June 27, 1944. D. M. MUIRHEAD 2,352,338

BUILDING STRUCTURE FOR INSULATION AGAINST INSECTS

Filed June 20, 1941

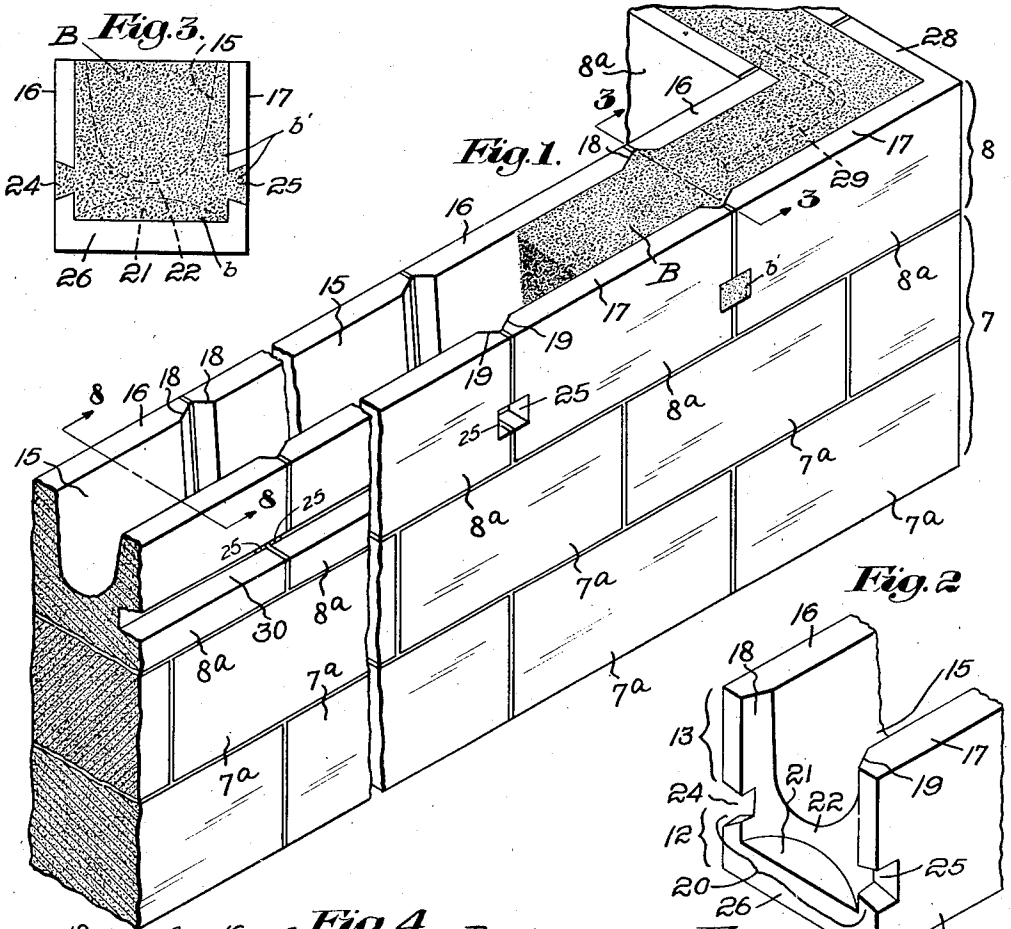


Fig. 1.

Fig. 2

Fig. 3.

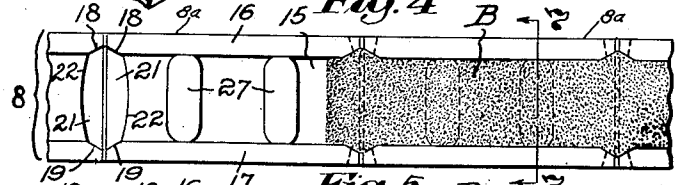


Fig. 4

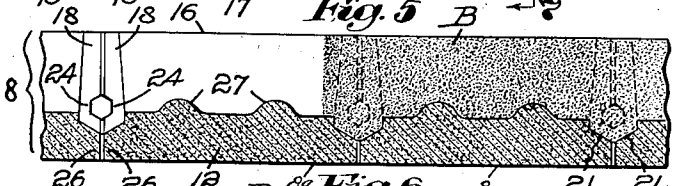


Fig. 5

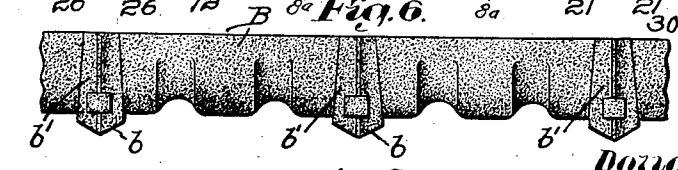


Fig. 6.

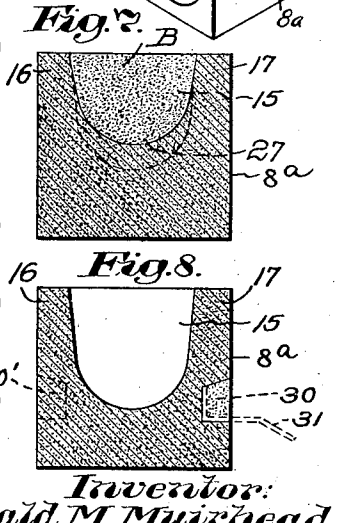


Fig. 7.

Fig. 8.

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BUILDING STRUCTURE FOR INSULATION AGAINST INSECTS

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3 Claims. (Cl. 72—60)

My present invention relates to building and wall construction, and aims to provide improved blocks and like structural units, of concrete or other monolithic or plastic material, especially but not exclusively adapted for use in termite, fungus and like control. In such control capacity the invention supplements the system of my prior patents, Nos. 2,165,192, 2,165,500 and 2,198,011, dated July 4 and 11, 1939, and April 23, 1940.

In the drawing representing by way of example certain embodiments of the invention:

Fig. 1 is a perspective view of a portion of a foundation or other wall structure;

Fig. 2 is a similar view on a larger scale of one end of a structural unit of the invention, such units being herein termed beam-blocks;

Fig. 3 is a transverse section of such beam-block and of the concrete beam carried thereby, as on the line 3—3 of Fig. 1;

Figs. 4 and 5 are a top plan and a longitudinal vertical section of a wall structure as in Fig. 1, with part of the concrete beam, at the left, omitted;

Fig. 6 shows separately, in side elevation, a length of concrete beam as formed in a course of beam-blocks; and

Figs. 7 and 8 are cross sections respectively on the lines 7—7 of Fig. 4 and 8—8 of Fig. 1.

Referring to the drawing in more detail, several courses of a wall 7 are represented in Fig. 1, composed of blocks 7a of concrete, cement or other molded material and of standard or preferred size and form. While not limited to such use, the invention has special application in connection with such block, brick, or other unit-type masonry construction.

The wall portion 7 of whatever structure is laid up to a determined level for a special course 8 comprising a longitudinal series of my novel beam-blocks or units 8a. These may in some instances be employed at lower levels but generally and as here shown will constitute an upper or the top course, at the level prescribed by the particular job, providing at such course in effect a continuous poured concrete beam to receive and support the wooden sills, timbers, and the like for the particular building. The beam-blocks 8a may have various shapes and sizes but ordinarily are of the general rectangular form customary for concrete blocks and of any dimensions usual or preferred for unit-type masonry, such as 8 x 8 (or 10 or 12) x 16 inches, etc.

Each beam-block 8a comprises a base section 12 and an upper or beam-forming section 13, Figs. 2, 3 and 4, the latter presenting a longitudinal inverted archway, beam-form or channel 15 open at the top and continuous from end to end of the block. This upwardly open formation or channel 15 has a depth preferably at least about half that of the block, giving it a general minimum depth of 2 to 3 inches or more down to the solid base section 12. As shown, its side and bottom walls conveniently round in and down along an arcuate sectional contour, but may be plane surfaced and relatively perpendicular or substantially so where the material and other conditions, such as the strength factor, permit. In a block of given height the degree of any such curvature of the lower portion of this channel or beam-form 15 is proportionate to the block width, being generally flatter in the wider blocks. The lateral walls of the channel 15 are defined by the spaced retaining formations, flanges or beam-siding members 16 and 17, along the respective longitudinal sides of each beam-block 8a. While in the illustrated example said flanges thicken downwardly toward and merge into the base section 12, their particular sectional contour may be substantially varied within the dictates of strength and stability.

A course of these blocks 8a aligned end to end as in Fig. 1 accordingly presents a continuous upwardly open trough-like form for the pouring of a coextensive beam or beam-like element B of cement, concrete or the like, shown stippled in various of the figures and seen separately in Fig. 6. The aligned upright flanges 16 and 17 of the several blocks constitute in effect integral, preformed siding frames or forms for such continuous beam B. After pouring and curing, the latter homogeneously connects the entire course 8 of blocks 8a, distributing and equalizing the weight to be supported on the wall, substantially as though the entire upper wall portion were of the poured concrete rather than the unit type such as shown at 7.

Ordinarily a unit-type masonry formation is relatively weak at the end joints between units, such as the concrete blocks 7a. That is where settling and shrinkage are most likely to cause trouble, tending to separate, crack or crevice the joints and so affording avenues for upward travel by insects and for growth of fungus. This holds true despite care in laying up the joints, even with the use of a rich Portland cement mortar in an attempt to seal off the joints horizontally.

It is an important feature of the present invention that the beam-blocks 8a not only provide for the pouring of a continuous concrete top

beam B but also so form the latter at the region of the inter-unit joints that, first, the resulting wall course or structure 8 is as strong or stronger at the joints than elsewhere and, second, the insect-impervious material of the beam B itself is laterally exposed at the joints, at either or both side faces of the blocks 8*a*, over a substantial inspecting area at a selected level between their bottom and top planes. In other words, an integral part of the beam B itself forms at the region of the joints a transverse barrier against insects and fungus. That barrier extends fully or almost fully through the wall at the inter-unit joints. And at any remaining non-barred outer extremities of the joints readily visible areas of the material of the beam B are exposed for inspection, at each face of the wall. Upwardly travelling insects, such as termites, accordingly either are stopped or are driven out laterally to an exposed and readily detectable position.

For the above purposes and as best seen in Fig. 2, the siding flanges 16, 17 are recessed or beveled at their inner end edge portions, as indicated at 18 and 19 respectively. These bevel formations or vertical recesses 18, 19 are carried down to and preferably beyond the bottom of the beam-forming channel 15, there merging downwardly into a cross recess 20. The bottom face 21 of the latter desirably is somewhat inclined inwardly and upwardly from the end of the block. Said cross recess 20 has an arcuate or inwardly concave upright inner transverse wall 22 which intersects the floor of the beam channel 15 and merges laterally into the vertical recess formations 18, 19.

The described cross recess 20 is in effect laterally extended out to the opposite side faces of each block 8*a*, preferably, as shown in Fig. 2, somewhat above the recess floor 21, by the provision of outwardly opening window-like passages or apertures 24, 25. These latter are open, in the manner of notches, at the vertical end plane of the block, and extend in from that plane for at least about ¾ of an inch, in a block of the usual size. Their three boundary surfaces, bottom, top and inner end, in cases where their notches or apertures are below the top plane of the blocks, or their two boundary surfaces, bottom and inner end, where said notch-like apertures are located at the upper portions of the siding flanges 16, 17, desirably are inclined to give these openings or windows 24, 25 somewhat of a lateral and outward flare or drift.

Below the described transverse end recess 20, which extends up to the top face of the blocks, and into which the windows 24, 25 open, is a solid flange-like end portion 26 of the base section 12. The siding flanges 16, 17 of the upper section terminate in the same vertical plane with the end face of said base flange 26, except at the location of said notches or openings 24, 25, defining with said base flange and with the inner end walls of said notches the corresponding end face of the block as a whole.

Referring to Figs. 4, 5 and 7, each block 8*a* may be provided with one or more reinforcing cross members or ribs 27 at the lower portion of its beam-forming channel 15. Two such ribs are illustrated in the present example, symmetrically disposed and spaced by about one-third the block length. As seen in section crosswise the block these ribs 27 are traversely arched in general conformity with the channel or archway 15, and are reversely arched as viewed in section lengthwise the block, that is, crosswise of the ribs; see Fig. 7. At their ends and along their lower side portions each rib 27 flows into the adjacent side and bottom surfaces of the beam-forming archway 15.

From the foregoing description and by reference to the drawing, it will be evident that in end to end positioning of the beam-blocks 8*a*, as in course 8 of Fig. 1, the end recessing of one block, including the formations 18, 19, 20, 24 and 25, is brought into complementary matching and oppositely facing relation to the corresponding end recessing at the adjoining end of the next block. Hence at each end joint there is a total form-like space of a general elliptical contour as viewed from above; see Fig. 4. The respective terminal recesses 20 each define one-half of this elliptical space or end wall, the floor of the latter being presented by the bottom faces 21 of said recesses, which faces also are the top surfaces of the corresponding base flanges 26. The matching lateral passages or windows 24, 25, whether these be at or above the floor 21, including instances where they may be located and extended vertically so as to open at the top face of the blocks, at the upper end corner portions of the flanges 16, 17, together define lateral extensions of these end wells, of a general rectangular form in vertical section lengthwise the blocks and of double the area, on such section, of the individual passage 24 or 25 of a single block. They afford visual and mechanical access to the end well at the given inter-block joint, from either and both sides of the resulting wall structure; see particularly Figs. 1, 2 and 3. It is also noted that the described end recessing or well-like formations merge into and in effect constitute integral portions or projecting enlargements, laterally and downwardly, of the main beam-forming channels 15 of the corresponding blocks 8*a*.

In constructing a unit-type masonry wall with the use of my pre-cast beam-blocks 8*a*, the latter are laid up as specified for the other masonry units 7*a*. The resulting top or other course such as 8 of Fig. 1 presents a continuous open-top channel along the entire course, ready for forming the concrete beam B in it. This beam-like channel form is filled, preferably in a continuous operation, with the specified insect-impervious homogeneous material, such as concrete of a 1:2:4 mix and having a water ratio desirably not more than approximately 7 gallons per bag of cement, the sand being clean and coarse, and the aggregate desirably a clean gravel or crushed stone of not over ¾ inch grade. This material as poured flows and packs down into and along the entire beam-form presented by the block channeling 15 and the associated lateral and vertical enlargements thereof at the block joints.

There results a concrete beam B coextensive with the entire course of beam-blocks 8*a*. A length of such beam is shown separately in Fig. 6, as it would appear if it could be removed and viewed separately in side elevation. By reference to that figure, and noting also Fig. 5, it will be evident that the beam B is of maximum cross sectional area at the region of the inter-block joints, to the extent contributed by the material received in the end recesses 18, 19, 20 of the corresponding blocks. Hence the beam and the wall structure of which it forms a part not only are at least equally as strong at the joints as elsewhere but in fact are there stronger, in proportion to the cross-sectional beam area at those regions. Further, the enlarged block-joint por-

tions *b* and *b'* of the beam B serve respectively as supplemental pier-like supporting feet, and as vertical reinforcing and positioning columns, as well as firmly anchoring and bonding the beam B at the inter-block joints. The mass of the beam as a whole integrally bridges across between the successive blocks 8*a*, resisting their relative displacement, particularly in the vertical plane.

Again, the beam offers an uninterrupted barrier of insect-impervious material effectively spanning the joints, with little or no chance of being there disrupted or cracked in the event of settling or other disturbance of the wall structure. Noting particularly Fig. 3, a section between blocks 8*a* in a course such as 8 of Fig. 1, it will be obvious that insects attempting to travel up in the plane of the joint will meet the barring beam B. To continue up they must either pass completely out to one side face of the wall or, if able to work up at the extreme side edge of the joint, at the narrow areas outside the beam, they cannot cross the portions of the beam that are exposed at the windows 24, 25 without themselves or their tubing being exposed to light and view and accordingly subject to detection on proper examination.

It will be understood that in pouring the cement into the channel 15 it will enter outwardly into the notches or window-like openings 24, 25, whether these are at the top of the blocks or at some lower point, and generally will fill these notch openings substantially flush with the sides of the blocks as at *b'* in the upper right portion of Fig. 1, these openings being temporarily closed at their outer ends during pouring of the cement, if desired. And it will be particularly noted that the beam material flowing out into the notches or openings 24, 25 there provides a horizontal overlapping lock-joint spanning the main vertical joint between blocks and extending outwardly from the beam proper into or through said notches. Thus, as will readily be seen by reference to Fig. 3, a horizontal cement-to-cement bond is provided across the joints throughout substantially the full width of the blocks, such horizontal bond, forming an impervious barrier to upward travel by insects, including that at the floor 21 of the cross-recess 20, see also Fig. 2, and that at the horizontal walls of the respective notches or openings 24, 25. And since no shrinkage of the filling material bonded to such horizontal surfaces takes place the barrier there formed remains impervious over an indefinite period. And in instances where the fill material of the beam does not completely fill the notch or notches 24, 25, any insects attempting to travel upwardly between the blocks adjacent their outer faces will be driven outwardly, by the beam itself and by the fill material in the notches, so that they must expose themselves to easy detection at the region of the latter.

The beam formation B may be continued uninterruptedly about any angle or corner of the wall structure, such as shown for example at the upper right in Fig. 1. At such corner, a regular beam-block 8*a* may be used, a portion of the appropriate side flange (member 16 in Fig. 1) being removed to open the beam channel 15 into that of the adjoining angularly disposed block. Or at such locations the corner beam-block, such as that at the right end of course 8 of Fig. 1, may have one end closed as at 28.

The beam-blocks 8*a* are cast in inverted position in special forms or molds. The end gates of these forms carry cores defining the end recessing and which desirably are removable. To cast a closed-end or a corner block the appropriate end core is merely removed. Also an insert having the cross-sectional shape of the beam channel 15 may be installed on the appropriate side wall of the block casting form, to produce a lateral extension of the beam channel 15 at one or the other or both sides adjacent the closed end of the block.

It will also be understood that the beam B of a course of my beam-blocks 8*a* may readily be reinforced by inserting longitudinal rods, metal mesh or the like during the pouring operation. Such reinforcement is herein indicated by way of example at the corner formation of Fig. 1, where one or more ¼ inch or other iron rods or the like 29 are incorporated into the concrete mix of the beam B, being bent to extend at least a foot in each direction.

Another advantage in the use of my beam-blocks is that they make it a very simple matter to locate upright anchor bolts for sills and the like, such as concerned in my Patent No. 2,165,500, at any desired points along the wall, including locations at the inter-block joints where bolts ordinarily are improper. Such anchor bolts need merely be set at the selected point along the beam-block course, in the beam archway 15 or its well-like enlargements at the block ends, the lower portions of the bolts being embedded in the poured beam material. At the strong inter-block joints the abutting base flanges 26 afford an excellent seat for the anchor bolt heads.

As previously explained, a course of my beam-blocks 8*a* with the concrete beam B formed in place therein avoids the use of the relatively expensive, time- and labor-consuming capping course of 3 or 4 inch thickness of rich cement compulsory for termite control under government and other accepted specifications for unit-type masonry foundations. Such topping or capping course not only requires the erection of wood forms for pouring it, but also introduces the complication of the extra 3 or 4 inch height of material at the wall top.

The more easily laid and less expensive beam course 8 of my present invention, instead of said solid full-width cement capping, affords adequate protection against termites at both interior and exterior faces of a unit-type masonry wall, at all its portions which are normally exposed, readily inspectable, and sufficiently extended above the earth grade, with the further assumption that periodic examinations of the wall will be had. But at inaccessible and covered areas additional protection is essential, by means of metal or other insect-impervious apron shielding. Such areas include the interior face of concrete foundation walls enclosing only partly excavated areas, interior portions below wall openings, and, at the exterior face, all concealed sections such as beneath or behind porches, steps, terraces and the like.

At any such concealed or non-readily inspectable wall faces provision for original or subsequent apron shielding should be made. In my patents, Nos. 2,165,192 and 2,198,011 there is disclosed and claimed my keyway system for the installation of such apron shielding.

The beam-blocks 8*a* of my present invention are particularly adapted for use with and cooperatively combine certain means of that system. Referring to Fig. 1, it is assumed that the left-

hand portion of the wall structure has its exterior face (that next the reader) at a location where it will be concealed or not readily inspected, as behind a porch or other platform, steps, etc. The beam-blocks 8a for such location have at their exterior side face a longitudinally continuous shield-receptor formation or keyway 30; see Fig. 8. As fully explained in my patents noted, this keyway provides for mounting an apron shielding such as shown dotted at 31 in Fig. 8 in concrete-to-concrete sealed relation with the material of the block 8a. Such shielding may be installed when the wall is erected or later, as circumstances may prescribe. At some locations shielding keyways may be desirable at both faces of the block, and I have so indicated by the dotted-line keyway 30' at the left in Fig. 8. Such double keyway blocks are appropriate, for example, at areas where there is no full excavation at the interior of the wall face and the immediately opposite exterior wall face is covered.

The keyways 30 or 30' at one or both faces may be constructed and arranged as longitudinal continuations of the lateral openings or windows 24 or 25 at the corresponding face of the block, and in any instance where a keyway is present lateral communication between the internal longitudinal channel 15 and the keyway, for outflow of the fill material, is provided at the interblock joints, as by means of said openings or windows 24, 25 there disposed so as at least to intersect the keyway. In such case the terminal portions of the keyway or keyways themselves with the inner portions of the windows 24, 25 at the keyway ends may constitute the means for visual access and laterally outward flow by to the material of the beam B, where the keyway is left open, without installation of but in readiness for the shielding 31. After such shielding is installed, it effectively bars termites, at the edges of the joints as well as elsewhere along the face of the wall, and the beam inspection openings accordingly may be covered by said shielding, in cases where as here illustrated the keyway or keyways are in line with and in effect continuations of the window openings such as 24 or 25 or both. And by reason of the laterally communicating passages or notches 24, 25 at the block ends between the internal channel 15 and the keyway the horizontal bond laterally across the blocks at the joints is furnished, fully barring upward travel by insects in the vertical end joints, including the portions thereof behind the shield-mounting keyway, between it and the beam-forming fill of the channel 15.

If but one side of a block 8a has the keyway it will be understood that the inspection aperture 24 or 25, as the case may be, at the non-keywayed side, may remain the same as in Fig. 2. And in any block 8a said inspection apertures or window passages 24, 25, and any keyway such as 30' or 30, are disposed at such relative level, whether in line or otherwise communicating, that an adequate solid mass is contained in the base section 12 and the lower portions of the block siding flanges 16, 17 integral with the latter. In this connection, certified tests by a disinterested firm of engineers have established that a two-block span of my concrete-filled beam-blocks, that is, two blocks 8a disposed end-to-end as in course 8 of Fig. 1 and concrete-filled with the beam formation B, is capable of supporting a load in excess of 2000 lbs. singly concentrated centrally lengthwise the block pair, i. e. at the inter-block joint. In making such test the beam-filled block pair, in this case with full-length keyway at one side, was set on fulcra approximately one-inch in from its opposite ends, the beam-block pair accordingly forming an otherwise unsupported 30-inch span, beam-face upward, the load being applied midway of said free span. And as to compressive strength the similar beam-filled blocks tested over 3300 lbs. per sq. inch, as contrasted with the standard requirement for concrete blocks under existing building codes of but 1000 lbs. per sq. inch.

My invention is not limited to the particular embodiments thereof as illustrated and described herein by way of example, and I set forth its scope in my following claims.

I claim:

1. In a building wall structure, an upper course of blocks disposed end to end, each having along its upper section a longitudinally continuous beam-forming downwardly extending channel, and having laterally outwardly opening end recesses communicating with the channel at the region of the inter-block joints there to expose areas of channel-filling poured beam material.

2. In a building wall structure, a plurality of longitudinally aligning generally rectangular blocks disposed end to end in a course position not directly covered by another course, said blocks having along their upper sections an open-top downwardly extending beam-forming channel of maximum width at its top and continuous from end to end of each non-terminal and non-corner block, the blocks including laterally spaced channel-defining solid vertical walls and a connecting horizontal base mass, said walls and base mass terminating in the same vertical plane at the respective ends of the block to define their end faces, said blocks having also in one channel-defining vertical wall end recesses leading horizontally from the respective end faces of the blocks and communicating laterally between the beam-forming channel and an outer face of the respective block, and beam material filling the channel and the end recesses thereby to provide at the block ends horizontal barriers against insects.

3. In a building wall structure, a plurality of longitudinally aligning generally rectangular blocks disposed end to end in a course position not directly covered by another course, said blocks having along their upper sections an open-top downwardly extending beam-forming channel of maximum width at its top and continuous from end to end of each non-terminal and non-corner block, the blocks including laterally spaced channel-defining solid vertical walls and a connecting horizontal base mass, said walls and base mass terminating in the same vertical plane at the respective ends of the block to define their end faces, said blocks having along the outer face of one channel-defining vertical wall a horizontally continuous keyway, a laterally projective insect-barring shield having an inner longitudinal portion received and supported in said keyway, said blocks having also in said keywayed vertical wall end recesses leading horizontally lengthwise from the respective end faces of the blocks and communicating laterally between the beam-forming channel and said keyway, and beam material poured filling the channel and the end recesses, thereby to provide at the block ends horizontal barriers against insects.

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