United States Patent [19]

Wood

[11] **3,717,967**

[45] **Feb. 27, 1973**

[54] **BLOCK AND BUIDLING CONSTRUCTION USING SAME**

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[52] **U.S. Cl.** **52/259,** 52/439, 52/566

[51] **Int. Cl.**.....**E04b 1/16,** E04b 2/26

[58] **Field of Search**.....52/259, 284–286, 52/437–442, 608–611, 584–593, 565, 421, 436, 439, 258, 566

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Assistant Examiner—James L. Ridgill, Jr.
Attorney—Emory L. Groff et al.

[57] **ABSTRACT**

A building construction utilizes hollow modular masonry blocks, each provided with at least one centrally disposed full-size cavity and one half-size cavity as defined by cross webs joining a pair of parallel sidewalls. The sidewalls terminate, at least at one end, in freely projecting extensions each having a distal inturned end flange adapted to laterally abut a similar construction of an adjacent block. The shoulder as provided behind each end flange serves to position and retain full-length vertically installed reinforcing bars through unobstructed vertically aligned cavities in the successive courses of the blocks from floor to floor while recesses in the top of each web receive horizontal reinforcing elements and permit the communication of a filler of concrete both horizontally and vertically throughout the wall.

8 Claims, 30 Drawing Figures

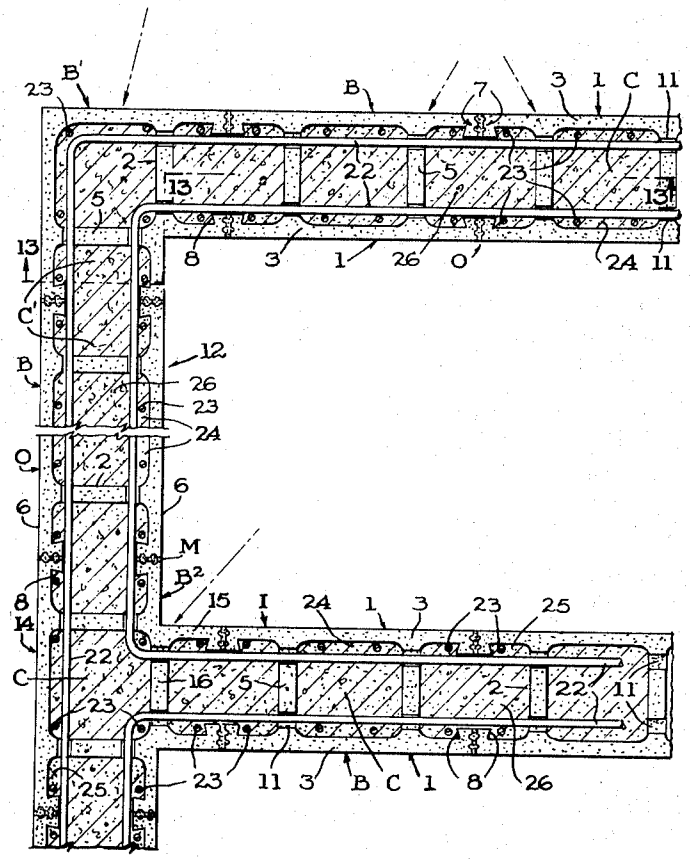


FIG. 4.

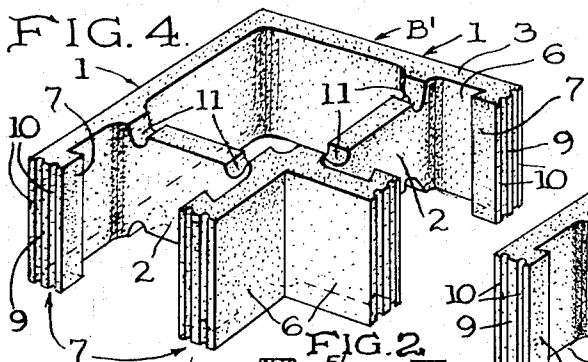


FIG. 1.

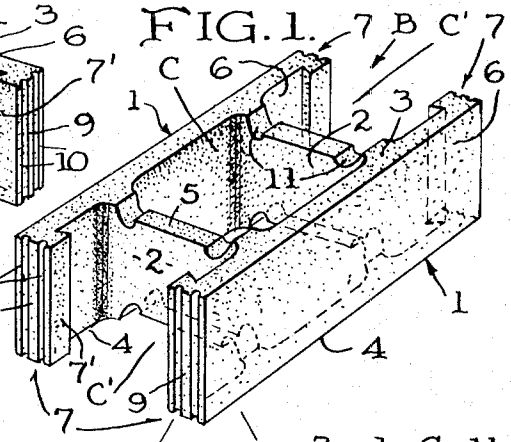
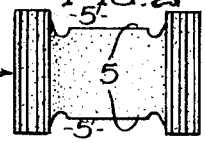


FIG. 2.



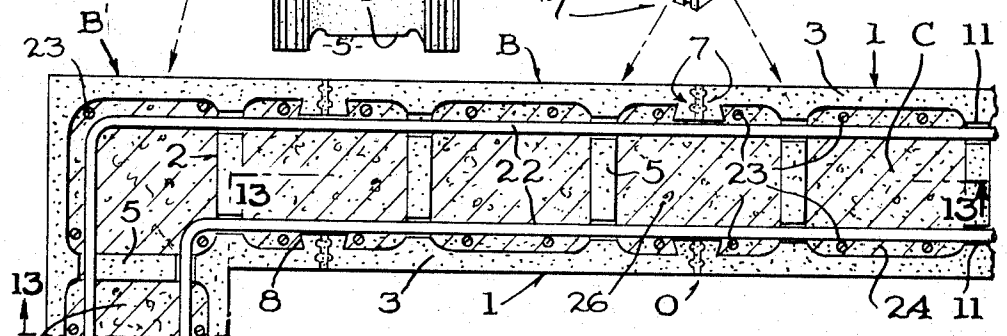
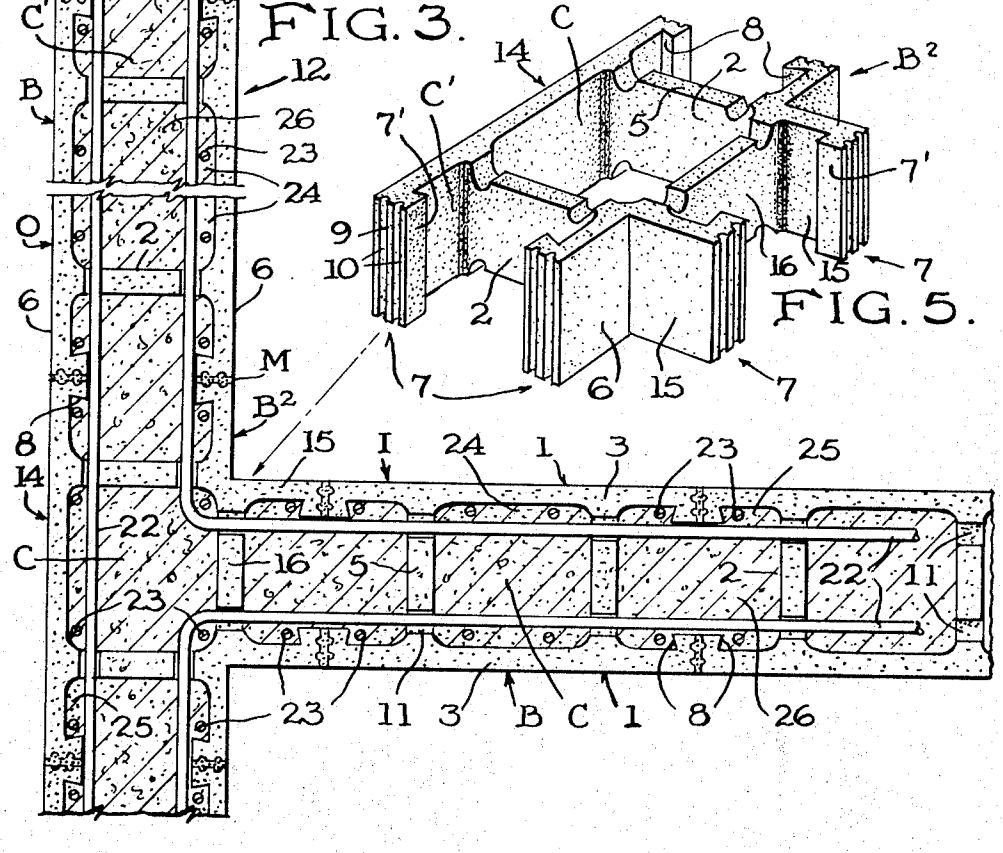


FIG. 3.



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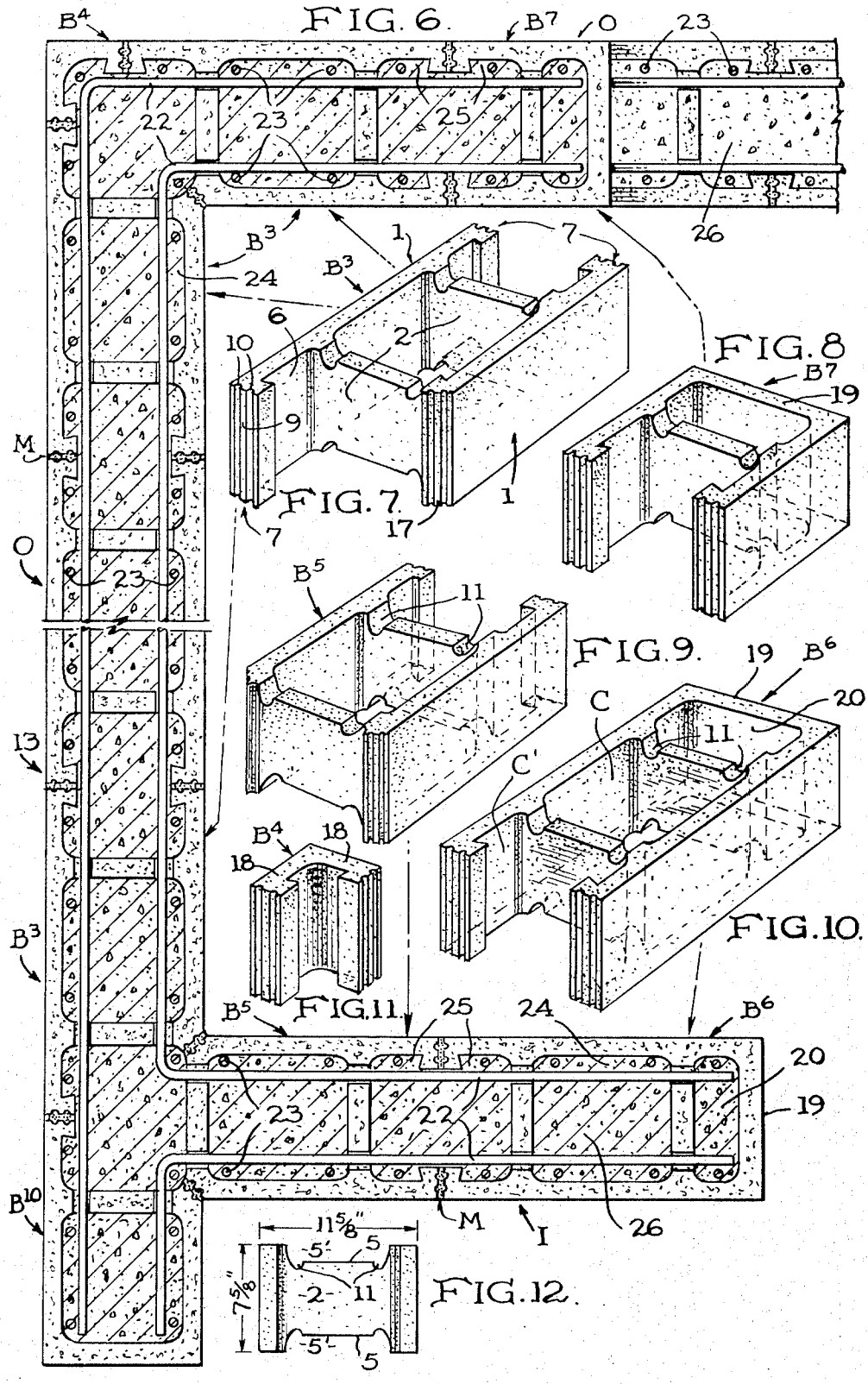


FIG. 6.

FIG. 7.

FIG. 8

FIG. 9.

FIG. 10.

FIG. 11.

FIG. 12.

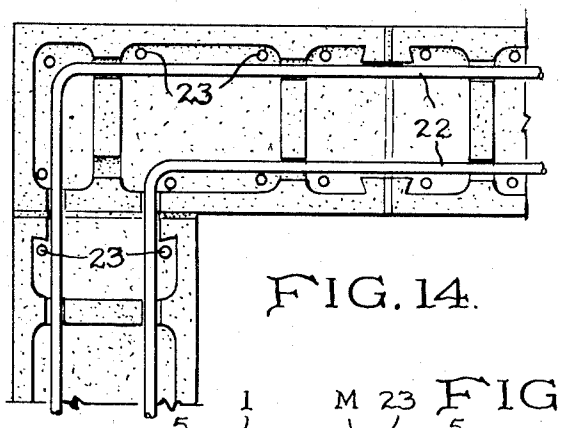
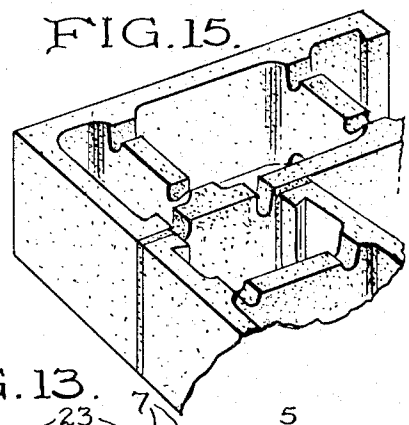


FIG. 14.

FIG. 15.



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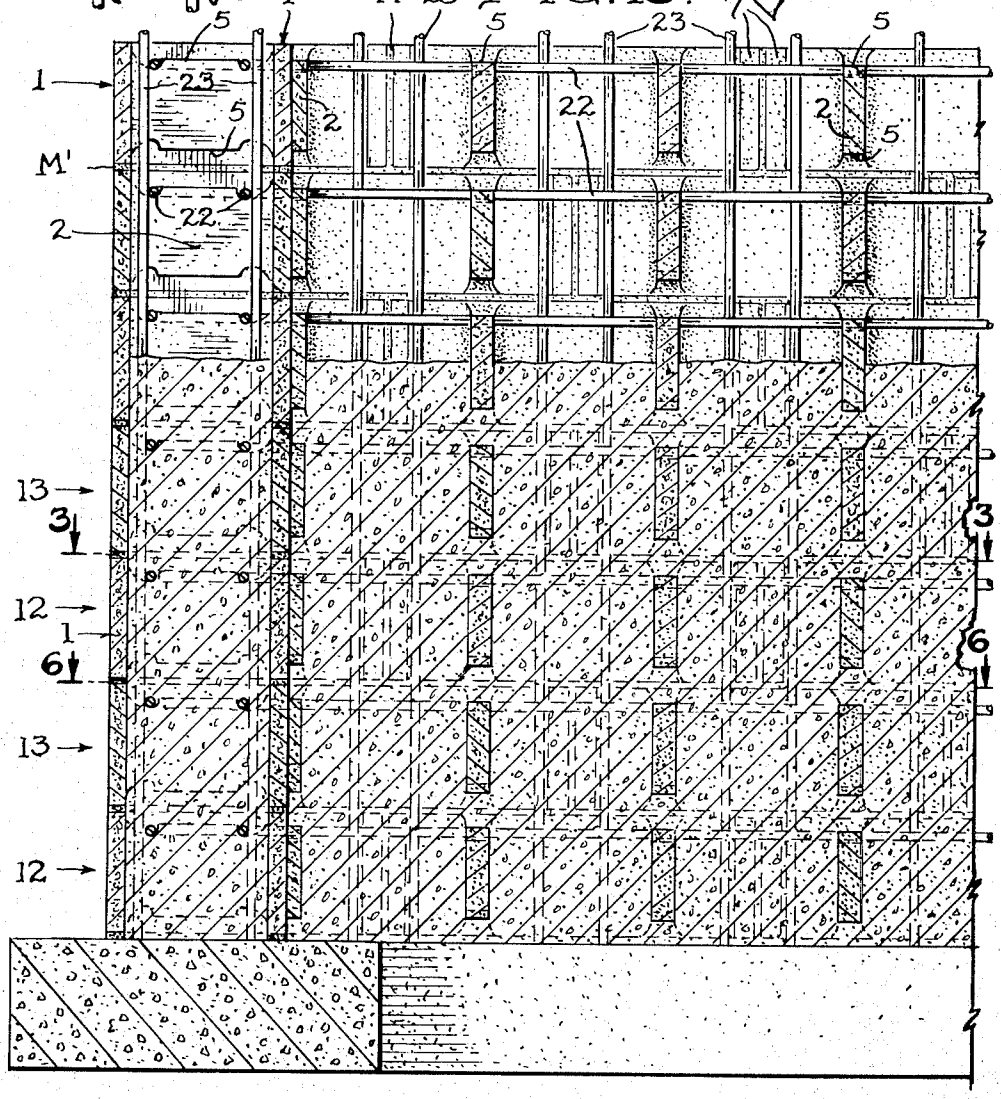

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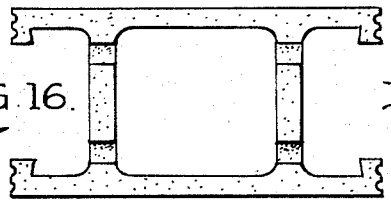


FIG. 17.

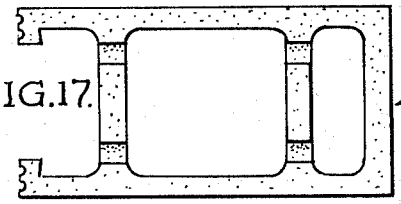
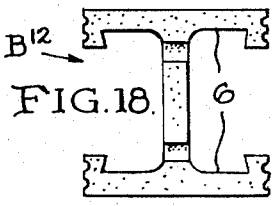


FIG. 18.



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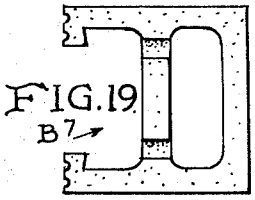

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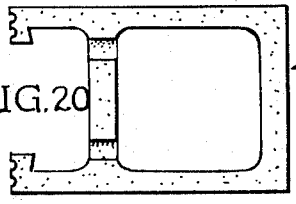

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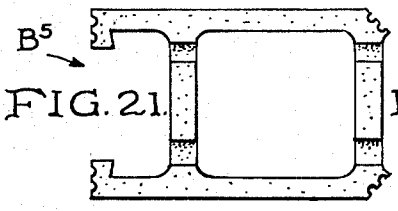

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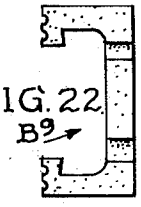

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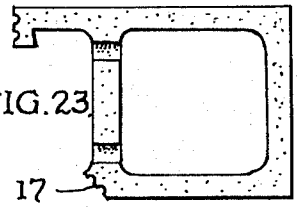

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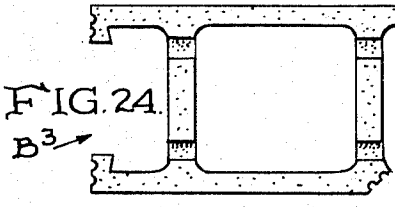

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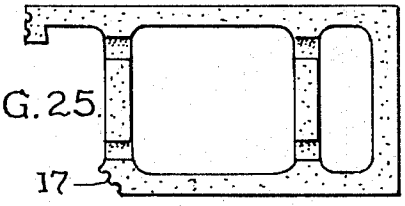

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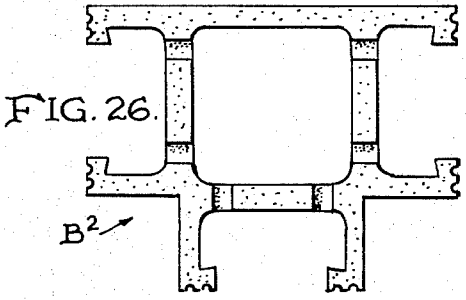

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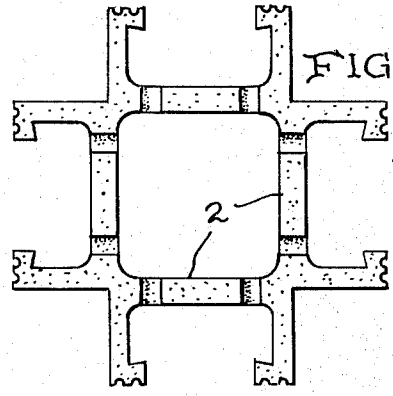

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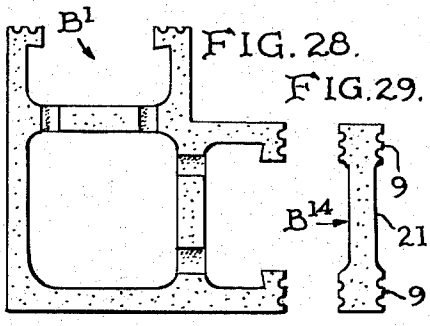

FIG. 29.

FIG. 30.

BLOCK AND BUIDLING CONSTRUCTION USING SAME

This invention relates generally to building construction, and more particularly, to an improved modular masonry block and a unique arrangement of a plurality of such blocks resulting in a more desirable building construction.

Hollow, modular type building blocks are generally well known wherein a cementious composition such as concrete or concrete/cinder material is molded or cast to provide a plurality of blocks having vertically extending passageways or cavities and which are laid up in multiple courses with the end mortar joints of successive courses disposed in staggered relationship. Likewise, it is also known in the art to fill the cavities formed in the blocks with reinforced concrete such that a monolithic-like wall construction is produced.

By the present invention, a unique arrangement is provided wherein both horizontally and vertically extending steel reinforcing elements are combined with modular blocks of improved construction and a reinforcing filler of concrete to yield a monolithic structural installation having vastly superior strength components in both the horizontal and vertical planes. It is acknowledged that the inclusion of both the steel and reinforcing concrete in a modular block-type wall construction in itself is not unique; yet the herein proposed construction provides an improved block configuration readily lending itself to a rapid erection of the building walls while offering positive positioning means for locating and retaining both the horizontally and vertically extending steel reinforcing elements. The present concept will be understood to be adaptable to building blocks as utilized for constructing a straight wall section as well as for erecting the corners or intersection of two or more walls while also setting forth a unique arrangement for tying-in intermediate load-bearing walls of the building, all of which results in a monolithic type of building construction obviating the necessity of utilizing common structural steel components such as beams or columns, yet resulting in a structure having a most desirable load distribution factor throughout all the various walls forming the building.

Accordingly, one of the primary objects of the present invention is to provide an improved masonry building block offering a modular construction containing means for positively locating and retaining both horizontally and vertically extending steel reinforcing elements.

Another object of the present invention is to provide an improved masonry building block of the modular type including at least a pair of sidewall extensions each having an inwardly turned end flange.

Still another object of the present invention is to provide an improved modular building block having a pair of parallel sidewalls joined by a plurality of parallel cross webs and wherein the top and bottom surfaces of these webs are inwardly offset from the plane of the top and bottom surfaces of the block sidewalls and further include a plurality of horizontally extending reinforcing rod receiving grooves.

A further object of the present invention is to provide an improved building construction including a plurality of modular masonry blocks disposed in a plurality of vertically offset courses and providing open cavities

extending freely from the top of the wall to the bottom of the wall and also communicating laterally from one side edge of the wall to the other side edge thereof for the reception of both metal reinforcing elements as well as a filler of reinforcing concrete such that a wall is provided having a plurality of unobstructed concealed vertical concrete columns.

With these and other objects in view which will more readily appear as the nature of the invention is better understood, the invention consists in the novel construction, combination and arrangement of parts hereinafter more fully described, illustrated and claimed.

A preferred and practical embodiment of the invention is shown in the accompanying drawings, in which:

FIG. 1 is a perspective view of a standard stretcher course building block according to the present invention.

FIG. 2 is an end elevation of a typical block according to the present invention.

FIG. 3 is a top plan view of a segment of a typical building construction according to the present invention and illustrates the arrangement of an odd-numbered course of blocks.

FIG. 4 is a perspective view of the corner block as shown in FIG. 3.

FIG. 5 is a perspective view of the T-block as used in the intersection of walls as shown in FIG. 3.

FIG. 6 is a top plan view illustrating a typical adjacent or even-numbered course of blocks associated with the construction shown in FIG. 3.

FIG. 7 is a perspective view of a companion corner block as used with the even-numbered course of FIG. 6.

FIG. 8 is a perspective view of a half-size block as used with the even-numbered course of FIG. 6 to provide a door or window jamb opening.

FIG. 9 is a perspective view of a three-quarter size stretcher companion block as used in the course of FIG. 6 to tie in an interior wall with a T.

FIG. 10 is a perspective view of a full-size stretcher course jamb block.

FIG. 11 is a perspective view of a corner block as used in the course of FIG. 6.

FIG. 12 is a vertical end sectional view taken through a typical block of the present invention.

FIG. 13 is a vertical sectional view through a plurality of courses of blocks as arranged to provide two intersecting walls and illustrates the concealed unobstructed vertical columns formed by the filler of concrete.

FIG. 14 is a fragmentary top plan view of a typical corner as constructed with prior art blocks.

FIG. 15 is a perspective view of the prior art blocks of FIG. 14.

FIGS. 16 through 30 are top plan views of various blocks constructed according to the present invention.

Similar reference characters designate corresponding parts throughout the several figures of the drawings.

Referring now to the drawings, particularly FIG. 1, the present invention will be seen to include, as a basic element, a modular cast or molded masonry stretcher course block, generally designated B, and which includes a pair of spaced-apart parallel sidewalls 1—1 connected by a pair of transverse parallel cross webs 2—2. The upper horizontal surfaces 3—3 of the two

sidewalls as well as the lower horizontal surfaces 4—4 thereof will be understood to be coplanar with respect to one another, while a significant feature of the present invention is the vertically displaced top and bottom horizontal surfaces 5 of the webs 2, which surfaces will be seen to be dropped or displaced inwardly from the plane of the surfaces 3 and 4 of the sidewalls 1. It will be understood that the block B as shown in this figure represents a typical construction carrying out the unique concept of the present invention. This specific block is intended to serve in the construction of a wall at points other than a corner thereof, adjacent a window or door jamb or intersection with an interior wall, which latter locations require the use of differently shaped blocks to be described hereinafter.

The free ends of each sidewall 1 projecting outwardly from the respective cross webs 2, provide sidewall extensions 6, each of which terminates with an inturned end flange 7, the distal portion of which intersects with a rearwardly directed or inclined wall 8 forming a shoulder, as shown most clearly in FIG. 3. The outer face 9 of each sidewall end flange 7 extends normal to the longitudinal dimension of the block for a distance approximately twice the thickness of the sidewall 1 and is provided with a pair of vertically extending mortar-receiving grooves 10 throughout its height. The provision of more than one such mortar groove on each outer face has been found to significantly improve the lateral mortar bond between adjacent blocks with a marked increase in weatherproofing at this normally vulnerable joint.

Associated with the aforedescribed dropped horizontal surfaces 5 on the cross webs 2, are a pair of longitudinally and horizontally extending grooves 11, located adjacent the two side walls 1 such that a line extending through the grooves 11 in one web 2 and the respective grooves 11 in another web 2 will be seen to be juxtaposed the distal portions 7' of the inturned end flanges 7, for reasons which will become obvious hereinafter. All forms of the block as proposed by the present invention are preferably symmetrical with respect to the top and bottom portions thereof. This feature is illustrated most clearly in FIG. 2, wherein it will be seen that both horizontal surfaces 5—5 of the web 2 are dropped inwardly with respect to the upper and lower surfaces 3 and 4 of the adjacent sidewalls such that a significant clearance or recess 5' is produced adjacent both the top and bottom of each web 2. This arrangement serves to increase the efficiency of labor during construction of a building by means of the present blocks, since it is not necessary for the workers to turn over most forms of block when placing each course in position. An exception would be when using the companion corner block of FIG. 7. This block is still symmetrical with respect to its upper and lower faces but includes a single sidewall section 6 at one end and accordingly may require inversion during certain installation situations.

The spaced-apart webs 2—2 of any block will be seen to define a full cavity C therebetween while the end portions of the blocks encompassed by the pairs of extended sidewall sections each substantially define a half cavity C'. Accordingly, when any two blocks in a course are laid end-to-end with a proper mortar joint M between the juxtaposed outer faces 9, a full cavity is in effect produced between the opposed webs of the two adjacent blocks.

A typical assembly of the blocks of this invention will be understood by a review of FIGS. 3 and 6 of the drawings. FIG. 3 may be considered to represent a fragmentary illustration of one course of various blocks incorporating the present invention as assembled in producing the corner of a building and which includes an interior load-bearing wall I, while FIG. 6 will be understood to disclose the arrangement of the present blocks as they would appear in the previous as well as the next succeeding course, immediately adjacent the course of FIG. 3. For ease of description, the course shown in FIG. 3 is referred to as a typical odd-numbered course 12. In other words, this arrangement of blocks may appear as the starter or first course as well as each alternate or odd-numbered course thereafter while the arrangement of FIG. 6 will appear alternately as the even-numbered courses 13.

The block B of FIG. 1, as described hereinbefore, is the standard stretcher course block, and it will be appreciated that any number of these blocks B are positioned in end-to-end relationship as required to complete the specified extent of either outer wall O from one corner to the next corner thereof.

The present invention provides novel means for insuring the continuation of the concealed vertical concrete columns as well as the horizontal and vertical metallic reinforcing throughout the entire building wall construction by including a number of special blocks for use at corners, intersections with interior walls, adjacent door or window openings, etc. In the corner block B' as used with the odd-numbered course 12, the construction will be seen to be somewhat similar to that of the block B in that a full cavity C is bounded by two cross webs 2—2 each of which define a half cavity C' on the opposite side thereof. The apparent distinction here is that the two pairs of extended sidewall sections 6 and their respective half cavities C' are disposed at right angles with respect to the full cavity C.

In order to carry out the present concept in a building construction at the point on the course 12 where an intermediate wall I is provided, an additional type of block may be utilized, as shown in FIG. 5. In the course illustrated in FIG. 3, a T-block, generally designated B^2, is substituted for one of the blocks B at the point where the interior wall I is designed to join the exterior wall O, it being understood that the overall length of the sidewall 14 of the block B^3 is identical to that of the sidewall 1 of the stretcher course block B. The opposite sidewall of the block B^2 includes a pair of extensions 15—15 which intersect at right angles to the adjacent extensions 6—6 and, like the other extensions, provide a half-size open cavity C' therebetween. In this block, the intermediate portion of the adjacent sidewall in effect comprises a web 16 having the same configuration and construction as the aforedescribed webs 2.

Side-stepping the application of the horizontal metal reinforcing rods at this point, the next succeeding course to follow course 12 will comprise a plurality of blocks arranged to insure continuity of the desired concealed vertical concrete columns while precluding the existence of vertically adjacent mortar joints M. This next course, referred to as an even-numbered course 13, may include the arrangement of FIG. 6, which will

be understood to overlie the course of FIG. 3 with an appropriate horizontal mortar joint M' therebetween. The standard stretcher course block B is laid upon course 12 to complete the straight running lengths of course 13 not involving a special feature as previously described. Quite obviously, each stretcher course block B is laid such that its full cavity C is centrally disposed above the vertical mortar joint M bounded by two half cavities C' of the blocks below.

At the intersection of the two outer walls O—O, 3 3 6 at . 3 17—4 4 18— it will be obvious that the corner block B' could not be used in laying the even-numbered course 13 as this would result in vertically adjacent mortar joints M, not to mention the existence of an odd-size gap between the two adjacent stretcher course blocks B. Accordingly, a special companion corner block B^3will be readily apparent from a review of FIG. 7 wherein it will be seen that this block is similar in length and overall construction to the standard stretcher block B with the exception that the block $B^3$is minus one extended sidewall section at one end thereof. The sidewall 1, in the area of the missing section 6, is provided with an outside bevel corner 17 disposed at an angle of 45°. With this one form of block a corner may be constructed by using two blocks B^3arranged as shown in FIG. 6 with the respective bevel corners 17–17 juxtaposed with an appropriate mortar joint M therebetween. The corner is then completed by the application of the corner block B^4shown in FIGS. 6 and 11. The block B^4comprises two sidewalls 18–18 disposed at right angles and of equal length. The distal portion of each sidewall 18 is provided with the same end flange 7 and attendant structure as the previously described blocks so that upon installation as shown in FIG. 6 a full cavity C will be formed which is in alignment with the full cavities of the vertically adjacent courses.

In the formation of the even-numbered course of blocks in the area of the interior wall I, a different type of construction than that of the underlying course 12 is also used in order to provide the desired structural tie-in between courses at this point, and like throughout the building construction, to preclude vertically adjacent blocks from having overlying joints. At the point of intersection between the interior wall I and the outer wall O, a pair of the same companion corner blocks B^3 are utilized along the outer wall O. Again, these blocks are laid in an opposed left-hand/right-hand relationship; however, in this instance, the two blocks B^3 are longitudinally aligned with their respective free-standing end flanges 7 juxtaposed as shown in FIG. 6.

Adapted to cooperate with the two blocks B^3 at this point is a three-quarter size stretcher companion block B^5, which is somewhat similar to the block B^3 but wherein both of the sidewall extensions 6—6 at one end of the block have been removed and the resulting corners each provided with similar bevels 17—17. In this manner, inasmuch as the two beveled corners of the adjacent blocks B^3 are disposed at an angle of 45 degrees, it will be seen that when assembled as shown in FIG. 6, the interior wall I will be maintained at an angle of 90° with respect to the outer wall O and a tie-in is produced between this course 13 and the adjacent courses 12.

In most buildings, provision must be made for door and/or window jambs in the outer and interior walls. The concept of the present invention may be carried out by utilizing jamb blocks of various lengths to define door or window openings. FIG. 6 illustrates the use of a full-size stretcher course jamb block B^6 in the interior wall I. This block, which is also shown in FIGS. 10 and 17, is similar to the standard stretcher course block B except for one end thereof which is devoid of the pair of end flanges 7—7 and instead is provided with a jamb face 19 enclosing one end of the block and defining a partial half-size cavity 20 between its body and the adjacent cross web 2.

If the specified location of a door or window opening dictates the use of a shorter jamb block for a particular course, then the half-size jamb block B^7 shown in FIGS. 6, 8 and 10 may be employed. Additional intermediate-sized jamb blocks are also disclosed. FIG. 20 illustrates a three-quarter size jamb block B^8 while FIG. 22 shows a one-quarter size jamb block B^9.

The jamb face 19 may be combined with other forms of blocks for use when a door or window opening is located adjacent a corner or T intersection. FIG. 23 illustrates a three-quarter size companion block B^{10} while a full-size companion block B^{11} is shown in FIG. 25, each provided with a bevel corner 17 and jamb face 19.

Additional special blocks shown in the drawings include the half-size stretcher course block B^{12} of FIG. 18 which comprises a single cross web 2 from which project pairs of sidewall sections 6 each provided with an end flange 7. An intersection between four walls may be constructed by use of the double T block B^{13} shown in FIG. 27 which will be seen to comprise a half-cavity C' provided on each of the sides of four webs 2 defining a full cavity C. The remaining block shown in the drawings comprises a filler block B^{14} (FIG. 29) which includes a single web section 21 having its enlarged side portions provided with the outer faces 9 similar to the other blocks.

Turning now to the erection of a building wall according to the present invention, it will be understood that as each course of blocks is laid, a horizontal metal reinforcing element 22 is positioned within the horizontally extending grooves 11 of the webs of all adjacent blocks with a continuous length of the reinforcing elements 22 extending throughout the lateral extent of the walls, as shown most particularly in FIGS. 3 and 6 of the drawings. This installation of reinforcing rods quite obviously takes place prior to the laying of the subsequent course when it is specified that each course is to be so reinforced. When a plurality of successive courses of blocks have been thus laid to a height substantially corresponding to one floor of the building, then a plurality of vertically extending reinforcing elements 23 are positioned as shown in FIGS. 3 and 6. The vertical reinforcing elements 23 are lowered from above into the spaces 24 and 25 formed by the previously deposited horizontal reinforcing elements 22 and the sidewall and extension sections, respectively. Reference to FIG. 13 will most readily convey the resultant construction achieved after following the present invention. It will be seen that any particular vertical reinforcing element 23 will alternately pass through a space 24 in the full cavity of one block and the space 24 in the half cavity of the vertically adjacent blocks. In view of the positive locating and retaining

feature of the end flange shoulder **8** associated with each half cavity space **25** and the captive relationship offered by the horizontal elements juxtaposed each end flange surface **7'**, it will be appreciated that an exacting positioning of both the horizontal and vertical reinforcing elements is achieved throughout both the vertical and lateral extent of all of the walls of the building.

After the installation of the vertical reinforcing elements has been completed, all of the exposed cavities within the assembled blocks are filled from the uppermost course with any suitable cementious material such as concrete. This filler **26** of concrete is formulated of such a consistency to insure that as it is being poured into the openings of the uppermost course of blocks, it will flow not only throughout the vertical extent of all of the vertically aligned cavities, but also laterally, in the area of each horizontal mortar joint M', between each pair of adjacent cavities so as to fill the recesses **5'** provided between each pair of vertically spaced apart webs of adjacent courses of blocks. In this manner, not only do the reinforcing elements **22** and **23** provide both horizontal and vertical stability to the completed wall construction, but also, it will be appreciated that the concrete filler **24** extends both vertically and horizontally throughout all the wall construction to produce a monolithic construction of maximum strength with total communication between all adjacent blocks, both vertically and horizontally by means of the reinforcing elements and concrete filler.

The arrangement shown in FIGS. **14** and **15** is a compromise construction wherein certain of the present blocks are disposed in a manner suggested by the prior art. It will be seen that such an assembly fails to make use of the teaching herein whereby unique corner blocks are provided to preclude the formation of vertical mortar joints parallel with the face of a wall.

I claim:

1. A building construction comprising a plurality of intersecting walls, said walls including a plurality of stacked courses of hollow blocks, a plurality of said blocks having a pair of spaced-apart sidewalls, a pair of cross webs having top and bottom surfaces joining said sidewalls and defining a full cavity therebetween, a pair of extended sidewall sections projecting from at least one said cross web and defining a half cavity therebetween, a pair of flanges extending inwardly from the end of said sidewall sections and provided with opposed distal surface portions adjacent a rearwardly facing shoulder, each said flange including an outer face disposed substantially normal to the running length of said sidewall section and having a width substantially equal to twice the thickness of each said sidewall section, said web top surfaces in a plane disposed substantially below that of said sidewalls to provide a recess thereabove and having transverse grooves therein adjacent one said sidewall and extending below the plane of said web top surfaces, said blocks of vertically adjacent courses longitudinally staggered with respect to each other whereby the full cavity of one said course block is vertically adjacent upper and lower disposed pairs of abutting block half cavities thereby providing a plurality of adjacent vertical cavities of equivalent cross-sectional area throughout the vertical extent of said walls, a horizontal reinforcing element disposed within said grooves in said webs with its periphery passing immediately adjacent said flange distal surface portion, a plurality of vertical reinforcing elements each extending alternately through full and half cavities of vertically adjacent blocks of said courses of blocks, each said vertical reinforcing element passing through said half cavity being captivated intermediate said flange shoulder and cross web and between said block sidewall and said horizontal reinforcing element thereby restricting the lateral position of each said vertical reinforcing rod as it passes through said full cavities of the vertically adjacent blocks, a body of poured concrete filling said vertical cavities throughout the vertical extent of said walls to provide a plurality of adjacent uninterrupted reinforced concrete columns and said poured concrete extending laterally between the spaced apart vertically adjacent block cross webs to fill said recesses and interlock adjacent said columns.

2. A building construction according to claim **1** wherein, the distance between said flange distal portion and said horizontal reinforcing element is less than the thickness of said vertical reinforcing element.

3. A building construction according to claim **1** wherein, each said outer face includes a plurality of vertical grooves.

4. A building construction according to claim **1** wherein, a plurality of said blocks are provided with sidewalls intersecting one another to form corner blocks, and said corner blocks include a pair of cross webs disposed in planes normal to each other.

5. A building construction according to claim **1** wherein, said block includes an end wall bridging a pair of said sidewall sections to close said half cavity therebetween.

6. A building construction according to claim **1** wherein, a plurality of said blocks includes a single extended sidewall section projecting from one cross web and a bevel corner is provided at the point where this latter mentioned cross web intersects the opposed sidewall.

7. A building construction according to claim **1** wherein, a plurality of said blocks include said sidewalls terminating at one said cross web to form bevel corners at the intersection of this latter mentioned cross web and the adjacent sidewalls.

8. A building construction according to claim **1** wherein, said blocks are symmetrical about both horizontal and vertical bisecting planes.

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