June 21, 1932. J. S. GROVES 1,863,981

CONCRETE BUILDING CONSTRUCTION

Filed June 17, 1930 3 Sheets-Sheet 1

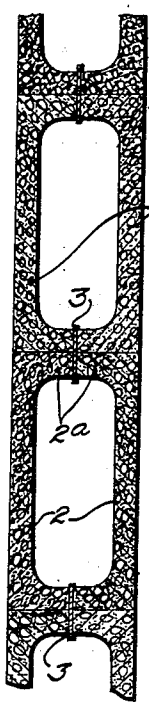


FIG. 2

FIG. 1

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CONCRETE BUILDING CONSTRUCTION

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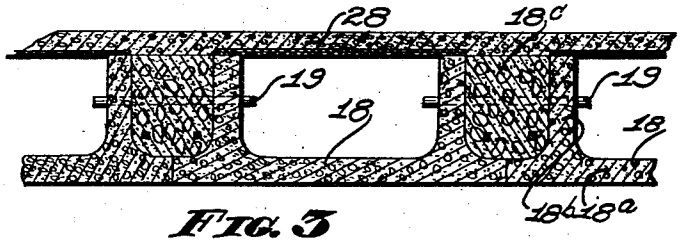


FIG. 3

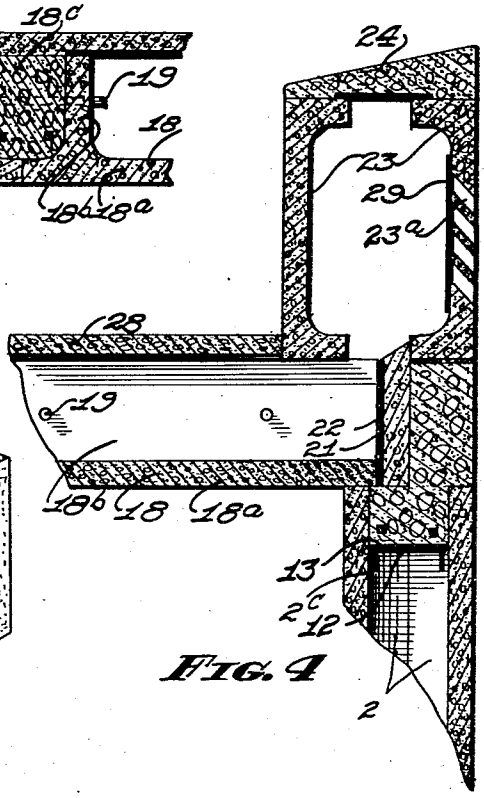


FIG. 4

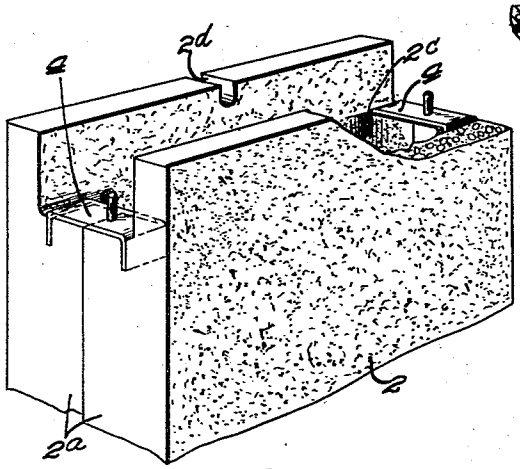


FIG. 5

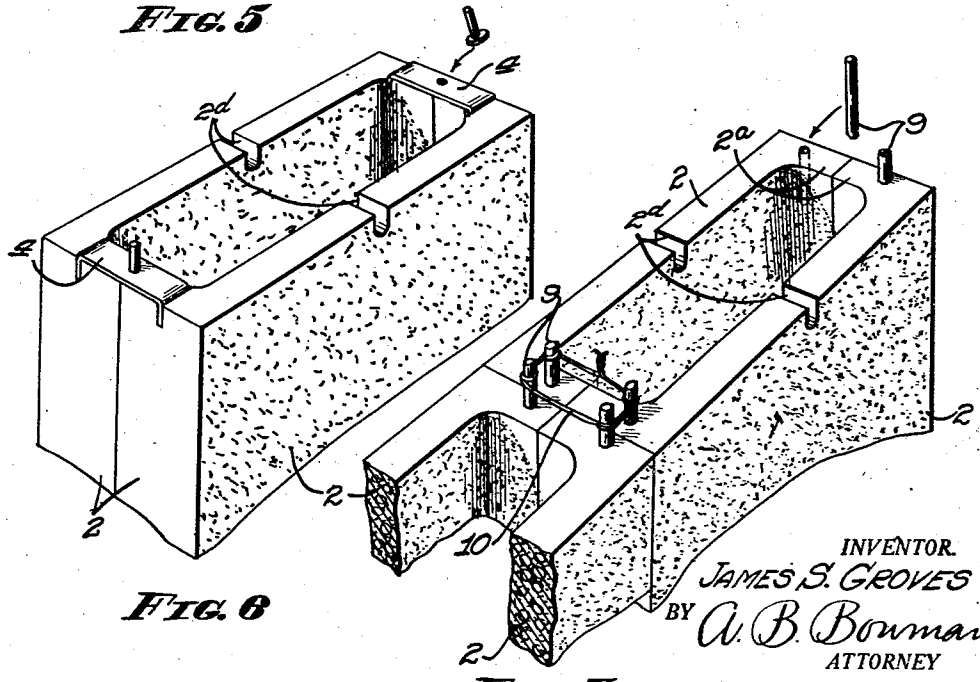


FIG. 6

FIG. 7

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CONCRETE BUILDING CONSTRUCTION

Filed June 17, 1930 3 Sheets-Sheet 3

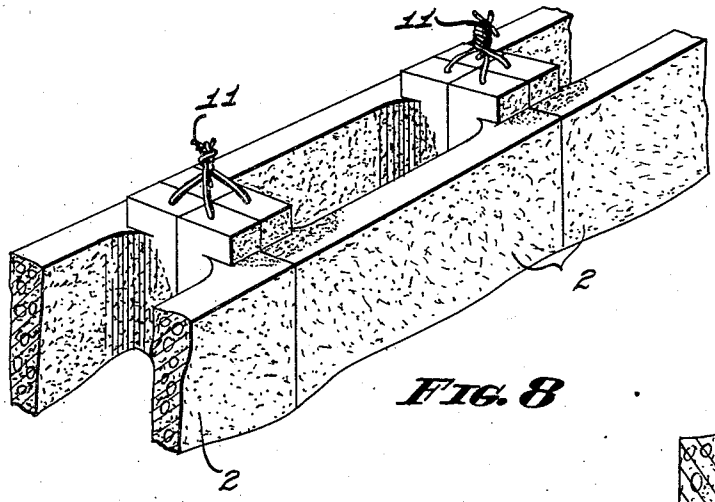


FIG. 8

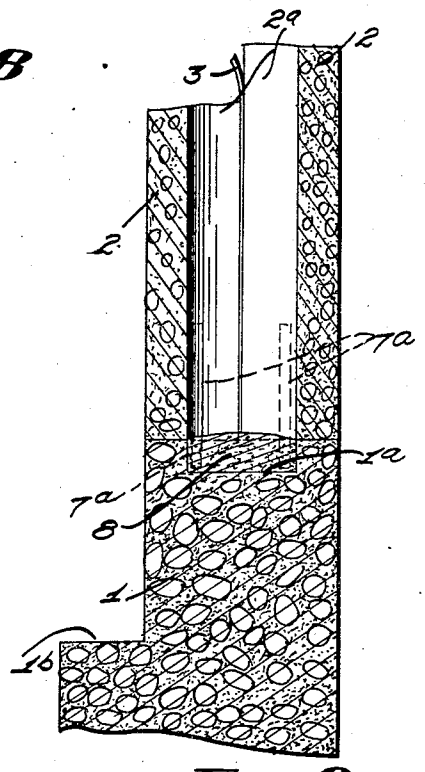


FIG. 9

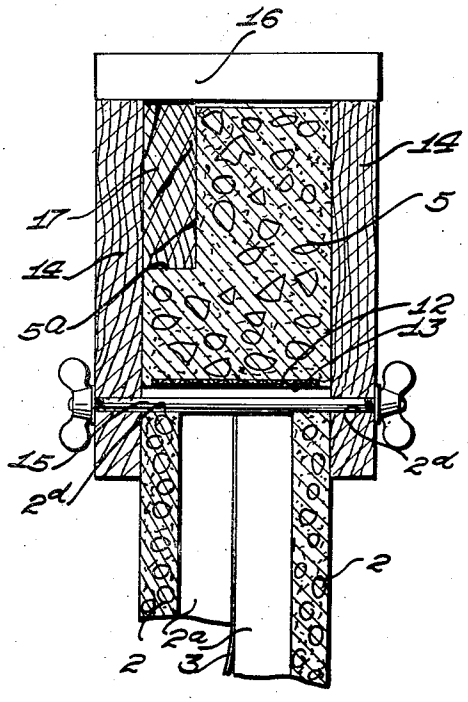


FIG. 10

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Patented June 21, 1932

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UNITED STATES PATENT OFFICE

JAMES S. GROVES, OF SAN DIEGO, CALIFORNIA

CONCRETE BUILDING CONSTRUCTION

Application filed June 17, 1930. Serial No. 461,713.

My invention relates to building construction and particularly to concrete building structures, in which the several portions of the building are made up of pre-cast members.

The objects of this invention are:

First: to provide building construction of this class whereby the greater portion of the building elements are pre-cast from concrete or other similar plastic material suitably reinforced, and in which such pre-cast elements are secured together by plastic material poured between the several elements in which such elements form portions of the molds for the plastic material applied to secure such elements together.

Second: to provide novelly constructed building wall units whereby a light and strong building wall may be formed of reinforced concrete or other plastic material, and whereby such a wall may be built quickly.

Third: to provide a building wall of this class whereby such building wall units may be easily, economically and effectively supported by and secured to the foundation, and also whereby such units, when made of separate elements, may be readily and effectively held together at their lower ends.

Fourth: to provide novel means for securing separate members of vertical building wall units together at their upper ends.

Fifth: to provide a novel girder or stringer construction at the upper ends of the building wall units for rigidly securing the upper ends thereof together as a unit.

Sixth: to provide novel means for sealing the joints between adjacent wall units making up the building wall.

Seventh: to provide building wall units of this class in which the upper ends of such units are provided with transverse channels parallel to the faces of the wall and in which the flange portions of the upper channels form the forms for securing said units together.

Eighth: to provide a novel narrow slab construction for forming floors and roofs of buildings whereby the same provide forms for containing a relatively small amount of plastic material and the adjacent edges of the slabs for securing the slabs together.

Ninth: to provide novel and simple means for securing separate slabs together and to the supporting wall.

Tenth: to provide slabs of this class which are provided with longitudinal channels whereby ventilation may be provided through the roof or floor to and from the building wall or parapet wall.

Eleventh: to provide a novel, light and strong slab construction for floors and roofs.

Twelfth: to provide a novelly constructed parapet wall and a novel relation between the same and the roof whereby ventilation may be had from one to the other and through the atmosphere, and

Thirteenth: to provide as a whole a novel concrete building construction and a construction of this class which is durable and which will not readily deteriorate.

With these and other objects in view as will appear hereinafter, my invention consists of certain novel features of construction, combination and arrangement of parts and portions as will be hereinafter described in detail and particularly set forth in the appended claims, reference being had to the accompanying drawings and to the characters of reference thereon which form a part of this application, in which:

Figure 1 is a fragmentary perspective view of a building incorporating my invention in the wall, floor, roof and parapet wall thereof in one form, Fig. 2 is a fragmentary sectional view thereof in plan showing the construction of a wall thereof in one form, Fig. 3 is a fragmentary sectional view in elevation showing the construction of the floor and roof thereof in one form, Fig. 4 is a fragmentary sectional elevational view taken through 4—4 of Fig. 1 showing the construction of the parapet wall and its relation to the main wall and the roof thereof in one form, Fig. 5 is a fragmentary perspective view showing the upper ends of one of the wall units, shown in Fig. 1, and showing particularly the means of securing the separate units of the wall together, Fig. 6 is a fragmentary perspective view of the upper end of the wall units in a slightly modified form of construction, Figs. 7 and 8 are fragmentary perspective views of the up-

per ends of the wall units showing modified forms of construction of the means for securing the separate members of the units together, Fig. 9 is a fragmentary sectional elevational view through the foundation showing a slightly modified form of construction and relation of the lower ends of the building wall units to the foundation and Fig. 10 is a fragmentary sectional view through the upper end of the wall units showing the method of securing the forms to the upper ends of the units for pouring the concrete stringer in place for securing the upper ends of the wall units together.

Similar characters of reference refer to similar parts and portions throughout the several views of the drawings.

The wall portion of my new concrete construction consists primarily of a foundation 1, vertical wall units 2, sealing members or strips 3, wall unit tie members 4, and horizontal girders or stringers 5, as shown best in Fig. 1.

The foundation 1 is preferably made of ordinary concrete and is cast or molded with a longitudinal groove in its upper face, said groove being spaced from the inner and outer sides of the foundation. This foundation is also provided with a supporting ledge at its inner side and below the upper face of the foundation for supporting the floor slabs, as will be described hereafter. In the foundation wall, and on the inner side thereof, are imbedded base nailing strips 6.

The wall units 2 consist preferably of two vertical wall members 2*a*, as shown best in Fig. 2. These wall members 2*a* are channel shape in cross section and are positioned with the edges of their flanges in abutting relation forming substantially hollow columns or wall members with vertical voids. The outer sides of these channel members form respectively the outer and inner faces of the wall and are alined substantially with the outer face of the foundation and the inner face thereof above the ledge.

The lower ends of these wall units 2 are formed preferably of tenons 2*b*, which extend into the groove 1*a* for fixedly positioning the lower ends of the wall units relative to the foundation.

In Fig. 9 of the drawings, I have shown a slightly modified form of construction of the lower end of the wall units. In this modified form, I have provided pins 7*a*, preferably of metal, which are inserted into the lower ends of the flanges of the channel members 2*a* and which extend into the groove 1*a* of the foundation. The ends of the pins 7, which extend downwardly are imbedded in a grout 8, with which the groove 1*a* is filled.

In order to seal the joints between two adjacent wall units, I place weather strips such as water-proof building paper 3, between the abutting edges of the flanges of the channel members of each unit, such weather paper being of sufficient width as to extend over the abutting edges of the flanges of the adjacent sides of adjacent wall units as shown best in Fig. 2, so as to prevent moisture from passing through the wall at the joints.

Where window openings are desired, only short wall units 2′ and 2″ are placed below and above the desired openings, as shown in Fig. 1. The ends of the units may be closed by sills 25 and lintels 26 of concrete as shown. Door openings are similarly formed. In the points between the channel members 2, forming the sides of the openings, may be secured anchors 27 to which window and doors casings may be secured.

The upper ends of the flanges of the channel members are provided with transverse slots 2*c*, into which extend the legs 4*a* of inverted U-shape securing or tie members 4. These tie members may be made of sheet metal and rest with the portions thereof, connecting the legs 4*a*, upon the upper ends of said flanges, as shown in Figs. 5 and 6. Thus the upper ends of the two channel members making up one wall unit are secured together.

In the modified structure shown in Fig. 7, the channel members are secured together by a different means, this means consisting of pins 9 inserted into the upper ends of the flanges of the channel members, and a wire 10 securing such ends together. It will be noted that the wire 10 may extend around all of the pins in the adjacent flanges of adjacent wall units as shown in Fig. 7.

In the modified structure shown in Fig. 8, the pins are eliminated and instead there are imbedded into the channel members, in place of pins, wires 11, which are secured together, for securing together, not only the two channel members of each unit but also adjacent wall units.

Over the upper ends of the wall units is cast in place a concrete cap 5, which forms a stringer for the upper portion of the wall, for rigidly tying adjacent wall units together, as well as tying the separate members of each unit together. It will be noted that in Figs. 1 and 5, of the drawings, the webs of the channel members 2*a* extend above the flanges thereof and form the lower portions of such stringer as well as form a part of the mold for such stringer.

In the modified structure shown in Figs. 6, 7 and 8, these upwardly extending webs are eliminated, and in these instances, the whole of the stringers rest upon the upper ends of the wall units.

If it is desired to prevent the concrete forming the stringers 5 from running into the hollow wall members, in order to retain the voids therein, there may be placed at the upper end of such units wire mesh 12 and building paper 13, as shown best in Fig. 4.

In Fig. 10 of the drawings, I have shown a mold or form for pouring or fastening the stringer 5 in place. This form consists of boards 14, placed in spaced apart relation at the inner and outer sides of the wall units so that the same extend above the wall units. These form boards are secured to the upper ends of the wall units by bolts 15, which rest in transverse slots 2*d* in the upper ends of the webs of the channel members 2*a*, and which bolts extend through said board. The upper edges of the form boards may be secured together by tie strips 16. If it is desired to form a ledge 5*a*, at the inner side of the stringers 5, a strip 17 may be secured to the upper portion of the inner form board 14, as shown in Fig. 10.

Floor and roof structure of my new building construction are substantially the same and consist substantially of relatively narrow slabs 18, which are pre-cast of reinforced concrete, as indicated on the channel members of the wall units. These slabs consist of slab portions 18*a*, having upwardly extending webs 18*b*, which are spaced from each other and inwardly from the edges of the slab portion, forming longitudinal channels between the webs of each slab and other longitudinal channels between adjacent webs of adjacent slabs, as shown best in Fig. 3, the latter channels forming forms for beams described hereafter. The ends of these slabs 18 rest in the one case upon the ledges 1*b* of the foundation, in the other case upon the ledges 5*a* of the stringer 5, either for a floor or a roof. The slab members are rigidly secured together by pouring concrete in the channels formed between the adjacent webs of adjacent slabs, forming beams 18*c*, as shown in Figs. 1 and 3. These slabs are also reinforced in respect to each other by reinforcing rods 19, extending through the concrete in the last mentioned channels or beams and also through the webs forming such channels. The slabs may be also reinforced by longitudinally extending reinforcing rods 20 within such channels, as shown in Fig. 3. Simultaneously with the pouring of the concrete in the channels between adjacent slabs, concrete is also poured between the ends of the slabs and the inner sides of the foundation 1, or stringer 5 above the ledges, for securely tying the floor's roof to the wall. If it is desired to prevent the concrete from flowing into the other channels of the slabs, there may be placed over the ends of such channels wire mesh 21, and building paper 22, as shown in Fig. 1. The floor or roof boards 23, or the strips or stringers to which the same are secured, may be placed directly upon the upper edges of the webs of the slabs, as shown.

The parapet wall of my new building construction consists preferably also of a pair of pre-cast concrete channel members 23, which are positioned horizontally with their channel portions adjacent each other. These channel members are, however, spaced apart the desired distance, primarily for forming a space at the lower portion of the parapet wall for ventilation purposes. The outer channel member in this instance rests upon the stringer 5, while the inner channel member 23 rests upon the ends of the upper edges of the webs of the slabs 18. Upon the upper flanges of the channel members 23, is placed a suitable cap 24, for sealing the space between the upper flanges of the channel members as shown in Figs. 1 and 4. In the case of the securing of the slabs 18 to the wall or the stringer 5, the channels between the webs of each slab are left open so that an air passage may be provided between the space in the parapet wall and such channels in the roof for ventilation purposes. In either or both of the channel members 23, may be provided openings 23*a*, so as to permit communication with the atmosphere of the space in the parapet wall to facilitate the circulation. Over these openings may be placed a suitable wire mesh or grating 24, to exclude matter which might clog the air passages.

Though I have shown and described a particular construction, combination and arrangement of parts and portions of my new building construction, and though I have shown certain modifications thereof, I do not wish to be limited to this particular construction, combination and arrangement nor to the modifications, but desire to include in the scope of my invention, the construction, combination and arrangement substantially as set forth in the appended claims.

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

1. In a building structure, a foundation, vertical wall members extending upwardly from the foundation, said wall members comprising a pair of channel members moulded from plastic material and positioned with their channel portions adjacent each other, forming outer parallel sides, said channel members being joined on a plane parallel to the wall and tie means concealed within the margins of said sides for securing said channel members together.

2. In a building structure, a foundation, vertical wall members extending upwardly from the foundation, said wall members comprising a pair of channel members moulded from plastic material and positioned with their channel portions adjacent each other, said channel members being joined on a plane parallel to the wall, and tie means embedded and concealed in said channel members at their opposite sides only for securing said channel members together at their opposite ends.

3. In a building structure, a foundation, vertical wall members extending upwardly

from the foundation, said wall members comprising a pair of channel members moulded from plastic material and positioned with their channel portions adjacent each other, the upper face of the foundation having a longitudinal groove, means at the lower end of the channel members and extending into the groove of the foundation for locating the channel members relative to the foundation, and means embedded and concealed at the upper ends only of said channel members for securing the same together.

4. In a building structure, a foundation, vertical wall members extending upwardly from the foundation, said wall members comprising a pair of channel members moulded from plastic material and positioned with their channel portions adjacent each other, and means in connection with the foundation and the channel members for securing the latter in joined relation to the foundation, and tie means at the upper ends only of the channel members and concealed and embedded therein for securing the same together in their joined relation.

5. In a building structure, a foundation, vertical wall members embedded therein at their lower ends and extending upwardly from said foundation, said wall members comprising a pair of channel members moulded from plastic material and positioned with their channel portions adjacent each other, and means in connection with the foundation and the channel members for securing the latter in joined relation to the foundation, the upper ends of the channel members having slots spaced from and parallel to the joined portions of the channel members, and inverted U-shaped strips extending with their legs into said slots and extending with the connecting portions of the U-shaped members across the joint between said channel members for connecting the upper ends of the channel members together.

6. In a building structure, a multiplicity of vertical building wall units positioned side by side forming a building wall, and a sealing member positioned across the joints between the units and extending in a vertical direction on the parallel to the front face of the wall, said sealing members being also positioned between the front and inner faces of the wall.

7. In a building structure, a multiplicity of vertical building wall units, each unit comprising a pair of vertical wall members forming respectively the outer and inner sides of the wall and joined together at their opposite sides in substantially the median plane of the wall, and sealing members for sealing the inner and outer wall members of a unit and extending between the joints between adjacent units.

8. In a building structure, a multiplicity of vertical building wall units, each unit comprising a pair of vertical wall members forming respectively the outer and inner sides of the wall and joined together at their opposite side in substantially the median plane of the wall, weather-proof building paper positioned in the joints between the inner and outer wall members of said units, and extending across the joints between adjacent units.

9. In a building structure, a foundation having a ledge on its inner side, vertical wall members extending upwardly from the foundation and positioned adjacent the other forming a continuous wall, pre-cast floor slab members positioned adjacent each other and supported at their ends on said ledge, said slabs having upwardly extending webs parallel to the longitudinal edges of said slab members and adjacent the joined edges thereof, a plastic material poured on said ledge between the ends of the slabs and the foundation and also between the webs of adjacent slabs for forming a beam therebetween.

10. In a building structure, a foundation having a ledge on its inner side, vertical wall members extending upwardly from the foundation and positioned adjacent the other forming a continous wall, pre-cast floor slab members positioned adjacent each other and supported at their ends on said ledge, said slabs having upwardly extending webs parallel to the longitudinal edges of said slab members and adjacent the joined edges thereof; a plastic material poured on said ledge between the ends of the slabs and the foundation and also between the webs of adjacent slabs for forming a beam therebetween, similar slabs supported with their ends on the upper ends of the vertical wall members, and other plastic material molded between the webs of adjacent last mentioned slabs and over the upper ends of said wall members, the plastic material at the upper ends of the wall members forming stringer for securing the upper ends of the wall members together.

11. In a building structure, a supporting wall, a plurality of narrow pre-cast slabs positioned adjacent each other with their ends resting upon said wall, said slabs having upwardly extending webs adjacent the joined edges of the slabs but spaced slightly from said edges, the adjacent webs of adjacent slabs forming side walls of a form for a beam, and plastic material molded between said adjacent webs forming a beam therebetween, the lower sides of said slabs forming a ceiling.

12. In a building structure, a supporting wall, a plurality of narrow pre-cast slabs postioned adjacent each other with their ends resting upon said wall, said slabs having upwardly extending webs adjacent the joined edges of the slabs but spaced slightly from said edges, the adjacent webs of adjacent slabs forming side walls of a form for a beam, reinforcing extending longitudinally between

said adjacent webs and also transversely between and through said webs.

13. In a building structure, a building wall, narrow pre-cast slabs positioned adjacent each other and supported at their ends on said wall, said slabs having upwardly extending webs spaced from each other and from the joined edges of the slabs, means securing said slabs together and to said wall, and a floor or roof covering supported at the upper edges of said webs.

14. In a building structure, a building wall, narrow pre-cast slabs positioned adjacent each other and supported at their ends on said wall, said slabs having upwardly extending webs spaced from each other, a hollow parapet wall extending upwardly from the wall and over the joints between the slabs and the wall, the parapet wall having openings in its base, and a sheathing over the upper edges of the webs of the slabs.

15. In a building structure, a building wall, narrow pre-cast slabs positioned adjacent each other and supported at their ends on said wall, said slabs having upwardly extendng webs spaced from each other, a parapet wall extending upwardly from the building wall, said parapet wall comprising a pair of spaced apart horizontal channel members with their channel portions adjacent each other, and a cap secured over the upper portions of the channel members, one of the channel members of the parapet wall having vent openings therein, the channels between said webs of the slabs communicating at the ends of the slabs with the space between the channel members and said vent openings, and a covering over the slabs, said covering being supported on the upper edges of said webs.

16. In a building structure, a building wall, narrow pre-cast slabs positioned adjacent each other and supported at their ends on said wall, said slabs having upwardly extending webs spaced from each other and from the joined edges of the slabs, plastic material molded between the webs of adjacent slabs and between the ends of the slabs and the building wall, a parapet wall extending upwardly from the building wall, said parapet wall comprising a pair of spaced apart horizontal channel members with their channel portions adjacent each other and a cap secured over the upper portions of the channel members, one of the channel members of the parapet wall having vent openings therein, the channels between adjacent webs of each slab communicating with the space between the ends of such slabs and the building wall and with the space between the channel members of the parapet wall and with the openings therein.

In testimony whereof, I have hereunto set my hand at San Diego, California, this 4th day of June, 1930.

JAMES S. GROVES.