May 3, 1938. J. STERNS 2,115,936

INTERLOCKED GYPSUM LUMBER

Filed May 16, 1931 2 Sheets-Sheet 1

Fig. 1

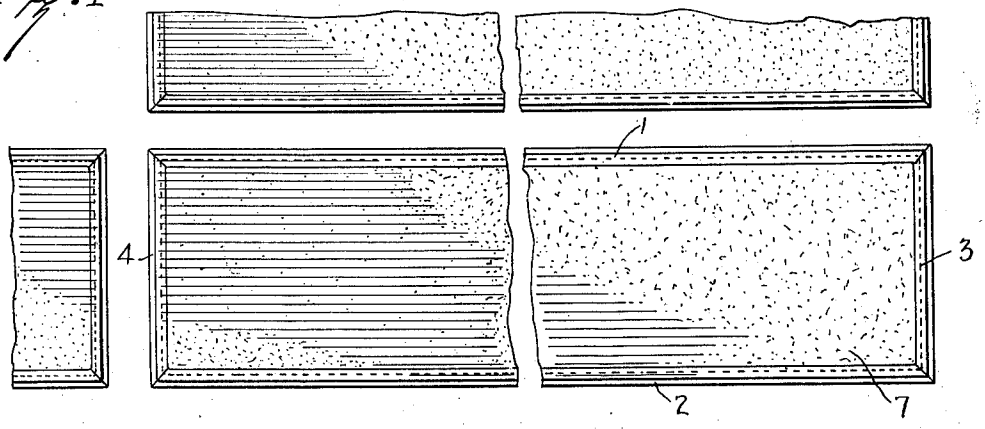


Fig. 2.

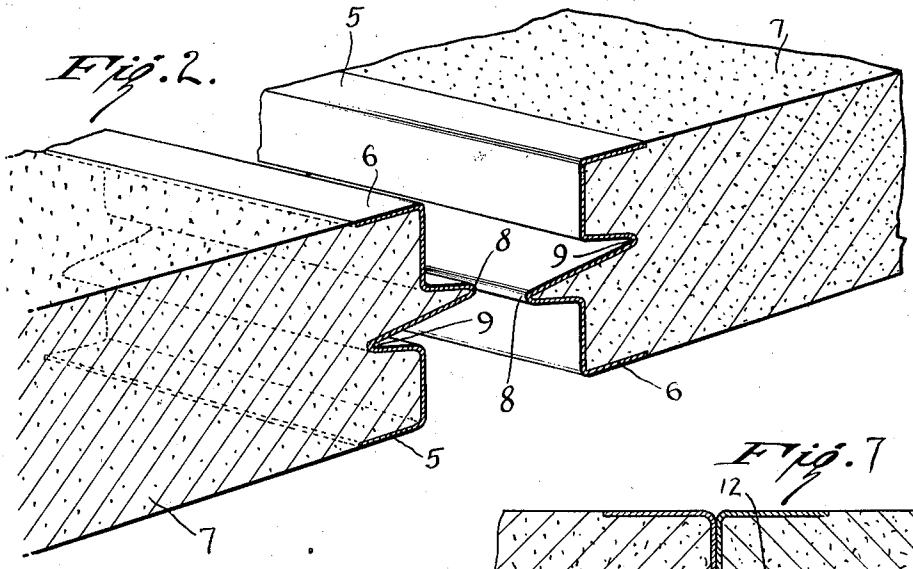


Fig. 7

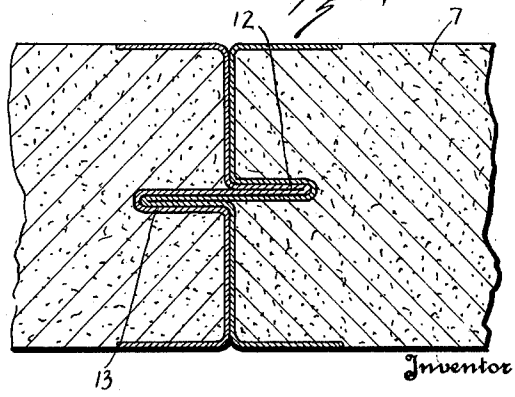
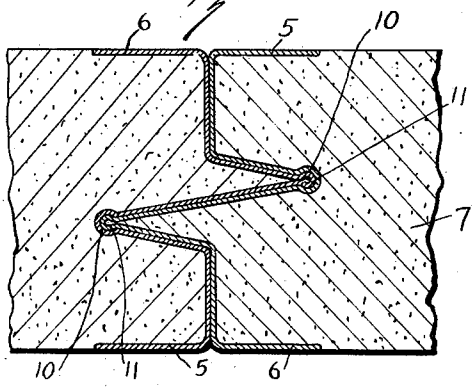


Fig. 6



Inventor

JENO STERNS,

By H. C. Brennan

Attorney

May 3, 1938. J. STERNS 2,115,936

INTERLOCKED GYPSUM LUMBER

Filed May 16, 1931 2 Sheets-Sheet 2

Fig. 4

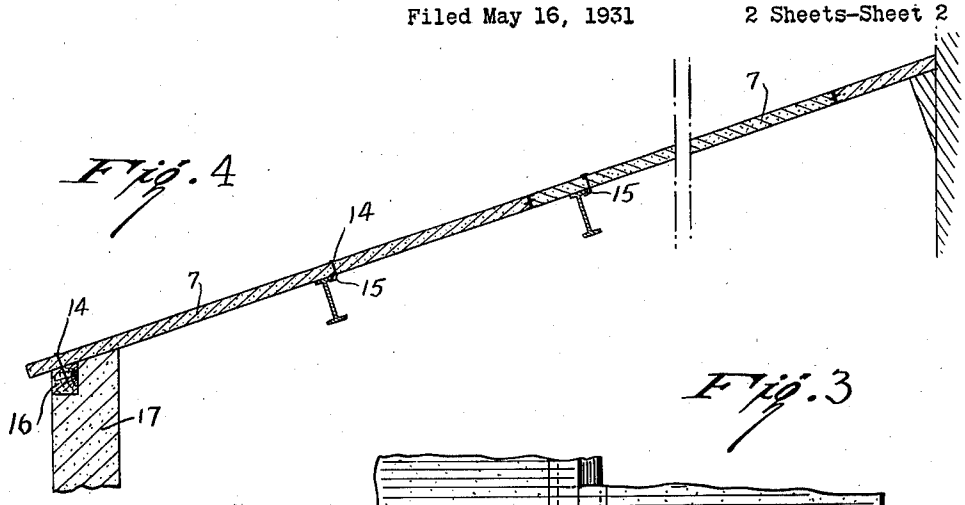


Fig. 3

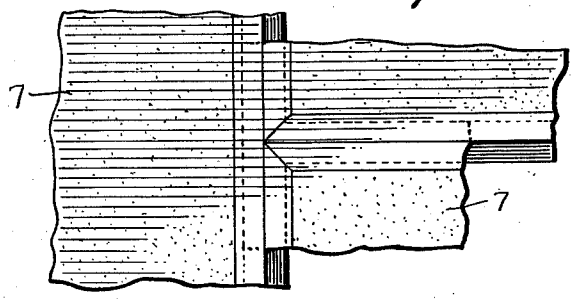
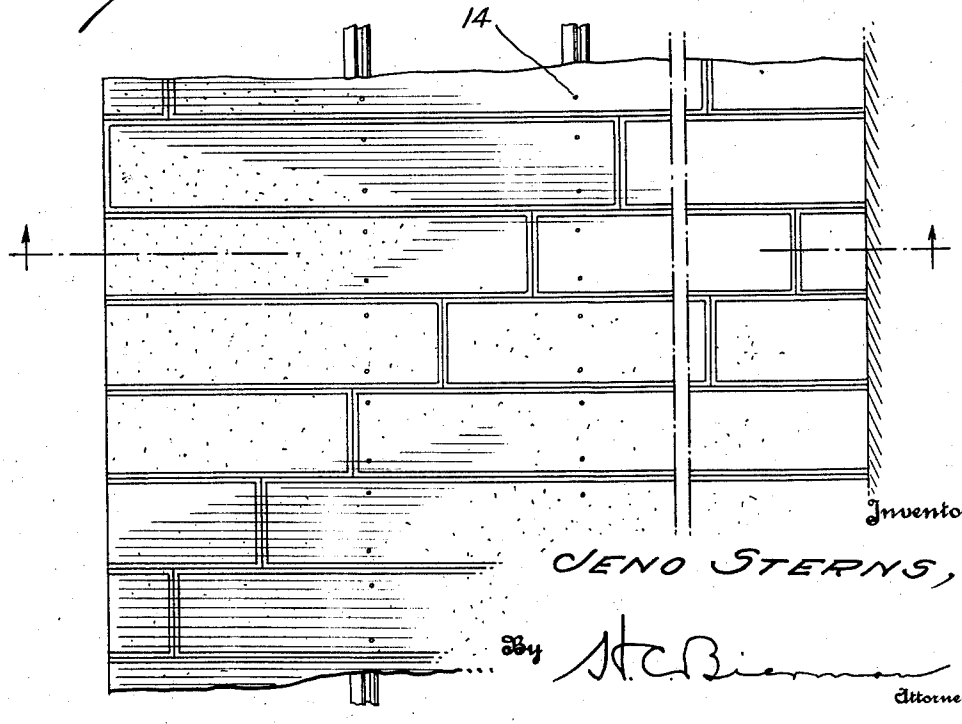


Fig. 5



Inventor

JENO STERNS,

By H. C. Bierman

Attorney

Patented May 3, 1938 2,115,936

UNITED STATES PATENT OFFICE

2,115,936

INTERLOCKED GYPSUM LUMBER

Jeno Sterns, New York, N. Y., assignor, by mesne assignments, to American Cyanamid & Chemical Corporation, a corporation of Delaware

Application May 16, 1931, Serial No. 537,776

33 Claims. (Cl. 72—68)

This invention relates to a fire-resisting precast slab and to a building construction embodying the same and particularly relates to a specific form of slab over and above that shown in the co-pending application of Clarke F. Davis, Serial No. 523,523.

The principal object of the invention is the provision of a structural unit having requisite strength, desirable fire-resisting qualities, great flexibility in its application, which may be cheaply and efficiently produced and which may be put to substantially all the uses for which a wooden plank of corresponding size is now used.

In present day building constructions, there are many types of floors, roof decks and walls, ranging from wooden structures involving the use of planking to poured-in-place concrete or gypsum constructions or constructions embodying precast slabs, having maximum fire-resisting qualities. There is a wide range in the relative costs of these various types of constructions, based not only upon the initial cost of production of the material, but dependent to a great extent upon the necessary manipulation during manufacture and in erection.

The present invention is designed to produce a cheap structural unit capable of mass production, which is simple to erect, having all of the desirable characteristics of wood planking, particularly as to its mode of application, its capability of being sawed, its ability to hold nails without cracking or spalling, being comparable thereto as to strength and weight, while at the same time having the desirable characteristics of gypsum constructions, such as insulating value and fire-resisting qualities.

To this end the invention contemplates the production of a structural unit comprising a framework of comparatively light structural metallic members such as channels, with a poured, set body therebetween of cementitious material, such as gypsum, with such admixtures or fillers so as to be readily sawed, to lighten the same, and which will receive and hold nails without cracking or spalling. Each metallic structural member is provided with a tongue and a grooved portion so that when adjacent slabs are erected, each slab will interlock with its neighbor and thus distribute the load and contribute to the strength of the entire structure. In the preferred form, the structural members are symmetrical, that is, each tongue is reversely similar to its groove in the same structural member. By reason of this fact but a single die is necessary to form the metallic member to shape, and it only becomes necessary to reversely place the members of adjacent slabs to enable the two adjacent slabs to be interlocked together in a mating joint.

In a modified form of the invention, the ends of the tongues and grooves are slightly enlarged so that when one metallic member is forced into contact with its neighbor, the enlarged ends thereof snap into engagement with the corresponding enlargements on the neighboring structural member, and a positive interlock thereby exists which resists the tendency to separate.

The invention further consists in the novel arrangement, combination and construction of parts more fully hereinafter shown and described.

In the drawings:—

Fig. 1 is a plan view of a slab of this invention, showing portions of others.

Fig. 2 is a fragmentary perspective view of two slabs, showing the mating joint.

Fig. 3 is a partial plan view of a joint between three slabs.

Fig. 4 is an elevation of a roof deck embodying slabs of this invention.

Fig. 5 is a plan view of a roof or floor construction.

Fig. 6 is a sectional view through two modified slabs, showing the mating joint.

Fig. 7 is a similar view showing still another form of mating joint.

Referring now with particularity to the embodiment illustrated, I have shown a precast slab having metallic structural members 1 and 2 constituting the longitudinal sides or edges of the slabs and members 3 and 4 at the ends thereof. Each of these members consists essentially of a channel having top and bottom flanges 5 and 6 respectively, overlying a body 7 of set cementitious material poured between the structural members. This cementitious material may be gypsum, with or without an admixture of about 3% of wood chips as filler, for the reason that this mixture is light, is readily sawed, may be nailed, sets quickly and has the requisite strength.

Each structural member is provided with a longitudinally extending tongue 8, as shown. Each structural member is likewise provided with a longitudinal grooving 9 similarly shaped. The tongue and groove in each element is so formed that they are substantially the reverse of each other, with the result that each structural member is symmetrical. This makes necessary only a single form die for the production of these shapes, and by simply reversing the slabs with

the structural members attached, the latter will make a snug mating joint with the similar but reversely placed element on the neighboring slab.

In Fig. 6, a modified form of tongue and groove is used, which simply consists of enlarging the end of the tongues and grooves to form enlargements 10 and 11, which when the slabs are placed adjacent, may snap together and form a positive interlock. In Fig. 6 this enlargement is somewhat exaggerated in order to clearly illustrate the same.

In Fig. 7, still another form of interlock is shown, in which the metal is folded directly upon itself to form a tongue 12 and another portion spaced apart the distance of two thicknesses of material to form a groove 13 into which the tongue from the corresponding slab fits.

In some instances it may be desirable to secure the various structural members in each slab to each other at their abutting corners as by welding or the like and in such case, this construction tends to contribute rigidity to the entire slab. This is not essential, however, as it has been found that there need be no connection whatever between the series of structural members, but on the contrary they may have their ends either overlapped or simply adjacent each other and rely solely in the latter case upon the bond between the inner faces thereof and the body of cementitious material to hold them in place. This bond is sufficient for handling purposes and, of course, when the various units are assembled in a building construction and the mating portions interlocked, each slab is entirely supported at its four edges by its neighboring slabs and hence no other connection is necessary. Where desired, however, one unit may be toe nailed to its neighbor.

In assembling the various units in a roof construction, for instance, it is not necessary that a special purlin or beam spacing be utilized. The slabs being made in substantial sizes for convenience, approximately 15 inches wide, 12 feet long and 2 inches thick, they more than bridge the gap between ordinary roof and floor supports. This provides a very new form of roof and floor unit, having a wide application to many circumstances, termed "constructional flexibility" in the trade. In applying the units, they may, for instance, be laid down from the peak toward the eaves or from wall to wall on floors or as wall coverings, regardless of purlins or beam spacings, and if the distance between the peak and the eaves, for instance, is greater than 12 feet, other units may be applied at the end of the preceding units, the ends of each abutting and being interlocked, and the excess length of the final unit cut off by means of a saw. The structural units being of comparatively light gauge, may be readily cut with a hacksaw or its equivalent, and the body of gypsum with an ordinary ice saw. This severed slab may then be used to begin the next row of units, which causes a break joint arrangement, thus greatly increasing the strength in this type construction. Due to the fact that this cut off section is supported at both sides and one end by its neighboring slabs, the fact that the other end is not supported is not important and it is not even essential that it rest upon a purlin. Sufficient strength and support is contributed by the neighboring slabs to provide a strong and satisfactory construction.

Due to the fact that the body of gypsum may readily receive nails, spikes or nails 14 may be driven directly through the same into the beams or purlins where they are of wood, or through the slab or in proximity to the beam or purlin where they are of metal, so that the protruding end of the nail or spike may be clinched below the flange as at 15. Of course, in many cases it will not be necessary to secure the slabs to the purlins at all, but this may be done if desirable. In a roof construction a nailing strip 16 may be supplied in the wall 17 to which the end slab may be nailed and thus assist in preventing slippage of the entire row of slabs. Due to the fact that the various tongues and grooves are wedge-shaped and have great frictional contact with each other, this end nailing may be dispensed with entirely where thought desirable.

A roof constructed as above may have applied thereto any of the various types of waterproof roofings, either in sheet form, which may be handled or tacked directly to the body of gypsum, or the slabs may be mopped with tar or pitch. In the latter case, an interlocking tongue and groove constitutes a pitch stop and thus prevents leakage of the tar or pitch between the slabs. It will be obvious that the same construction may be used in floors of buildings and that this arrangement may support any of the desired type of floor finishes, such as cinder fill, concrete, terrazzo or wood. In the latter case, the wood floor may be nailed directly to the body of gypsum material. The slabs as above constructed are comparable as to cost with wood planking of the same thickness and while they weigh slightly more, are still capable of being handled by two men, as would be required with a wooden plank of similar size. It may be put to the uses for which a wooden plank is now adapted, but in addition it has insulating and fire-resisting qualities which make it superior to wood. Such a floor or roof construction has the desirable characteristics of a gypsum precast slab or poured-in-place construction but avoids many of the intricate operations necessary in their erection. In addition, no grouting is necessary with the present construction. As the slabs pass over purlins or beams, they are not dependent upon the width of purlin or beam flanges for their support as are units which are adapted to extend only from beam to beam.

While the invention has been shown and described with reference to a specific embodiment, yet obviously I do not wish to be limited thereto but the invention is to be construed broadly and limited only by the scope of the claims.

I claim:

1. A slab comprising spaced apart metallic structural members and a body of set cementitious material therebetween, each of said members being longitudinally tongued and grooved, with enlargements at the end of the tongue and groove respectively.

2. A slab comprising a body of set cementitious material and having a metallic member covering the edge portion, said member having a tongue and a groove, the tongue being constituted by a portion of the metallic member being bent upon itself to form two thicknesses of material in substantially continuous contact.

3. A slab comprising a body of set cementitious material and having a metallic member covering the edge portion, said member having a tongue and a groove, the groove being constituted by a portion of the metallic member being bent upon itself to form two substantially parallel and spaced apart plane portions and adapted to re-

ceive the tongue of a corresponding slab in tight frictional engagement therewith.

4. A slab comprising a body of set cementitious material and having a metallic member covering the edge portion, said member having a tongue and a groove, the tongue being constituted by a portion of the metallic member being bent upon itself to form two thicknesses of material in substantially continuous contact, said groove being constituted by bending a portion of the metal upon itself to form two thicknesses of material separated by the thickness of the tongue, the two thicknesses of the tongue and the two thicknesses of the groove constituting substantially plane portions parallel with each other.

5. A slab comprising a body and a metallic member located at the edge thereof, said member having a tongue and groove, the tongue being constituted by a portion of the metallic member being bent upon itself to form two thicknesses of material in substantially continuous contact, said member having a flange on each side of the tongue in planes substantially parallel with the slab face.

6. A slab comprising a body of set cementitious material and having a metallic member at the edge thereof, said member having a tongue and a groove, the tongue being constituted by a portion of the metallic member being bent upon itself to form two thicknesses of material in substantially continuous contact, said groove being constituted by bending a portion of the metal upon itself to form two thicknesses of material separated by the thickness of the tongue.

7. A building construction including two precast slabs erected adjacent each other, each slab having a body and a metallic member at the edge adjacent its neighbor, one metal member having a tongue with an enlarged end, the other member having a groove with an enlarged end, the two members being interlocked together with the enlargement of the tongue held in the enlargement of the groove.

8. A slab comprising spaced apart metallic structural members and a body of set cementitious material therebetween, each of said members being longitudinally tongued and grooved, with enlargements at the end of the tongue and groove respectively, said enlargements constituting beads.

9. A slab comprising spaced apart metallic structural members and a body of set cementitious material therebetween, each of said members being longitudinally tongued and grooved, with enlargements at the end of the tongue and groove respectively, the tongue being filled with body material.

10. A building construction comprising precast slabs with two edges adjacent, a metallic member between the adjacent edges of the slabs, said member having a tongue with a rounded end projecting into one slab, said tongue having parallel plane faces substantially parallel to a slab face.

11. A precast slab of set cementitious material having metal members at opposite edge portions, said members having complementary parts, one of said members having a recess with a restricted neck, the other member having a projection with an enlarged end portion, said enlarged end portion being adapted to enter the corresponding recess in the adjacent slab when two slabs are erected together, and lie beyond the restricted neck so as to positively lock the two slabs together.

12. A building construction comprising precast slabs of set cementitious material each having metal members at opposite edge portions, the members on each slab having complementary parts, one of said members on one slab having a recess with a restricted neck, the adjacent member on a contiguous slab having a projection with an enlarged end portion, said enlarged end portion being seated in the corresponding recess in the adjacent metal member and lying beyond the restricted neck thereof, whereby the two slabs are positively locked together.

13. A building construction comprising two precast slabs of set cementitious material erected adjacent each other, one slab having a tongue and the other a corresponding groove, the tongue being within the groove, and means to prevent withdrawal of the tongue.

14. In a building unit, an elongated cementitious slab, metal members carried by at least two opposite edges of the slab, said members having complementary tongues and grooves, flanges formed on said members in the planes of the surfaces of said slab, and a bead formed in said members for anchoring said members to said slab.

15. In a building slab, an elongated, flattened slab of cementitious material, tongued and grooved edge members encasing opposite edges of said slab, parallel telescoping shoulders formed on said members and extending parallel to the bases of said slab, and flanges formed on said members in the plane of the surfaces of said slab.

16. A precast slab of set cementitious material having metal members on at least two opposite edge portions, one member being tongued and the other being complementarily grooved, the tongue and groove having faces substantially parallel to each other, and mechanical means carried by the edge members to anchor them to the slab body.

17. A precast slab of set cementitious material having metal members on opposite edge portions, said members having complementary parts, one of said members having a recess with a restricted neck, the other member having a collapsible projection adapted to enter the corresponding recess on an adjacent slab when two such slabs are erected together, to be collapsed as it passes through the restricted neck and then automatically expand beyond the neck to positively interlock the two slabs together.

18. A precast slab of set cementitious material having metallic members on opposite edge portions, said members having complementary parts, one of said members having a recess with a restricted neck, said neck having an angular top wall, the other member having a collapsible projection adapted to enter the corresponding recess on an adjacent slab when two such slabs are erected together, to be collapsed as it passes through the restricted neck and then automatically expand beyond the neck to positively interlock the two slabs together.

19. A precast slab of set cementitious material having metal members on opposite edge portions said members having complementary parts, one of said members having a recess with a restricted neck, the other member having a collapsible projection adapted to enter the corresponding recess on an adjacent slab when two such slabs are erected together, to be collapsed as it passes through the restricted neck, and then automatically expand beyond the neck, said recess having

vertical dimensions greater and lesser than the vertical dimension of the collapsible portion of the projection, to positively interlock the two slabs together.

20. A building construction including two precast slabs erected adjacent to each other, each slab having a metallic member co-operating with a complementary portion of the adjacent metallic member, one of said members having a recess with a restricted neck, the other member having a projection sprung up into said recess beyond the neck.

21. A building construction including two precast slabs erected adjacent to each other, each slab having a metallic member co-operating with a complementary portion of the adjacent metallic member, one of said members having a recess with a restricted neck, the other member having a projection sprung up in said recess and beyond the neck, the recess having vertical dimensions greater and lesser than the vertical dimensions of the sprung up projection.

22. The combination of claim 20 in which the recess is substantially circular in cross-section.

23. A building construction including two precast slabs erected adjacent to each other, each slab having a metallic member co-operating with a complementary portion of the metallic member on the other slab, one of said members having a recess with a restricted neck, the other member having a projection sprung into said recess beyond the neck.

24. A building construction including two precast slabs erected adjacent to each other, each slab having a metallic member co-operating with a complementary portion of the metallic member on the other slab, one of said members having a recess with a restricted neck, the other member having a projection expanded into said recess.

25. A building construction including two precast slabs erected adjacent to each other, each slab having a metallic member with a portion entering a reversely complementary portion of a metallic member on the other slab, the complementary portions constituting a spring lock to prevent accidental separation of the slabs and to hold them together in a substantially rigid manner.

26. In a frame for constructing composition building boards, said frame being formed of metal channel members having the bottom walls thereof in planes at right angles to the general plane of the frame, a tongue and a groove formed on the bottom wall of the channel member and extending the length thereof, said tongue and groove having a common side wall extending along the longitudinal center line of said bottom wall, each of said channel members being reversible and adapted to be used to form any side of said frame so that all sides of said frame comprise channel members of identically the same construction.

27. In a frame for constructing composition building boards, said frame being formed of metal channel members having the bottom walls thereof in planes at right angles to the general plane of the frame, means to enable adjacent frames to be snugly fitted together, said means comprising a tongue and groove formed on the bottom wall of each channel member and extending throughout the length thereof, one side wall of said tongue being a continuation of a side wall of the groove, each of said channel members being reversible and adapted to be used to form any side of said frame so that all sides of said frame comprise channel members of identically the same construction.

28. In a frame for constructing composition building boards, said frame being formed of metal channel members having the bottom walls thereof in planes at right angles to the general plane of the frame, means to enable adjacent frames to be snugly fitted together, said means comprising a tongue and an adjacent groove formed on the bottom wall of the channel member and extending throughout the length thereof, said tongue and groove having substantially the same cross-sectional shape and having a common side wall, each of said channel members being reversible and adapted to be used to form any side of said frame so that all sides of said frame comprise channel members of identically the same construction.

29. In combination, two slabs erected adjacent each other, one having a projection with an enlarged head, and the other a complementary groove with a restricted neck, the projection fitting and held within the groove with its enlarged head lying beyond the restricted neck, thereby preventing accidental separation of the slabs.

30. A precast slab of set cementitious material having on at least two opposite edges complementary metallic members with positive means upon each metallic member to prevent each member from falling away from the slab.

31. A precast slab of set plastic material having on one edge thereof a metallic load sustaining element, said element having a plurality of interlocking means for cooperation with complementary portions of an adjacent slab.

32. A precast slab of set cementitious material having on at least two opposite edges strengthening metallic members, said members being complementarily tongued and grooved, said members being mechanically secured to said slab by a portion of the members themselves.

33. The slab of claim 32 in which the mechanical securing means includes a deformed portion of the metallic members embedded in the set cementitious material.

JENO STERNS.