Nov. 24, 1931. E. H. LOCKWOOD 1,833,875

BUILDING CONSTRUCTION

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Fig. 1.

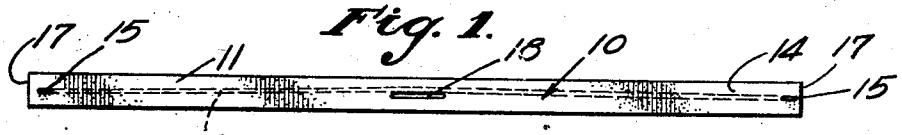


Fig. 2.

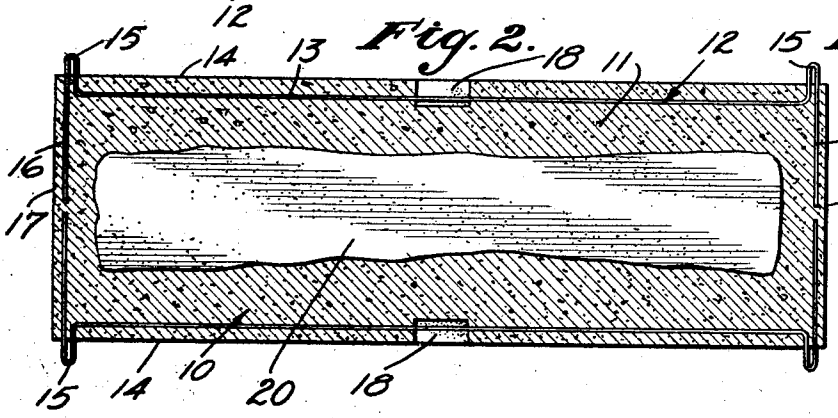


Fig. 3.

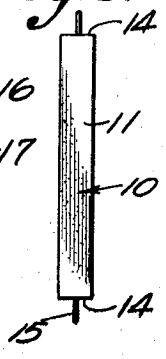


Fig. 4.

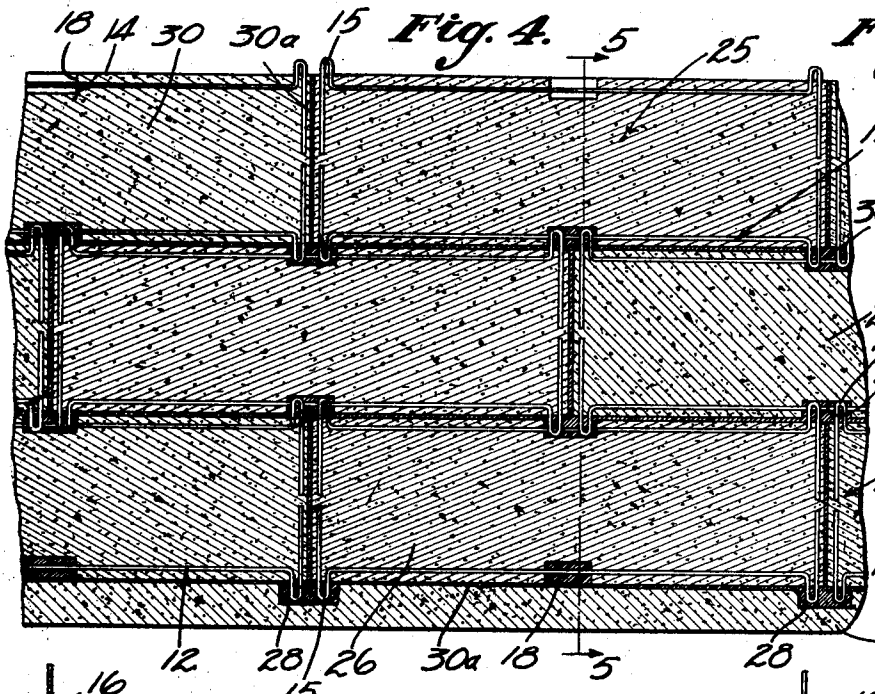


Fig. 5.

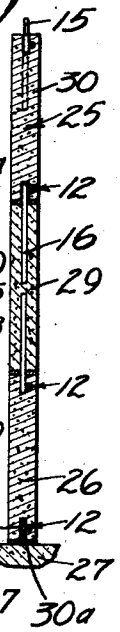


Fig. 6.

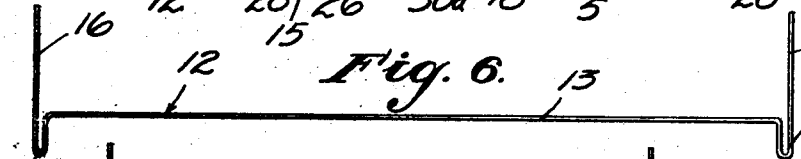
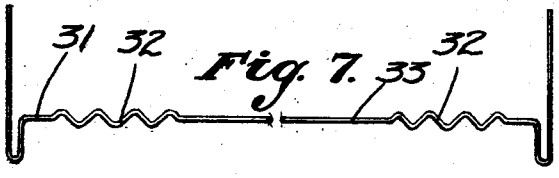


Fig. 7.



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Fig. 8.

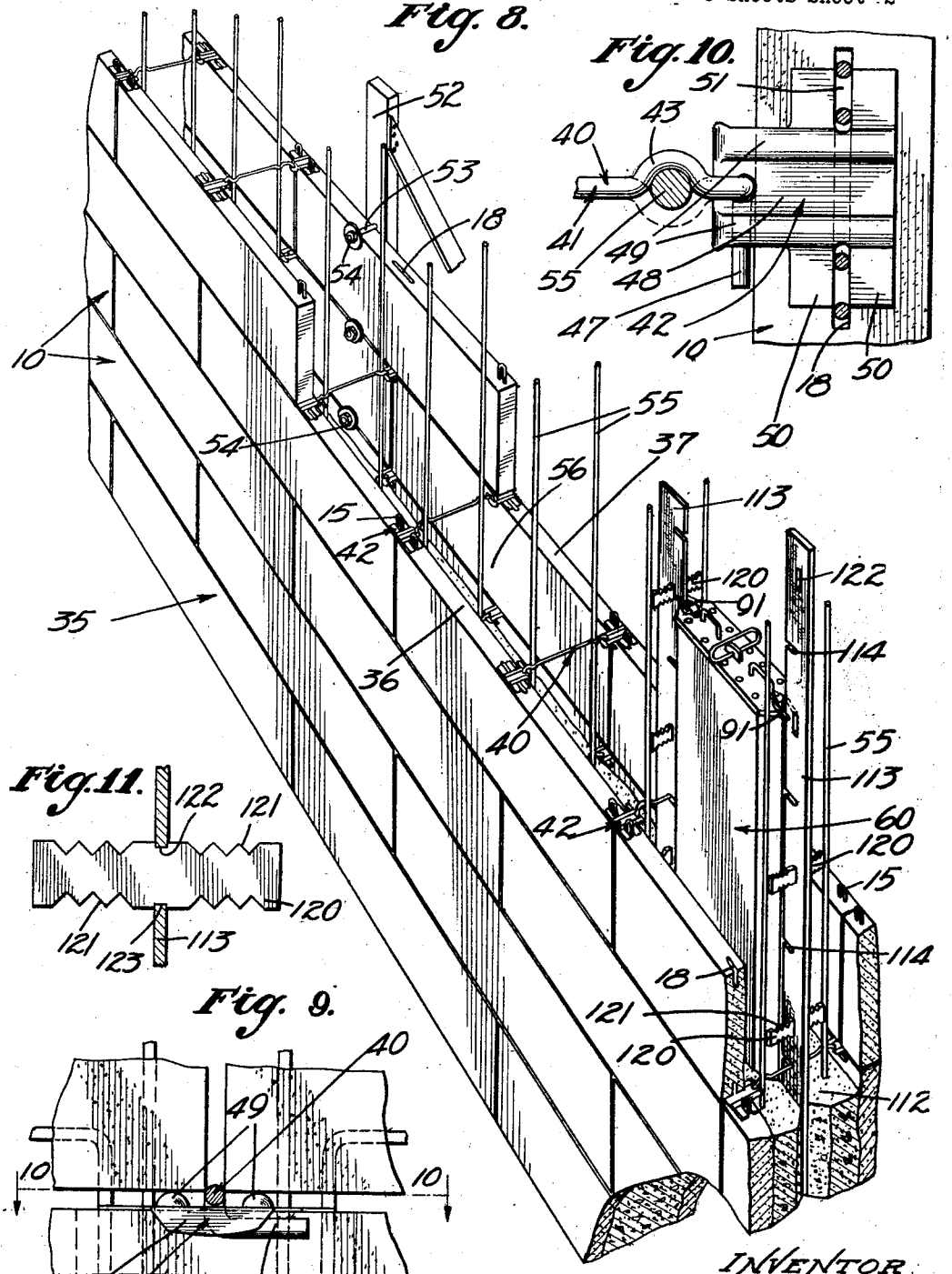


Fig. 10.

Fig. 11.

Fig. 9.

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Fig. 13.

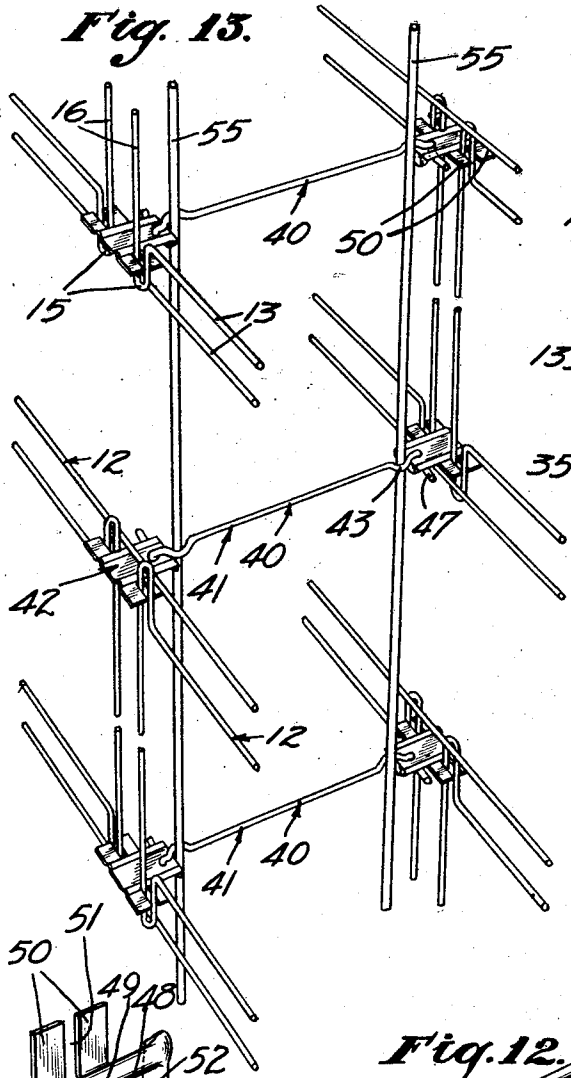
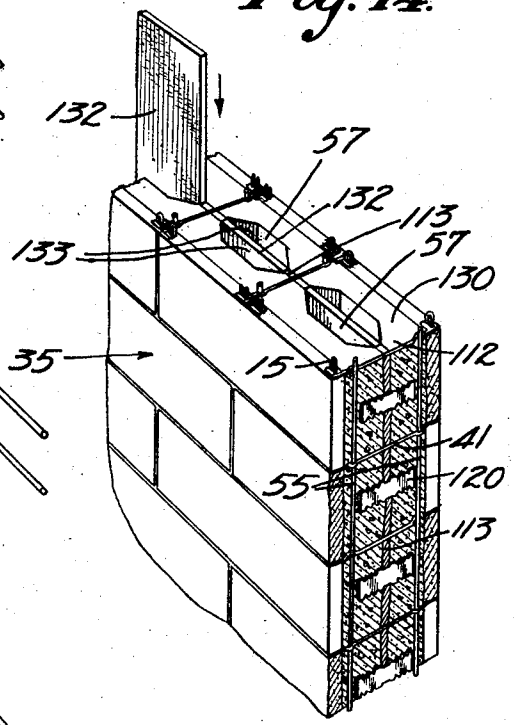


Fig. 14.



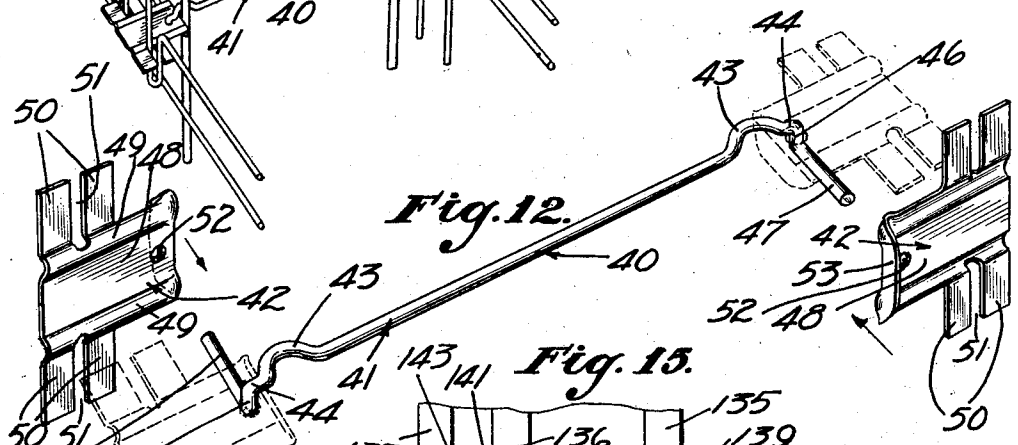
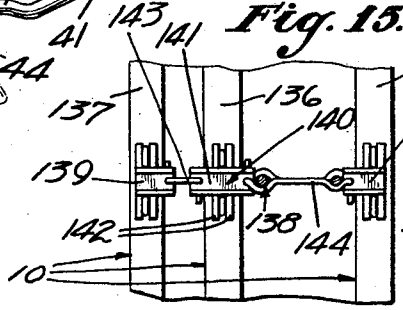


Fig. 12.

Fig. 15.



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BUILDING CONSTRUCTION

Application filed March 2, 1927. Serial No. 171,998.

My invention relates to the art of building construction and particularly to the construction of buildings which are formed largely of concrete. In this art it is common practice to pour the concrete inside wooden forms, the cost of erecting these forms being one of the principal constituents of the total cost of the building.

It is an object of my invention to provide means by which concrete buildings may be erected without the use of external forms. This I accomplish by using precast concrete slabs.

It is a further object of my invention to provide such slabs with means by which they may be secured together to form various types of buildings.

It is a further object of the invention to provide means by which the slabs may be secured together to form composite walls in which the slabs are utilized to form facings between which concrete is cast, the slabs serving as forms for the concrete which in turn locks the slabs into the finished wall. This eliminates the great expense of the wood forms now employed in concrete building construction. The slabs cast by the process described in my copending application may be produced with a great variety of surface characteristics. As a result walls in which these slabs form the outer facing may have a wide variety of texture or color and do not need any sort of exterior treatment to produce a pleasing effect. This is a great saving over present methods in which the wall, as cast, plainly shows the joints and imperfections of the wooden forms, thus necessitating some external finish where a good architectural effect is desired.

It is a further object of my invention to provide means by which the facings of slabs used in a composite wall may be secured together in accurate alignment and also to so construct these aligning means that they may be made to tie to and cooperate with additional reinforcement in the core of the wall. This not only insures an accurate alignment of the slabs, which are of uniform dimensions, thus allowing an extremely accurate wall to be easily built by relatively unskilled labor, but also provides means for holding the wall permanently in its initial, accurately placed position.

It is a further object of the invention to provide means by which air spaces may be formed in the concrete as it is cast in place in the wall. This is necessary to render the wall a poor conductor of heat, moisture and sound.

It is a further object of my invention to provide a wall which is formed of concrete but in which is embedded or secured sheets or strips of insulating material.

Other objects and advantages will be made manifest in the following description and the accompanying drawings in which

Fig. 1 is a plan view of the slab of my invention.

Fig. 2 is a side elevation of this slab with the peripherial portion thereof broken away to show the reinforcing of the slab.

Fig. 3 is an end elevation of the slab.

Fig. 4 is a vertical sectional view taken on the interfacial medial plane of a partition formed by successive courses of slabs placed together edge to edge in break-joint relation.

Fig. 5 is a vertical sectional view taken on the line 5—5 of Fig. 4.

Fig. 6 is an elevational view of a preferred form of reinforcing wire such as is used in the manufacture of the slabs.

Fig. 7 shows a modified form of reinforcing wire.

Fig. 8 is a perspective view of the composite wall of my invention during the course of its construction.

Fig. 9 is an enlarged fragmentary elevational view taken from the interior of the wall shown in Fig. 8 of a juncture point between three slabs, making up the facings of one side of the wall.

Fig. 10 is a horizontal sectional view taken on the line 10—10 of Fig. 9.

Fig. 11 is an enlarged fragmentary sectional view through one of the insulating members employed in my invention and showing a metal key disposed in an opening in this insulation member.

Fig. 12 is a perspective view of the tie member employed to space the opposite facing

sheets of my composite wall during the assembly thereof.

Fig. 13 is a perspective skeleton view showing a portion of all the reinforcing present in the composite wall of my invention adjacent to a given transverse plane passing through the wall.

Fig. 14 is a fragmentary perspective view of the composite wall of my invention when substantially completed.

Fig. 15 is a plan view of a modified form of composite wall.

The slab

Referring to Figs. 1, 2 and 3, 10 indicates the building slab used by me, this slab comprising a thin, rectangular body 11, which contains reinforcing members 12 which are cast in the body 11. The body 11, as well understood, may be formed of any cementitious material which will set to assume a fixed shape. It is preferable that plastic concrete or a similar material be used in forming the body 11 so that when this material sets it will have a lithoid nature so as to possess the maximum qualities of endurance when exposed to the elements.

The reinforcing members 12 are disposed within the body 11 as shown in the drawings. These members 12 are preferably bent from a strong steel wire so as to have central portions 13 which are disposed just within the body 11 from upper and lower edges 14 of the slab 10. Each reinforcing member 12 is bent outwardly at the opposite ends of the portions 13 and then looped back upon itself to form tongues 15 and reinforcing portions 16. The slabs 10 are so cast that the tongues 15 project outwardly from the ends of the edges 14 and so that the end reinforcing portions 16 lie just within the body 11 from the side edges 17 of the slab 10. The end reinforcing portions 16 of the reinforcing members 12 may be of the length shown in Fig. 2 or else they may be longer so as to overlap each other throughout a greater part of their length so as to provide a double reinforcing in the body 11 just within the side edges 17 thereof.

Apertures 18 are centrally formed in the slab body 11 in the upper and lower edges 14 thereof. The apertures 18 are of substantially the same transverse dimension as the gauge of the wire reinforcing member 12, and are slightly longer than the sum of twice the width of a tongue 15 and twice the distance from the edge 17 at which the tongues 15 are disposed in the slab body 11. It will be noted in Fig. 1 that the central portion 13 of each reinforcing member 12 deviates from a straight line between the tongues 15 to pass around an aperture 18. In the manufacture of the slabs 10 a face 20 thereof may be formed of such material and texture as to be suitable for a surface facing of a wall. Moreover, in case it is desired to plaster a wall surface which may be formed by a plurality of slabs 10 as hereinafter described, the face 20 will be roughened in the manufacture of the slab 10 by partially embedding gravel or broken rock in the main body of the slab on the face 20 thereof.

Method of erecting partitions

The apertures 18 and the tongues 15 in each slab 10 are disposed upon the interfacial axial plane of that slab. This is of vital importance to the present invention inasmuch as it makes possible an easy assembling of the slabs to form a perfectly aligned wall facing member or a partition 25 as shown in Fig. 4, of the thickness of the single slab. Such partitions being the simplest form of wall, the method used in their erection will be described.

A first course 26 of slabs is properly aligned upon a floor or foundation 27 having aligned apertures 28 into which the tongues 15, projecting downwardly from the lowermost course of slabs 26, are allowed to enter and be retained by mortar as shown. After the first course 26 of slabs 10 has thus been laid in true alignment with each other, a second course 29 of slabs 10 is laid edge to edge with the top of the first course 26, and in break-joint relation therewith so that the tongues 15 of the second course 29 projecting downwardly therefrom, enter the apertures 18 of the lower course 26. Likewise the tongues 15 projecting upwardly from the course 26, enter the apertures 18 on the lower edge 14 of the course 29 of slabs 10. This interlocking of adjacent courses of slabs course of slabs 26, are allowed to enter and causes adjacent courses to assume a position of longitudinal alignment with each other in which the interfacial medial planes of all the slabs lie in the single interfacial plane of the entire partition 25. A course of slabs 30 may likewise then be formed to interlock with the upper edge of the course 29 and in this manner the partition 25 may be built up to any desired height so long as the partition 25 is supported at its ends to prevent buckling on a horizontal line between some adjacent pair of the courses of slabs used in its construction. While the slabs 10 are thus being erected in courses to form a partition 25 which it is desired to stand alone after finished, a motar 30*a* is placed between the adjacent edges of the slabs so as to adhere to these edges and so as to fill the apertures 18 and rigidly secure the tongues 15 in these apertures.

The reinforcing wire 31 shown in Fig. 7 is a modified form of the reinforcing member 12, as shown in Fig. 8, and differs therefrom in the provision of wavy portions 32 in the central portion 33 of the reinforcing wire, the reinforcing wire 31 being otherwise identical

with the reinforcing wire 12. The wavy portions 32 may sometimes be used advantageously by virtue of their anchoring the central portion 33 of the reinforcing wire against longitudinal movement in the material of the slab body.

Composite wall construction

In addition to being adapted to form partitions my slabs lend themselves readily to composite wall construction. In the fabrication of a composite wall 35, as shown in Fig. 8, a pair of wall facings 36 and 37 are erected in such a manner as to be held in a fixed spaced relation to each other. The facings 36 and 37 when thus erected have their finished surfaces disposed to the exterior to provide finished faces upon the composite wall to be formed.

In the formation of the facings 36 and 37 the slabs 10 are assembled in break-joint relation in a manner similar to that in which the partion 25 was formed. Likewise, opposite courses of slabs on the same level in the facings 36 and 37 are disposed in break-joint relation relative to each other. However, no mortar is placed between the slabs 10 at the time of the erection of the facings 36 and 37. The facings 36 and 37 are held in fixed spaced relation by composite tie members 40, as will be hereinafter described.

The tie members 40 comprise a central wire connecting element 41 which is adapted to be attached at its ends to end plates 42. The element 41 has arcuated bends 43 formed at its outer ends which terminate in portions 44 aligned with the central portion of the element, the portions 44 terminating in downward bent portions 46. The ends 47 of the connecting element 41 are bent in opposite directions perpendicularly from the portions 46.

The construction of the end plates 42 is clearly shown in the perspective view of Fig. 12. These end plates are stamped from sheet metal so as to have a flat body portion 48 having corrugations 49 at its opposite sides. From the outer portions of the edges of the corrugations 49 extend pairs of arms 50, a slot 51 being formed between each pair of arms 50. A hole 52 is formed near the inner end of the body portion 48 of sufficient size to slip over an end 47 of the connecting element 41. The inner edge of the body 48 is reinforced by an anchor lip 53 bent downwardly therefrom.

In the assembly of the tie member 40, the parts thereof are positioned as shown by the full lines in Fig. 12 in which, as is clear, the end plates 42 are disposed in vertical position. The end plates are then moved so that the holes 52 receive the connecting element wire ends 47 and the ends 47 have passed entirely through the holes 52 so that the end plates 42 can be rotated into horizontal position with the connecting element portions 46 disposed in the holes 52. It is now clear that before the tie member 40 can be disassembled, one or the other of the plates 42 must be moved out of horizontal into vertical position. This is an important feature as will presently be seen.

After the bottom courses of slabs 10 in the facings 36 and 37 are assembled and properly aligned with each other, the tie members 40 are assembled as just described, and placed with the end plates 42 resting upon the upper edges of these first courses of slabs in the manner shown in Fig. 8. As shown, an end plate 42 at one end of each tie member is disposed between and embraces the tongues 15 extending upwardly from an adjacent pair of slabs in one of the bottom courses above mentioned. The end plate at the opposite end of the tie member rests upon the central portion of the upper edge of a slab in the opposite facing so that the slots 51 are disposed, as clearly shown in Fig. 10, over opposite ends of the upper aperture 18 of that slab. By virtue of the assembling of slabs of each facing 36 and 37 in break-joint relation, each end plate thus placed over an adjacent pair of tongues 15 will be retained in place by the central portion of the lower edge of a slab in the next course, being fitted downwardly thereover so that the aperture 18 thereof receives the tongues 15 about which this end plate 42 had been placed. In a similar manner each end plate 42 which has been placed over a mouth 18 will be retained in place by the tongues of adjacent slabs in the next higher course which will be extended downwardly into that aperture 18. In this manner, as each successive pair of courses of slabs are built up in the erection of the facing sheets 36 and 37, the tie members 40 placed to rest on top of the previous courses of slabs in these facing sheets are rigidly held in place and prevented from being disassembled because of both the end plates 42 of each tie member 40 being held rigidly in horizontal position. The erection of each wall 35 is begun at a corner of the building, where the true vertical alignment of the facing members is determined by the corner construction as will hereinafter be pointed out. Between the corners, the facing members 36 and 37 are maintained in true vertical alignment by scaffolding studs 52 which are braced in vertical position from the ground and lie against a facing as shown. Bolts 53 are passed through holes in each stud 52 and, extending between successive courses of slabs 10, are threaded into nuts 54, so as to rigidly secure the slabs 10 to the studs 52.

As the facings 36 and 37 are thus erected it is desired to correctly position pairs of vertical reinforcing rods 55 at various intervals throughout the length of the wall 35. This positioning of the reinforcing rods 55 is made

a very simple matter by reversing the position of alternate tie members 40 when these are placed in position; thus the arcuate bends 43 open in adjacent tie members on opposite sides of the tie member 40. This alternate reversing of the position of the tie members is carried out not only in a vertical direction but also in a horizontal direction. After the first facings 36 and 37 are erected a few courses of slabs in height, the rods 55 are thrust downwardly in interwoven relation with each vertical series of connecting elements 41 so that the arcuate portions 43 thereof receive and correctly position the reinforcing rods 45 as clearly shown in Figs. 8 and 13.

As shown in Fig. 9, the corrugations 49 in the end plates 42 provide a means for uniformly spacing successive horizontal courses of slabs in each of the facings 36 and 37 from each other.

Formation of air spaces

When the facings 36 and 37 have been built up to a height of three or four slabs, it is desired to pour the interior space 56 between the facings 36 and 37 full of plastic concrete. It is also desired to have air spaces 57, as shown in Fig. 14, provided in this concrete between each successive pair of vertical series of tie members 40. For the purpose of forming these air spaces 57, an air space form 60 is provided. The form 60 may be of any convenient construction; that is, any form that can be readily withdrawn after the concrete has set, thus leaving air spaces 57 between the walls formed of the members 40.

Insulation of wall

As shown in Figs. 8 and 14 the formation of these air spaces leaves webs 112 of concrete which would normally be continuous between facings 36 and 37. It is very desirable not to have a continuous mass of concrete connecting the outer and inner facings 36 and 37 of the composite wall of my invention when this wall is desired to be used for the outer wall of a building. It is therefore an important feature of my invention to provide a means for parting the webs 112 medially so that there will be no continuous mass of concrete communicating between opposite faces of the wall 35. This division of the webs 112 is effected by the positioning of vertical strips 113 of suitable insulating material between adjacent edges of each adjacent pair of forms 60. The strips 113 have slots 114 at suitable levels to receive the connecting elements 41 of the tie members 40. When it is desired to utilize the insulation strips 113, the forks 91 are swung into an outward position so as to engage opposite edges of the strip 113 and retain this strip in its correct position. In order to insure that the portions of the webs 112 on opposite sides of the strips 113 be securely united together against relative movement, keys 120 which preferably have serrated edges 121 are adapted to be positioned in holes 122 provided at suitable levels in the strips 113. The keys 120 may be recessed centrally at 123 so as to be rigidly retained in place in the holes 122.

The strips of insulating material 113 may be of the same length as the height of the wall 35 or may be spliced at intervals as desired. When a given portion of concrete within the interior space 56 of the wall 35 has set sufficiently for the form 60 to be drawn upward to prepare for an additional pouring of concrete, the forks 91 slide freely upon the edges of the strips 113, as clearly shown in Fig. 8.

In Fig. 14 the near end of a wall 35 which has been poured completely up to its top 130 is broken away upon a vertical plane in which keys 120 are shown cast into opposite portions of an insulation divided web 112. It will be seen that in this same plane a pair of vertical reinforcing rods 55, as well as a vertical series of connecting elements 41, are disposed for the reinforcing of the web 112. The wall 35, after its completion as shown in Fig. 14, may be further insulated by the introduction of sheets of insulating material 132 into the air spaces 57 to divide these air spaces upon the longitudinal axis of the wall 35 into a pair of air spaces 133. In case the air spaces 133 are sealed at top and bottom so that they are what is usually termed "dead" air spaces, the insulating sheets 132 thereby greatly increase the resistance of the wall 35 to the passage of heat therethrough.

A wall is thus economically produced which satisfies all of the requirements for a perfect exterior wall of a building. The slabs 10 not only provide a beautiful exterior finish which has been economically applied in the process of their manufacture, but these slabs are unusually strong due to their reinforcement and in addition to this may be erected at a comparatively low cost. Moreover, the insulating feature of the wall 35 entirely prevents the communication of extreme weather conditions outside of the building to the rooms on the interior thereof. Due to this fact the condensation or sweating of the inner faces of exterior walls formed of concrete will be entirely eliminated. Therefore any desired finish other than the manufactured finish applied to the slabs 10, may be applied directly to the interior face of the wall 35 without danger of this finish being damaged by condensation.

The material of which the insulating strips 113 and the sheets 132 are formed may be any preferred heat, or moisture, or heat and moisture insulating substance. The material known to the trade as "Cellotex" which is formed of ground-up sugar cane from which

the sucrose material has been extracted and which has been especially treated to prevent decay thereof, may be used for this purpose.

Fig. 15 illustrates diagrammatically the manner by which three members 135, 136 and 137 assembled from slabs 10 in the same manner as facings 36 and 37, may be held in spaced relation to form a single wall. These sheets of material are spaced by a tie member 138 which has end plates 139 at its opposite ends which are identical with the end plates 42 and which engage the wall members 135 and 137 in the same manner as end plates 42 engage facings 36 and 37. An intermediate end plate 140 engages the center sheet 136, this plate having a central body 141 which is extended in opposite directions from a pair of tongue gripping forks 142 so as to engage with connecting elements 143 and 144 in identically the same manner as the end plates 42 engage with the connecting elements 41.

I claim as my invention:

1. In an interlocking slab of any suitable moldable composition, the combination of: a rectangular body; tongues protruding from both longitudinal edges near each corner thereof, respectively; and tongue receiving apertures formed in said edges between said tongues.

2. In an interlocking slab of any suitable moldable composition, the combination of: a rectangular body; tongues protruding from both longitudinal edges thereof a fixed distance from each of the corners; and tongue receiving apertures formed in said edges between said tongues.

3. In combination: a rectangular slab; and metallic slab interlocking means cast within end portions of each of the longitudinal edges of said slab, there being complementary interlocking means provided in said edges between said metallic means and adapted to interlock with two of said metallic interlocking means on other such slabs when assembled edge to edge in break joint relation therewith.

4. In combination: a rectangular slab; and tongues cast within said slab and protruding from end portions of each of the longitudinal edges thereof, there being tongue receiving recesses formed in said edges between said tongues, said slab being adapted to be assembled edge to edge in breakjoint relation with other such slabs so that said tongues of each slab are received into said recesses of adjacent slabs.

5. In combination: a rectangular slab; and tongues cast in said slab and protruding from both longitudinal edges thereof, there being tongue receiving recesses also formed in said edges, said slab being adapted to be assembled edge to edge in breakjoint relation with other such slabs so that said tongues of each slab enter recesses of adjacent slabs and rigidly interlock said slabs in a predetermined plane of alignment.

6. A combination as in claim 5 in which the tongues of said slab are connected with reinforcing members cast therein.

7. In combination: a rectangular slab; and tongues comprising wire loops cast within said slab and protruding from end portions of each of the longitudinal edges thereof, there being tongue receiving recesses formed in said edges between said tongues, said slab being adapted to be assembled edge to edge in breakjoint relation with other such slabs so that said tongues of each slab are received into said recesses of adjacent slabs.

8. A combination as in claim 7 in which said loops are bent from reinforcing wires extending along longitudinal elges of said slab and cast therein.

9. In combination: a molded rectangular slab; and slab interlocking means disposed upon both longitudinal edges thereof, which consist of fixed tongues, one of which is disposed near each slab corner, and tongue receiving recesses so formed and positioned between said tongues that when a plurality of such slabs are assembled end to end in courses and said courses edge to edge in breakjoint relation, adjacent courses are reciprocally interlocked upon their adjacent edges by the tongues disposed upon each of said adjacent edges having been severally inserted into oppositely disposed recesses in the other of said adjacent edges, respectively, said tongues having a close lateral fit in said recesses but having lengthwise allowance for slab end spacing.

10. In combination: a molded rectangular slab; metallic reinforcing members, cast within the slab and strengthening particularly the slab corners; and definitely formed and positioned metallic loops formed upon said members and protruding as tongues from both longitudinal slab edges near the slab corners, respectively, said slab further having loop receiving recesses so definitely formed and positioned in both of said longitudinal edges between said loops, that when a plurality of such slabs are assembled end to end in courses and said courses edge to edge in breakjoint relation, adjacent courses are reciprocally interlocked upon their adjacent edges by the loops disposed upon each of said adjacent edges having been severally inserted into oppositely disposed recesses in the other of said adjacent courses, respectively, said loops having a close lateral fit in said recesses but having lengthwise allowance for slab end spacing.

11. In combination: a molded rectangular slab; and fixed metal tongues protruding from both longitudinal slab edges near the slab corners, there being grooves formed in said edges between said tongues so that when a plurality of such slabs are assembled end

to end in courses, and said courses edge to edge in breakjoint relation, adjacent courses are reciprocally interlocked upon their adjacent edges, by the tongues disposed upon each of said adjacent edges, respectively, having been severally inserted into the oppositely disposed groove in the other of said adjacent edges, respectively.

12. In combination: a molded rectangular slab; two oppositely disposed metallic reinforcing members, definitely formed and cast within said slab along the longitudinal slab edges, respectively; and tongues formed by the ends of said members which, having been bent outwardly protrude from both of said longitudinal slab edges near each slab corner, respectively, said slab further having elongated recesses one of which is provided in each of said longitudinal edges between the tongues, protruding therefrom, said recesses being so formed and positioned that when a plurality of such slabs are assembled end to end in courses and said courses edge to edge in breakjoint relation, adjacent courses are reciprocally interlocked upon their adjacent edges by each pair of tongues of each pair of adjacent corners upon each of said adjacent edges, having been inserted in an oppositely disposed elongated recess upon the other of said adjacent edges.

13. In combination: a molded rectangular slab; definitely formed and positioned reinforcing members cast within said slab in close proximity to the perimeter thereof; and loops bent upon said reinforcing members so as to protrude from both longitudinal edges near the slab corners, said slab further having elongated recesses one of which is provided in each of said longitudinal edges, between the loops protruding therefrom, said recesses being so formed and positioned that when a plurality of such slabs are assembled end to end in courses and said courses edge to edge in breakjoint relation, adjacent courses are reciprocally interlocked upon their adjacent edges by each pair of loops of each pair of adjacent corners upon each of said adjacent edges, respectively, having been inserted in an oppositely disposed elongated recess upon the other of said adjacent edges, respectively.

14. A composite wall which combines two slab structural members, each formed by an assembly of slabs as defined in claim 13, said members serving as wall facings and, as such, being oppositely disposed in breakjoint relation with each other; and transverse ties which engage oppositely disposed loops in said members and rigidly space said members; and material introduced between said members to permanently maintain said spacing.

15. In a composite slab member, the combination of: a plurality of interlocking slabs, each having a rectangular body; a pair of spaced tongues protruding from each of the longitudinal edges of said slab and a tongue receiving aperture formed in each of said edges between said tongues, said slabs being assembled end to end in courses and said courses edge to edge in such breakjoint relation that adjacent courses are mutually interlocked by the tongues of each of said adjacent courses having been inserted in the oppositely disposed apertures of the other of said adjacent courses, respectively.

16. In a composite wall, the combination of: a pair of oppositely disposed wall facing members each comprising a composite slab member as described in claim 15; said facing members being held in spaced parallel relation with each other by transverse ties and concrete poured therebetween to form a composite wall.

17. In a composite wall, the combination of: a pair of oppositely disposed composite slab members, each as described in claim 15, the slabs of oppositely disposed courses being in breakjoint relation with each other; said members being held in spaced parallel relation by transverse ties engaging oppositely disposed tongues; concrete structural supports being cast between said oppositely disposed members.

18. A composite insulated wall having in combination: spaced parallel members comprising composite slab members, each as described in claim 15; and also an insulating member of a composition having less conductivity of heat or cold than that of said composite slab members, means being provided for permanently holding all said members in position.

19. In a composite insulated wall the combination of: a pair of oppositely disposed composite slab members, each as described in claim 15, said members being held in spaced parallel relation to each other by transverse ties; structural supporting members of plastic concrete cast between said composite slab members; and material of less heat or cold or sound conductivity, than that of said concrete, inserted within said wall.

20. A composite wall having in combination: two oppositely disposed composite slab members, each as described in claim 15, oppositely disposed courses of slabs being in breakjoint relation with each other; transverse ties engaging tongues in said oppositely disposed members and holding same in spaced and parallel relation with each other; vertical concrete studs cast between said oppositely disposed members and uniting same into a composite wall.

21. In a building construction, the combination of: a plurality of precast rectangular slabs set up edge to edge in breakjoint relation to form a sheet-like member of building

material; reinforcement members embedded in each of said slabs; and tongues provided upon said reinforcement members to project from edges of said slabs near their corners there being recesses provided centrally in edges of said slabs to receive said tongues of certain adjacent slabs.

22. In a building construction, the combination of: a plurality of precast slabs set up edge to edge in breakjoint relation to form a sheet-like member of building material; reinforcement members embedded in peripheral portions of said slabs; and tongues, each comprising a loop formed in one of said reinforcement members, said tongues extending from edges of said slabs near their corners, there being recesses provided centrally in edges of said slabs to receive said tongues of certain adjacent slabs.

23. A combination as in claim 22 in which said recesses are of such length as to permit a suitable degree of longitudinal adjustment between adjacent slabs, a tongue of one of which extends into a recess of the other.

24. In a composite wall construction, the combination of: two facings of slabs, said facings being erected in spaced relation to each other; and tie members, each of which comprises two end parts and a connecting element, said end parts being adapted to be assembled upon said connecting element and the tie member set in place with the end parts lying between adjacent slabs in opposite facings and engaging said facings so as to hold them in spaced relation, said connecting elements having a recess therein on one side thereof, said tie members installed in said walls in alignment with each other being alternately reversed to retain a reinforcing member in place.

25. In a composite wall construction, the combination of: a plurality of rectangular slabs; tongues cast within said slabs and protruding from end portions of each of the longitudinal edges thereof, there being tongue receiving recesses formed in said edges between said tongues, said slabs being assembled edge to edge in breakjoint relation to form two spaced wall facings, tongues of each slab being received into recesses of adjacent slabs; and cross tie means connecting said tongues in one of said facings with oppositely disposed tongues in the other of said facings.

26. A combination as in claim 25 in which said cross tie means has deformations which serve to space adjacent slab edges a predetermined distance.

27. A combination as in claim 25 in which said cross tie means is provided with means for holding major wall reinforcing rods in position.

28. In a building construction, the combination of: two facings of slabs formed by erecting said slabs edge to edge, in breakjoint relation, there being recesses formed in opposite longitudinal edges of said slabs, said recesses being located substantially intermediate the ends of said edges; and tongues cast into said slabs so as to protrude therefrom at the ends of said edges and adapted to project into said recesses of other slabs to align said slabs with each other; tie members engaging tongues in opposite facings, at points therein opposite each other, for holding said facings in fixed spaced relation; and a body of concrete cast in the space between said facings, said body of concrete having vertical air spaces formed therein thus dividing said body into thin portions joined by webs.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 24th day of February, 1927.

ERNEST H. LOCKWOOD.