereinafter described. In a specific embodiment the attaching means comprise various devices which are transverse to the thickness of the slabs or in general perpendicular to the faces, and which permit the slabs to be placed flush with the face of the stud or lie flat against it.

General forms as well as several specific forms of the above mentioned embedded members may be employed within the scope of the invention. One of said general forms comprises a suitable bar, rod, tube, hook and eye, snap, clips, and similar devices or other suitable device which may be embedded in the slabs at spaced intervals at the time the slab is fabricated, or at any time prior to its placement in the wall, the embedded members being attached to the studs as the slab is placed in position. In some forms the attaching members may not necessarily be embedded in the slab although in this case provision is preferably made for allowing the slab to be placed flush with the stud.

With the types of embedded members above mentioned they may either extend between and protrude from opposite vertical edges of the slab, or may extend only part way into the slab from its vertical edges or they may be embedded and/or attached to the face next to the stud. In one modification the slabs may also be attached directly to the studs by nails or screws, the heads of which are preferably counter-sunk or combination methods of attachment selected from those described may be employed. It is to be understood that the various methods described are non-equivalent although departures and variations within the scope of the invention are to be included therein.

As one of the features of the present invention, the slabs or pairs of slabs attached adjacent studs are placed with their inner faces or surfaces flatly against the faces or flanges of the studs to which they are attached and the slabs are relatively thin and are preferably not corner notched as are those in the parent application.

As a feature of the present invention I may employ slabs or wall board made of fibrous or composition insulation material upon which is superimposed a relatively thin layer of separately formed plastic material, preferably made laminated fabric, e. g., paper saturated with a synthetic resin but which may also be in the form of a pre-formed sheet of plastic material such as from a molding mixture of a plastic and filler material or the molded plastic alone. This may be fixed integrally upon the insulation board or wall slab with a suitable adhesive and serves the purpose of both interior and exterior decoration and protection. The various modifications of the plastic layer is described and claimed more completely in an application which is copending with the present one.

In the drawings,

Fig. 1 is a plan sectional view of a wall constructed in accordance with my invention, said section being taken on the line 1—1 of Fig. 2.

Fig. 2 is an elevational view of the wall shown in Fig. 1.

Fig. 3 is a sectional view taken on line 3—3 of Fig. 1.

Fig. 4 is a fragmentary detailed perspective view of a corner of one of the wall panel units employed in constructing the wall shown in Fig. 1.

Fig. 5 is a plan sectional view of a wall illustrating a modified form of my invention.

Fig. 6 is a transverse sectional view taken on line 6—6 of Fig. 5.

Fig. 7 is a sectional view taken on line 7—7 of Fig. 6.

Figs. 8, 9, 10, 11, 12, 14, 15 and 16 are views similar to Fig. 6 of various modified forms of wall panel hanging means.

Fig. 13 is a face sectional view of a hanging device shown in Fig. 12.

Fig. 17 is a sectional elevational view of a building illustrating my improved wall structure as used for an outer building wall.

Referring in detail to the drawings, 1—1 indicates a plurality of I-beams which are vertically disposed in spaced relationship to provide building wall studs. Each of the I-beams 1 comprises a web 2 and opposite flanges 3. Of course, it is to be understood that other iron shapes may be utilized since my invention is not predicated or dependent upon the use of I-beams for studs. U-shaped metal members 4 are secured to the flanges 3 of the I-beams at spaced points along the length of the I-beams. Each of the members 4 is provided with a back 5 and spaced flanges 6. Preferably, the members 4 are constructed of metal and the backs 5 are welded to the flanges 3 of the I-beams so as to cause the flanges 6 to project outwardly from the I-beams. Preferably, the members 4 are disposed in pairs of opposite flanges of the I-beam.

Each of the flanges 6 of the members 4 is provided with a tapered slot 7 which opens towards the top of the flange. The slots 7 are adapted for the reception of the ends of rods 8 which are embedded in the thickness of wall panels 9. The wall panels 9 may be constructed of fibrous material in general of organic or numeral characteristics preferably having heat insulating properties. The panels 9 are preferably constructed in rectangular units and each unit carries one or more, and preferably two or more, embedded rods 8. Corner portions of the panels 9 are recessed as indicated at 10 in Fig. 4, said recesses occurring where the ends of the rods 8 project from the panel material.

To assemble a wall 11 constructed in accordance with my invention, the panels 9 are disposed in spaced relationship on each side of the I-beams 1 and the ends of the rods 8 are positioned in the slots 7. It can readily be seen that the panels 9 abut along the line of the studs and may be positioned one above the other between adjacent studs.

Referring in detail to Fig. 17, my invention is illustrated as employed in an usual building 12. The building 12 comprises the usual foundation 13, lower floor 14, upper floor 15, upper ceiling 16 and roof 17. A plurality of I-beam studs 1 are vertically positioned upon the foundation 13. At the top of said studs an I-beam 18 extends transversely. Upon the upper flange of the I-beam 18 another plurality of I-beams 1 are vertically positioned in spaced relationship along the length of the beam 18. A plurality of wall panels 9 are hung upon the members 4 which are carried by the I-beams 1 by means of the embedded rods 8. Upon the outer surface of the wall, sheathing 19 may be positioned. Instead of the sheathing 19, said outer surface may be covered with clap boards, or other suitable covering known to the art such as brick, stucco and weather protecting material generally. The inner panels 9 may, if desired, be covered with plaster 20 or other decorative material.

Of course, although the wall 11 is illustrated in Fig. 17 as comprising an outer wall, said wall may also be utilized for inner or partition walls. Further, suitable modifications must be made in the panels to accommodate windows and doors in the walls. These modifications, of course, involve purely mechanical skill and will be understood by those skilled in the art.

Referring particularly to Figs. 5, 6 and 7, a modified form of my invention is illustrated. In this form of my invention, 21—22 indicates I-beam studs which are positioned in a manner similar to the studs 1. Each of the I-beams 21 comprises a web 22 and opposite flanges 23. Angular members 24 are secured to one or both flanges of the I-beams 21 by means of bolts 25 or the like.

It is to be understood, of course that any convenient means of attachment of the members 24 to the I-beam flanges is contemplated. The angular members 24 are positioned in pairs upon the flanges 23 and are disposed in such a manner as to provide spaced spring arms 26. Wall panels 27 are adapted to be carried by the I-beam studs 21, each of the panels carrying one or more embedded rods 28 which project at each of their ends into a recess 29, similar to recess 10 hereinbefore described. The ends of the rods 28 are adapted to be inserted between the adjacent spring arms 26 and said arms are suitably curved to resiliently or frictionally retain the rods 28. To provide further retention of adjacent panels 27 on each side of the web of the I-beam, pairs of angular members 24 are positioned adjacent each other. If desired, the wall illustrated in Figs. 5, 6, 7, instead of carrying one set of panels 27, may carry spaced sets of panels similar to wall 11.

Referring particularly to Figs. 8 to 16 inclusive, modified forms of hanging means are illustrated.

In view of the fact that in many instances the wall panels are of the same construction wherever similar elements are described, the same reference numerals will be used.

Referring particularly to Fig. 8, a vertical stud 30 of I-beam construction is adapted to carry a plurality of panels 31. The panels 31 are provided with recesses 32 similar to the recesses 10 and 29 hereinbefore described. One or more rods 33 may be embedded in the thickness of the panels 31 and extend into the recesses 32. At spaced points along the length of each of the studs 30, hook-like members 34 are secured to the flanges of the studs by means of bolts 35 or other securing agencies.

Referring particularly to Fig. 9, the hanging members comprise angular plates 36, each of which has an outwardly extending flange 37. A notch 38 is provided in the flange 37 for the reception of the end of rod 33, the notch 38 resembling a bayonet slot.

Referring particularly to Fig. 10, the stud 30 carries a plurality of panels 39. In this form of my invention the panels are not provided with the customary rods 8, 28 or 33, but are provided with downwardly projecting hooks 40 which are secured within recesses 41 to the panels 39 by means of nails or screws 42. At spaced intervals along the length of the studs 30, tubular members 43 are secured to the flanges of said studs, the downwardly extending hook member being adapted to engage in the tubular member 43. The tubular members 43 are preferably welded to the studs 30.

Referring particularly to Fig. 11, an I-beam stud 30 is illustrated as carrying a plurality of hook members 34 similar to the members 34 illustrated in Fig. 8. Wall panels 44 instead of being provided with notched recesses similar to recesses 10, 29 and 32, are provided with slot type of recesses 45. Across the recess 45 rods 46 extend, the ends of said rods being embedded in the thickness of the panels 44 on each side of the slots. In this form of my invention the rods 46 do not extend throughout the entire width of the panel.

Referring particularly to Figs. 12 and 13, an I-beam stud 30 is illustrated as carrying a plurality of panels 44, said panels being provided with recesses 45 similar to the recess described in conjunction with Fig. 11. Rods 46 extend across the recess 45 and are embedded in the panel thickness on each side of the recess. Said rods are adapted to engage in the hanging member 47, each of which comprises a lower hook member 48 and an upper clamping member 49 between which the rods 46 are positioned.

Referring particularly to Fig. 14, an I-beam stud 30 is illustrated as carrying a panel 31 similar to the panels 9 and 27. A plurality of recesses 32 similar to recesses 10 and 29 are provided in the panel. In this form of my invention, an eyelet member 50 is carried by I-beam 30 and secured thereto by bolts 51 or otherwise. An engaging member 52 having an upper hook-like element 53 and a lower clamping element 54, is carried by the panel, the engaging member being secured to the panel by means of nails or screws 55. The hook-like member 53 and clamp member 54 engage the encircling portion of the eyelet 50.

Referring particularly to Fig. 15, an I-beam 30 carries a forwardly extending hook 56 which is secured to a flange of the I-beam by means of bolts 57 or the like. The I-beam is adapted to carry a panel 31 having a plurality of recesses 32 similar to recesses 10 and 29. An eyelet 58 is carried by the panel 31 and secured thereto by means of nails or screws 59.

Referring particularly to Fig. 16, I-beam stud 30 carries an eyelet 60 which is secured to the flange of the I-beam by means of bolts or the like 61. A panel 31 is carried by the I-beam, said panel being provided with a plurality of recesses 32. A downwardly extending hook member 62 is secured to the panel 31 by means of bolts or screws 63.

In order to make the attaching means more secure and to prevent movement of the slabs cement or cementitious materials or in general materials having adhesive and/or plastic properties which may set after drying or curing, may be placed in or around the attaching means just prior to placing the slabs in position.

Nailing strips may be employed wherever convenient or necessary for attaching either interior or exterior finishes, such as plaster or expanded metal for the interior or clapboard on the exterior. These may comprise wood strips suitably disposed in the slabs.

Although wood-siding is indicated at 19 in Fig. 17 the invention contemplates the use of any desired type of exterior finish for the wall slabs, such as, for example, brick or stone veneer, stucco, metal siding, or the like. Exterior finishes, such as plywood, or sheets of any other desired material which is sufficiently resistant to deterioration from moisture and varying weather conditions, may be applied to the slabs after they are installed or may be furnished integral with the individual wall slabs, being attached, in the latter case, to the underlying surface of the slabs by glueing, or in any other desired manner.

A plaster finish 20 applied directly to the interior surface of the wall slabs, is here illustrated, although the invention contemplates the use of any other accepted type of interior finish, such as for example, wood or plywood panels, metal sheets, tiling or simulated tile, linoleum or the like which may be integral with the slabs as they are installed, or may be attached thereto in any desired manner after the slabs are installed in the wall. Reinforced mesh, such as expanded metal lath, or the like, may be employed with plaster or other plastic finishes on the interior surface of the wall, when desired, as well as with the stucco finishes, or the like, for the exterior surface.

It will be apparent from the foregoing that the invention provides a number of related but non-equivalent methods and means of attaching slabs of wall materials to spaced stud members in the walls of a structure. Each of these methods and means is particularly well adapted to use with wall slabs composed primarily of the so-called "rigid" type of heat-insulating materials such as gypsum blocks or preferably slabs of insulation composed of fibrous materials, of vegetable, animal or mineral origin, as well as other types of insulating slabs and blocks such as, for example, cast or molded materials containing ingredients of good insulating quality or a high percentage of relatively small voids or pockets of entrapped air or inert gas. The features of the invention are particularly desirable in connection with the use of slabs or blocks of insulating materials since the methods and means of attachment provided do not materially decrease the overall efficiency of the insulating material used and eliminate penetrating members of high heat conductivity.

However, the invention is not limited to the use of materials of good heat insulating quality for the wall slabs, since the methods and means herein provided for attaching the slabs to spaced stud members will also prove advantageous for attaching other types of wall materials, particularly in certain types of buildings where a high degree of insulating efficiency is not essential. Molded or precast slabs of hydraulic cement, concrete, natural or synthetic resins, ceramic materials and the like may be attached to the framing members of any type of structure in the manner and by the means herein provided.

As applied to buildings such as houses, office buildings, factories and the like, any desired form and type of interior and exterior wall materials may be utilized in conjunction with the wall slabs. When plaster is employed as an interior finish it is preferably applied directly to the interior surface of the slabs although expanded metal lath, wire mesh or the like may, of course, be utilized as a base, when desired. Stucco and kellastone or the like may be applied to the exterior surface of the slabs either without or, preferably, with a suitable reinforcing mesh. Brick or stone veneer may be applied over the slabs and wood or metal siding of any desired type as well as wood or composition shingles may be employed as an external finish. When wood siding, shingles or panels of wood, metal or composite materials are employed suitable nailing strips may be anchored to the slabs in any desired manner such as, for example, by embedding or

anchoring bolts, metal clips or the like in the insulating material and attaching the same to the nailing strips. Masonry veneer may also be anchored to the slabs in a similar manner.

It will also be understood that, although metal studs such as I-beams or H-columns are shown in the illustrations, wood framing may be employed with equal facility, in which case the wood studs may be of either square, rectangular, I or H shape in the cross-section, with the clips or brackets for attaching the slabs either nailed or bolted thereto.

It will, of course, be understood that various combinations of the features of the invention, other than the combinations illustrated and described, will be obvious to those skilled in the art and are therefore entirely within the scope of the invention, as defined by the appended claims. The same applies to various modifications and minor departures from the specific forms of wall slabs as well as the method and means of attaching the wall slabs, herein illustrated and described.

I claim as my invention:

1. A wall comprising in combination spaced stud members, slabs of wall material disposed in pairs between said stud members, the outer faces of which are disposed in substantially parallel planes, attaching means comprising hooks carried by the side ends of said slabs and extending from the body of the slabs, means carried by said studs for engaging with said hooks whereby the inner faces of the slabs are carried by the studs substantially flush with the outer portions of said studs, the outer portions of said studs and attaching means being covered by said wall material.

2. A wall comprising in combination spaced stud members, slabs of wall material disposed in pairs between said stud members, the outer faces of which are disposed in substantially parallel planes, attaching means carried by the side ends of said slabs and extending from the body of the slabs, hooks carried by said studs for engaging with said attaching means carried by the slabs whereby the inner faces of the slabs are carried by the studs and lie substantially flush with the outer portions of said studs, the outer portions of said studs and attaching means being covered by said wall material.

3. A wall comprising in combination spaced stud members, slabs of wall material the faces of which are disposed in substantially parallel planes and extending between adjacent stud members, attaching means comprising auxiliary members secured to said slabs and studs at spaced intervals, certain of said auxiliary members being provided with slots for engaging other auxiliary members whereby to secure the slabs to the said studs, in a manner whereby the slab may be attached to the supporting members by moving the slab in a plane at substantially right angles to the face of the wall.

4. A wall comprising in combination spaced stud members, slabs of wall material the faces of which are disposed in substantially parallel planes and extending between adjacent stud members, attaching means comprising auxiliary members secured to said slabs and studs at spaced intervals, certain of said auxiliary members comprising loops for engaging other auxiliary members whereby the slabs may be mounted upon studs in adjacent relationship by moving the slabs in a plane substantially at right angles to the face of the wall, whereby the inner faces of the slabs lie flat upon and are attached to the flanges of the said studs.

5. A substantially vertical building wall comprising spaced supporting members carrying panel supporting means, a wall panel of greater width and length than thickness, said panel having substantially vertically spaced recesses adjacent opposite side edges thereof said recesses containing supporting means complementary to the supporting means carried by the supporting members, at least one of said supporting means comprising an open hooked member whereby the panel may be attached to the supporting member by moving the panel in a plane at substantially right angles to the face of the wall.

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