Oct. 27, 1931. V. A. BARNHART 1,829,435

HOLLOW BUILDING BLOCK

Filed Sept. 21, 1929 4 Sheets-Sheet 1

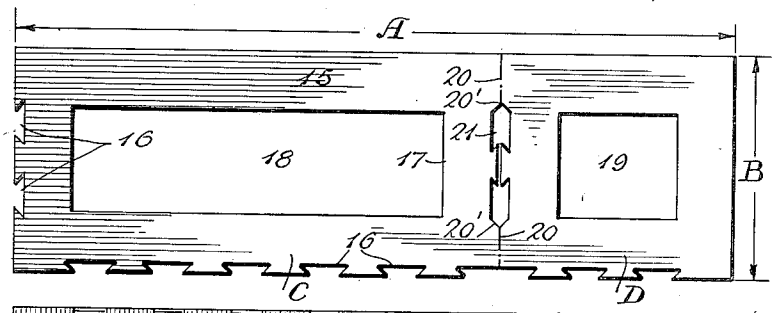


Fig. 1.

Fig. 3.

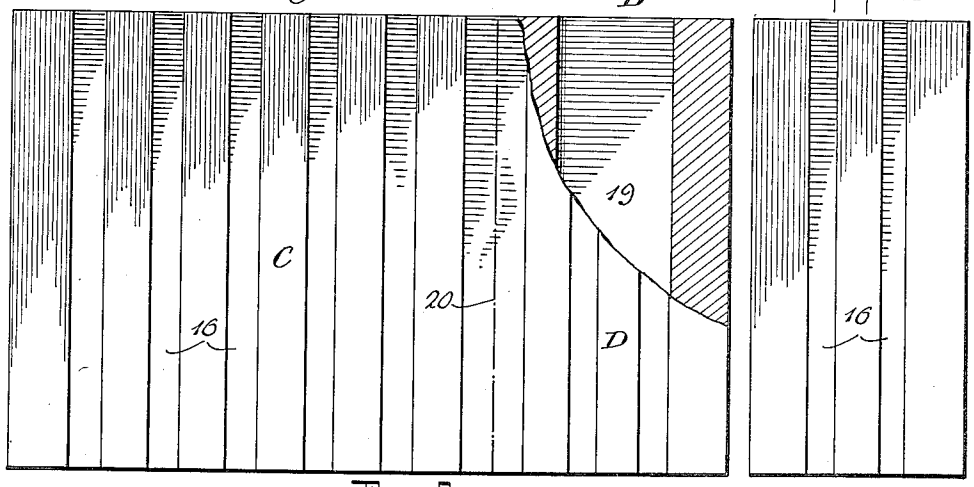


Fig. 2.

Fig. 12.

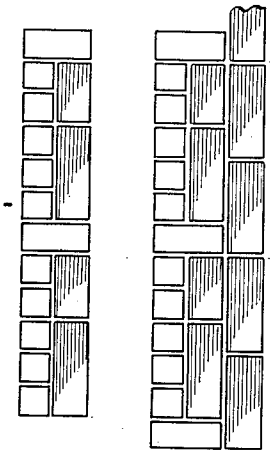


Fig. 13.

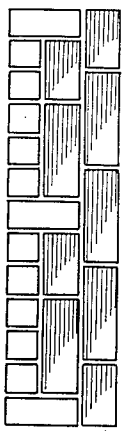


Fig. 14.

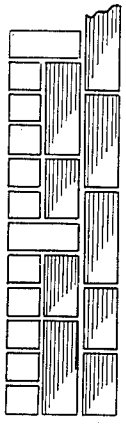


Fig. 15.

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Oct. 27, 1931. V. A. BARNHART 1,829,435

HOLLOW BUILDING BLOCK

Filed Sept. 21, 1929 4 Sheets-Sheet 2

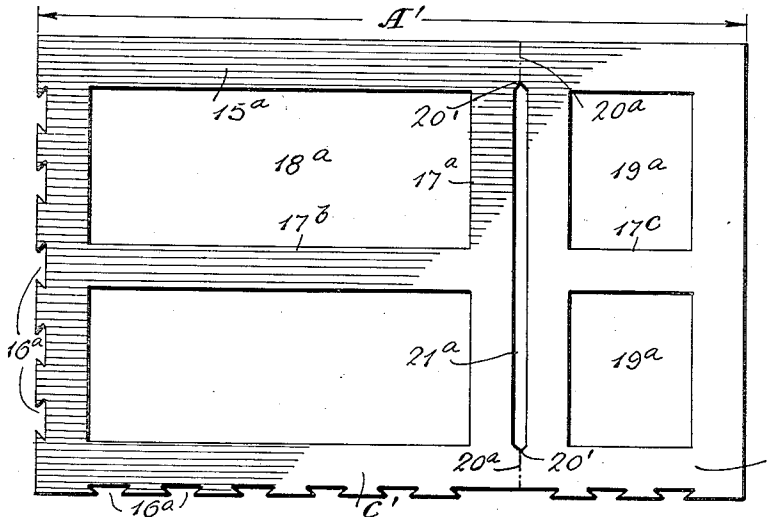


Fig. 4.

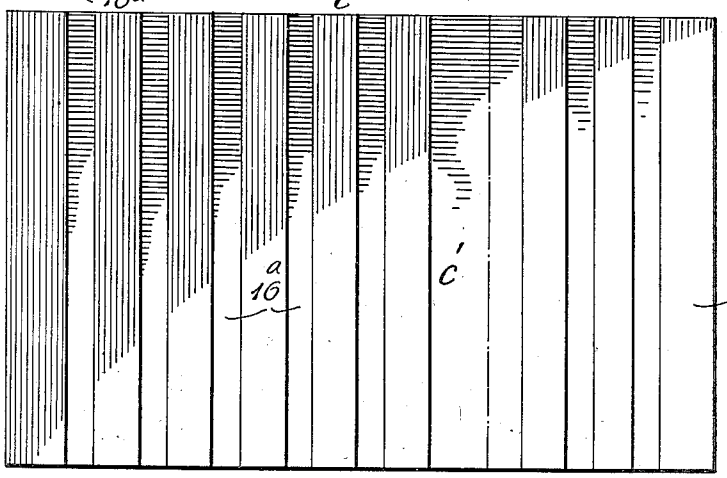
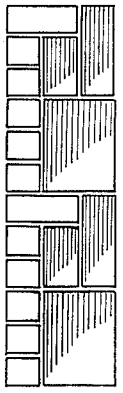


Fig. 5.

Fig. 16.



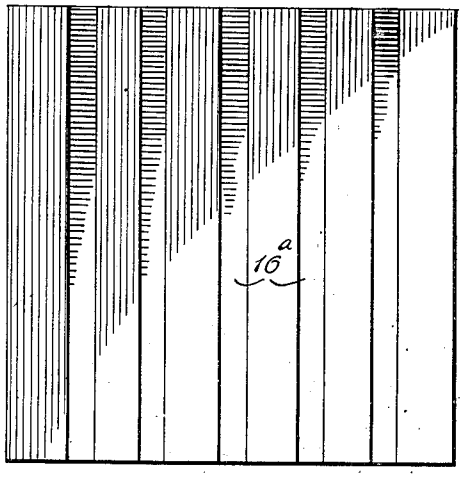


Fig. 6.

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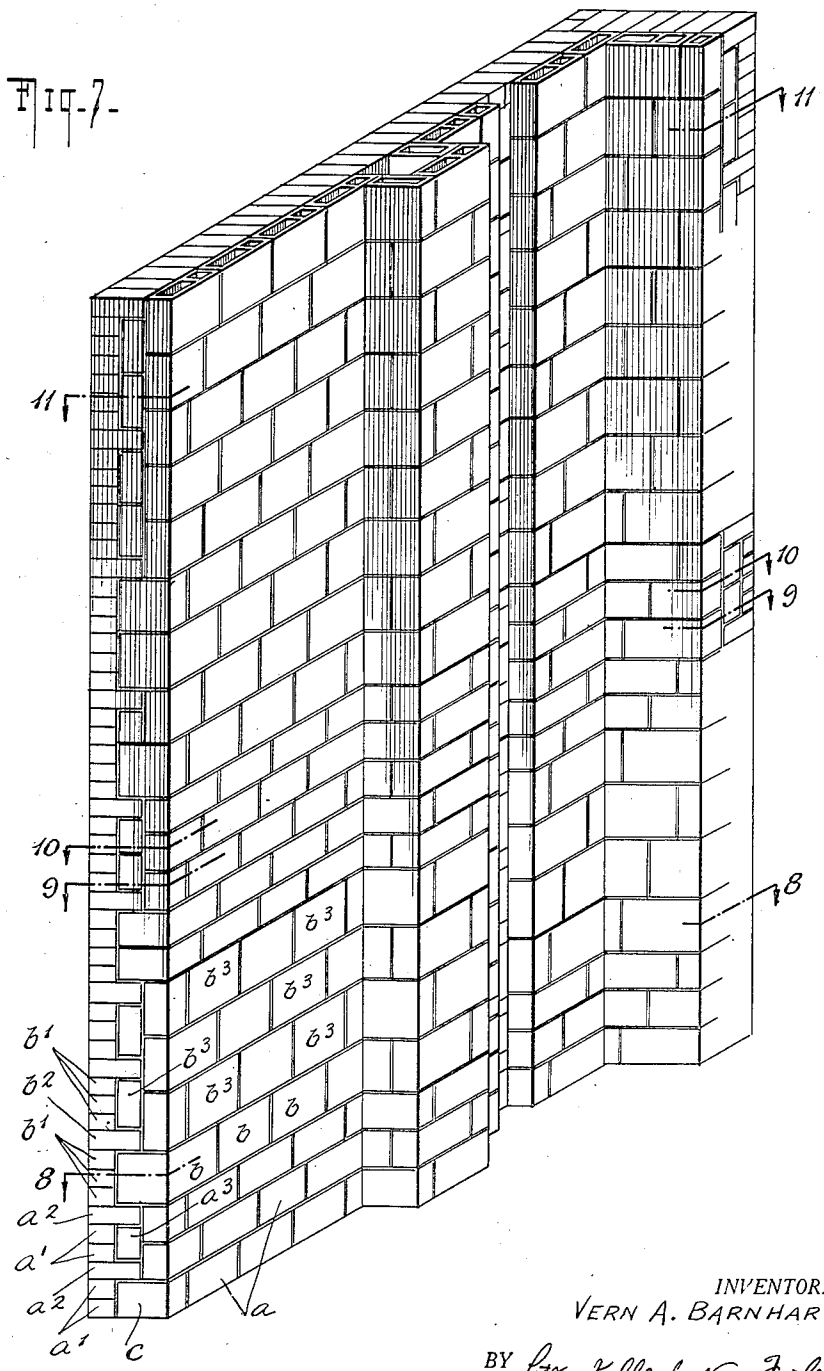
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Fig. 7.



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Oct. 27, 1931. V. A. BARNHART 1,829,435

HOLLOW BUILDING BLOCK

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Fig. 11.

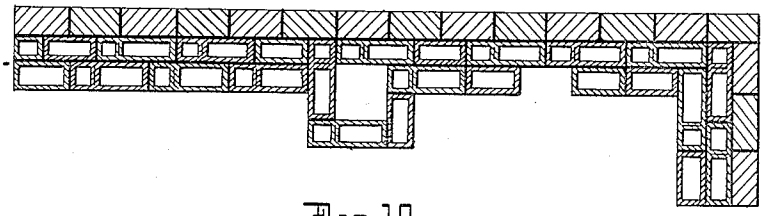


Fig. 10.

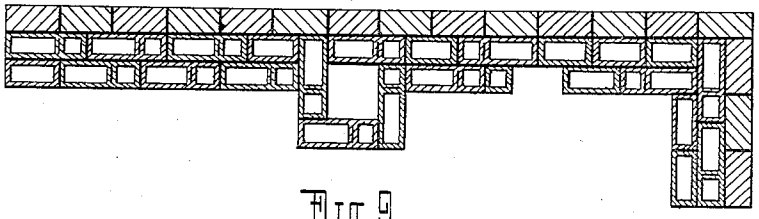


Fig. 9.

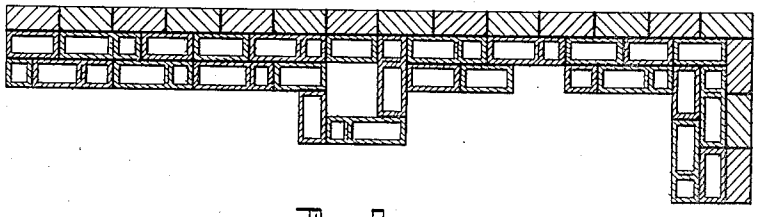


Fig. 8.

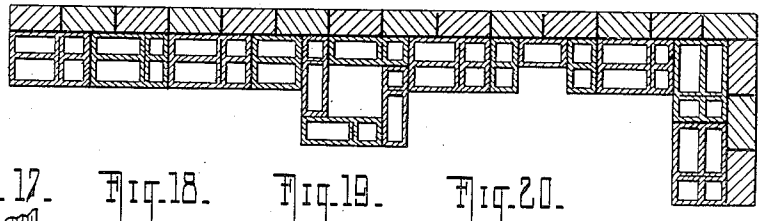


Fig. 17.

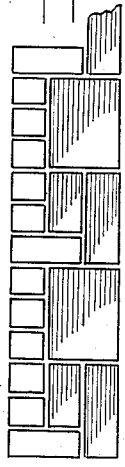


Fig. 18.

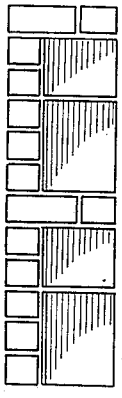


Fig. 19.

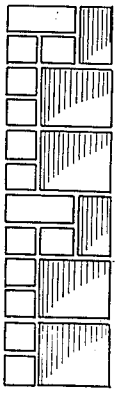
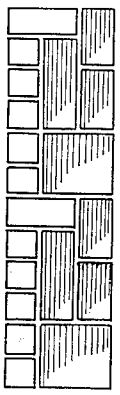


Fig. 20.



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Patented Oct. 27, 1931 1,829,435

UNITED STATES PATENT OFFICE

VERN A. BARNHART, OF MILLINGTON, NEW JERSEY, ASSIGNOR TO UTILITY BLOCK, INC., OF NEWARK, NEW JERSEY, A CORPORATION OF NEW YORK

HOLLOW BUILDING BLOCK

Application filed September 21, 1929. Serial No. 394,164.

The invention relates to the construction of building walls, and more particularly to walls consisting of hollow building blocks of the type generally referred to as hollow tile and which in many structures are faced with brick veneer or its equivalent. The object of the invention is to provide a hollow building block constructed in a novel manner to permit its use independently of any other units in the complete construction of a wall and more particularly a back-up wall and to avoid the necessity for any so-called patch work by the use of common brick or special units in completing wall lengths. The invention contemplates further a hollow block dimensioned in predetermined proportion to standard brick sizes, and easily divisible into unequal sections of such shape and dimensions with respect to standard brick sizes that building walls may be constructed from such blocks and sections thereof in a manner to give complete end set back up construction in brick lengths to the end of the wall, to avoid open cells and to do away with the necessity for using patching units to complete the construction and so as to include any special features such as pipe chases, jamb recesses, piers, pilasters, set back pylons, column coverings etc. Another object of the invention is the provision of a hollow building block of predetermined, proportionate dimensions adapted to be divided into unequal sections each bearing a predetermined ratio to such dimensions and all capable of being used as parts of a building wall to thereby avoid waste and thus reduce the cost of such wall construction to a minimum. In addition to the above, the invention proposes to provide a hollow building block constructed in a novel manner to facilitate the proper bonding of facing masonry to give complete end set back up construction in brick lengths to the ends of the wall without requiring the use of common brick or special units for this purpose. Other objects will appear from the description hereinafter, and the features of novelty will be pointed out in the claims.

In the accompanying drawings, which, without defining the limits of the invention, illustrate examples of the novel building block and of building walls embodying the use thereof, Fig. 1 is a plan view of one form of the block; Fig. 2 is a front elevation thereof; Fig. 3 is an end elevation of said block; Figs. 4, 5 and 6 are views corresponding respectively to Figs. 1, 2 and 3 of another form of the block; Fig. 7 is a perspective view of a building wall embodying said blocks; Figs. 8, 9, 10 and 11 are horizontal sections of said wall taken respectively, on the lines 8—8, 9—9, 10—10, and 11—11 of Fig. 7, and Figs. 12 to 20 inclusive are diagrammatic views illustrating nine different ways in which to build back up walls with sixth course headers to provide complete end set construction in brick lengths.

In all of its forms the novel building block is constructed as a hollow unit which includes voids or cells extending vertically so that in use the hollow block provides complete closed end set constructions, the block lengths further being dimensioned in accordance with standard brick sizes and being easily divisible into separate sections, each of which is dimensioned in relatively exact proportion to such standard brick sizes.

As shown in Figs. 1, 2 and 3 the novel hollow block consists of a shell 15, the thickness of which is approximately uniform, and which preferably is suitably scored upon its exterior surfaces for instance by being provided with vertically extending grooves 16 of dovetail form in cross section and arranged in spaced parallel relation as illustrated. At a predetermined point the shell 15 is provided interiorly with a transverse web 17 preferably of relatively greater thickness than said shell 15 as shown by way of example in Fig. 1. In the illustrated example the web 17 is located nearer to one end of the block so as to provide a major cell or void 18 and a minor cell or void 19, both of which extend vertically through the block and open at the upper and lower faces thereof. The external dimensions of the block shown in Figs. 1, 2 and 3 are such that its length in the direction A is for instance one and one half times the length of a standard commercial brick, while the height of the block corresponds to the dimensions of any

predetermined number of brick heights plus the joints as for instance, the height of two courses of standard brick with included mortar joints. With the arrangement shown in the drawings the location of the web 17 is such that the major cell or void 18 is approximately three times as long as the minor cell 19 which consequently is substantially one third of the length of the cell 18, so that both sections of the block, of which the divisions of the web 17 form parts, constitute complete units of dimensions bearing a predetermined ratio to the dimensions of standard bricks; it will be understood that in some forms the major void 18 may itself be divided by one or more suitable webs. The web 17 includes a line of cleavage extending through the central vertical plane thereof indicated by the line 20 and including a suitable kerf 20′ at its terminal ends, and consisting for instance of dovetail and other grooves 21 arranged in opposed relation to each other and joined together along said central vertical plane as shown in Fig. 1, or equivalent devices suitable to the material used in the manufacture for bringing about corresponding results.

With this form when the block is divided along the cleavage line 20, which may be easily done by means of a sharp blow delivered by a trowel or hammer, two separate and complete hollow block sections C and D of unequal lengths will be provided. In the illustrated example the resulting section C will be about two thirds of the length of the complete block and will correspond approximately to the length of a standard brick, while the section D will comprise about one third of the length of said complete block and correspond approximately to the width of such standard brick which generally speaking corresponds approximately to one half the length of such standard brick. In addition to this, the web 17 when separated will consist of two parts each of which constitute one wall of the sections C and D respectively, each part being externally provided with the dovetail grooves 21 or their equivalent. As a result, at least two adjacent walls of each of the sections C and D in the illustrated example include dovetail grooves or equivalent scoring, so that both sections constitute complete units of dimensions bearing a predetermined ratio to the dimensions of the aforesaid standard bricks.

In the form shown in Figs. 4, 5 and 6, the block likewise consists of a shell 15^a of approximately uniform thickness, and having its external surfaces suitably scored for instance by being provided with dovetail grooves 16^a extending vertically in spaced parallel relation as shown. At a predetermined point the shell 15^a is provided interiorly with a transverse web 17^a preferably of greater thickness than the shell 15^a; in the illustrated example the web 17^a is of approximately double the thickness of the shell 15^a, and corresponds in location therein to the web 17 of the form first described. In the form now being described the shell 15^a includes one or more additional webs, located in predetermined position with respect to the web 17^a. In the illustrated example the shell 15^a is accordingly provided with a web 17^b extending lengthwise of said shell between one end wall thereof and the web 17^a and a web 17^c extending longitudinally of the shell 15^a between the other end wall thereof and the web 17^a preferably in alignment with the web 17^b as shown in Fig. 4. With this arrangement the shell is divided into two sections by the web 17^a each of which sections are divided into two parts to form two cells or voids 18^a and two cells or voids 19^a all of which extend vertically through the block from the lower to the upper surfaces thereof. In the illustrated example of this form of the block the external dimensions are such that its length in the direction A′ is for instance one and one half times that of a conventional standard brick, while the height of the block in this case being also equal to any number of brick heights plus the joints and corresponding for instance to two or more brick courses with included mortar joints. The web 17^a in this form also includes a line of cleavage extending through the vertical plane thereof indicated by the line 20^a and preferably provided at its terminal ends with a suitable kerf such as 20′, said cleavage line either corresponding to that of Fig. 1, or as shown in the illustrated example, consisting of a continuous slit 21^a, arranged equidistantly upon opposite sides of and extending along said central plane as shown in Fig. 4. It will be obvious that equivalent devices suitable to the material used in manufacture may be substituted for the illustrated line of cleavage to bring about equivalent results.

When the block now under discussion is divided along the cleavage line 20^a the resulting separate sections C′ and D′ will be of unequal length corresponding respectively to the length of a standard brick and to the width thereof which generally speaking corresponds approximately to one half of such brick length as in the form first described. The two sections C′ and D′ each include one half portion of the web 17^a which thus become end walls of said sections so that the latter each constitute complete blocks bearing predetermined size relations to standard bricks and at least two adjacent walls of each of said sections including scoring grooves 16^a and 21^a or being otherwise scored in an equivalent manner.

It will be understood that the thickness of the novel blocks may correspond to any predetermined dimensions in accordance with

the thickness of the walls for which the blocks are designed.

In Figs. 7–11 inclusive, the drawings show an example of a wall constructed with hollow blocks of the type hereinbefore described, said wall, for the purposes of description and to illustrate utility including groups of blocks of varying dimensions all bearing predetermined relation to standard brick sizes and all including the novel features of the improved block. Furthermore, the illustrated wall includes a facing of brick of standard, commercial size bonded in various ways to further illustrate the utility of the novel blocks and to clearly show the avoidance of patchwork of any kind.

As shown in Fig. 7 the three lower courses of the wall are built up of hollow blocks preferably of the type shown in Figs. 1, 2 and 3 and of a height corresponding to the height of two courses of standard brick and included mortar joints. The blocks, in their complete form, are laid in staggered relation in courses in the customary manner, as indicated at a, the lowermost course comprising two blocks set in surface contact with each other, and properly bonded together and the second and third courses consisting of single rows of the hollow blocks set to the inside of the wall as shown. The facing of bricks a' is laid in two courses in the customary manner in contact with and bonded by mortar to the outer row of blocks a; the bricks a^2 in the third course which constitute a header course, are laid at right angles to the bricks a' so as to project over and in contact with the blocks a of the lower course as illustrated in Fig. 7. Upon the inner end portions of the bricks a^2 another row of blocks such as a are laid as indicated at a^3 after which two additional courses of bricks a' are laid in the conventional manner; the next course of bricks again consists of bricks a^2 laid at right angles to the bricks a' so as to project over and in contact with the blocks a^3 as shown. At the exposed end face of the wall, which may represent a jam or terminal of any kind, the lower course of blocks may, as shown, include a section C of one of the indicated blocks laid at right angles to the blocks a, it being understood that this is only an example and that other arrangements of said section C in said wall may be substituted to secure corresponding results; in some cases the sections D may be utilized in the wall at this point to provide similar construction. The section C, when laid as indicated in Fig. 7, being approximately of the same dimensions as two of the same blocks laid in surface engagement as at a, the end of the wall at this point will be properly finished to give complete end set back up construction in brick lengths without the aid of patchwork of any kind. With the hollow blocks arranged as in the three lowermost courses efficient and perfect header bonds between the bricks and the blocks are effected at every third course of bricks.

In the fourth course of the wall complete blocks of the type shown in Figs. 4, 5 and 6 are laid in the customary manner, as indicated at b, the blocks each having a height corresponding to three standard bricks and included joints. The brick facing at this point consists of three courses laid in the conventional manner as indicated at b' and bonded in the customary way to the outer faces of the blocks b. In the next succeeding course the facing bricks are laid at right angles to the bricks b' as indicated at b^2 so as to project inwardly over and in contact with the blocks b, to constitute a header course. The next three courses starting at b^2 consist of blocks similar to the blocks a but corresponding in height to three standard bricks plus joints instead of two, said blocks b^3 being laid to form the inner face of the wall at this point, and being also laid upon the inner end portions of the overlapping header bricks b^2; the terminal ends of the fifth and seventh courses consist of sections D of the blocks shown in Figs. 1, 2 and 3, but corresponding in height to three courses of standard brick, plus joints. Above the course of header bricks b^2 three courses of bricks b' are laid in the conventional manner and bonded by mortar to the outer surfaces of the blocks b^3, after which another course of header bricks is laid at right angles so as to project over and in contact with the blocks b^3 of the outer row. With the method of building the portion of the wall now being described efficient and perfect header bonds between the brick facing and the hollow blocks are provided at every fourth course of the facing bricks, and the terminal end face of the wall is finished, at the required places, with sections C and D and without requiring patch work of any kind. It will be noted in the portion of the illustrated wall comprising the tenth to the eighteenth courses of bricks inclusive and the associated blocks, that no through mortar joints extend transversely through the wall, so that seepage of moisture through said wall is prevented.

The upper continuing portion of the wall shown in Fig. 7 is built up of hollow building blocks of the type herein under discussion and of the required dimensions so that header bonds between the brick facing and the hollow blocks are provided respectively at every fifth, sixth and seventh course of the aforesaid facing bricks. The portions of the wall in each case include sections of the complete blocks so laid in the respective courses as to complete the wall portions and terminal surfaces thereof, as illustrated, to provide complete end set back up construction in brick lengths without the need for any patchwork. In addition to this, as shown

in the different sectional views illustrated in Figs. 8–11, the hollow blocks may be laid and built up to provide column enclosures and to build transverse walls without the need for patchwork of any kind, or for the introduction of any extraneous materials. It will of course be understood that there are numerous other ways of assembling the blocks to provide the same or equivalent results, as is clearly indicated in Figs. 12–20.

There are in existence many different types of hollow building blocks designed to fit various definite heights of brickwork, but which require the introduction of special units with each change in the position or location of the bonding course, and all of which is done without regard to brick lengths when it is desired to bond the brick facing into the wall of hollow blocks. In the instant case on the other hand, the hollow building block is designed and specially constructed to be divisible into sections of whole brick lengths and sections corresponding to the width of said bricks, which, as previously stated correspond approximately to half the lengths of such bricks, with which different sections the complete building construction may be effected and which will build a header backup wall at any desired predetermined course, and which gives complete closed end set construction in all walls laid out in brick dimensions. In a great many cases the bricks are not bonded to the back up wall by the use of headers but are tied thereto by means of metal wall ties. The previously mentioned objections to existing hollow building blocks are present to the same extent under such conditions, while the utility of the novel block will be just as pronounced with such wall constructions as with those which include the header bonds. Manufacturing may be simplified by providing the novel hollow blocks in two predetermined different heights so that only two dies are required and only two different cuts are necessary for height: with such blocks, only a minimum number of stock piles are required to service any operation for the completion of all wall details. Without the hollow block now being described, it is impossible to avoid patchwork in all normal building of walls or equivalent structures. Face walls built with brick are in lengths which are multiples of four inches, for example: two bricks equal sixteen inches, two and one half bricks equal twenty inches, etc. Hollow blocks generally are of twelve inches in length and as such can fit only one third of the possible wall lengths. Where twelve inch hollow units are used with the voids horizontal, it is impossible to fit one third of the possible brick wall lengths and to secure closures so that patchwork must be resorted to to complete the construction. Special shapes have been put on the market from time to time in an attempt to make closures in twelve inch units, but never to reconcile the lack of relationship between the lengthwise dimensions of a brick and the lengthwise dimensions of such hollow units. Such special shapes, however, have not been found commercially practicable. In hollow tile wall construction, patching or completing length of walls, or forming closures all with brick has been a common practice and one which is absolutely necessary with the conventional twelve inch long hollow tile units. Such brickwork is invariably found at jambs, terminals, chases or piers where load concentrations occur. Tests have been conducted to determine the strength of such patchwork construction, and it has been conclusively proven that the wall strength at such points with the patchwork described, results in a comparatively weak wall. This may be understood when it is pointed out that the brickwork requires a much greater number of mortar bed joints than the tile work. For instance, at a window jamb six feet high, patched with brick, there would be twenty seven bed joints totalling approximately 13½ inches of mortar. The use of the novel hollow block reduces the amount of mortar thickness by one-half or more and inasmuch as the mortar is the weak element, thus bring about a reduction, which is most desirable; moreover, the desirable unity in the amount of mortar for producing unity of wall structure also results from the use of the novel block. A wall constructed of such novel block is in good balance at the points of concentrated load and thus eliminates shearing action which is developed between the main wall and the brick patching of existing constructions, and thereby provides a uniformly strong wall arranged to resist all developed load concentrations.

In a wall constructed of the improved hollow blocks, the number of through mortar joints is reduced to a minimum and the inside of the wall may be composed of blocks of the same vertical dimensions throughout. The design of the novel block as compared with both special and common units of existing form may be considerably lighter in weight and at the same time meet the same code requirements for which said units of existing forms are designed. For instance where the code requirements specify shells and webs to be not less than ¾″ in thickness and the block to contain not more than 55% voids, would mean that the common side set block 5 x 8 x 12″ would have 238½ cubic inches of material and would have a void area of approximately 50% and a net bearing area of 27 sq. in. with no end wall bearing while the novel block described herein with all ¾″ shells and webs, the thickened web being 1½″, would have 220 cubic inches of material and a void area of 46% and a net bearing area of 27 sq. in. plus the added

net bearing area of 4⅞ square inches at the end of the wall, terminals, chases, etc., an increase of approximately 15% where the end walls align and where increased strength is desired. The same is true of the common side set 5 x 4 x 12″ with ¾″ walls which would have 135 cubic inches of material and 44% voids and a net bearing area of 18 sq. in., while the novel block as described would have 127½ cubic inches of material and 47% voids and a net bearing area of 18 sq. in. It will readily be seen that using the same thicknesses of wall constructions for both, the weight thus would be reduced by 6½% in favor of the new unit without disturbing the net bearing area which is the main factor in hollow tile strength and wall construction. It is a well accepted fact that end set construction in itself is stronger than side set construction. This decrease in weight results in a tremendous saving in manufacture and transportation charges, and also reduces the dead load structure, and at the same time speeds up and economizes in the distribution of the units and in the labor of setting same on a given job. Because of its novel design and construction the new block may be made of any sort of suitable material and yet respond to all of the requirements of any existing code, and the bearing wall thicknesses may be considerably greater than with the existing units, without increasing the dead weight or solid area thereof. Furthermore, the machine production of the novel hollow blocks is more than double in ordinary twelve inch units.

The design of the novel hollow block as compared with both common and special units of existing form may be considerably lighter in weight, for instance, using the same wall and web thicknesses of 1″ for both blocks, as compared to the common block of 5 x 8 x 12 dimensions laid with the voids horizontal, which has 300 cubic inches of material and 36 sq. in. of net bearing area with no end wall bearing, the new unit in corresponding dimensions will have only 255 cubic inches of material with 36 sq. in. of net bearing area plus an added bearing at wall ends of 6 sq. in., or in other words an increase of 16% in the net bearing area at the wall terminals, pipe chases, etc. where it is of greatest value. The weight thus would be reduced by 15% in favor of the new unit.

One of the most desirable and important advantages of the novel hollow block is found in the possibility of enabling the brick layer to easily lay it with one hand. Practically all end set units of existing form have a complicated centre construction which necessitates a broad, spreading of the hand, wherein only the fingers rather than the hand represent the gripping factors; in such case the fingers come into contact with the sharp edges or the voids are such that a man cannot secure a full hand hold on any part of the block. With existing side set units it is necessary for the bricklayer to lift the entire load, represented by each unit, with the pressure of his finger tips in attempting to lay such units with one hand; this results in seriously cramping the hand and throws the units out of balance during such handling. The novel block on the other hand, because of its construction, enables the bricklayer to develop a full hand grip on an inner wall thereof without bringing the sensitive and tender parts of the fingers into contact with the sharp edges of the unit. In other words it is unnecessary to spread the hand to produce what may be termed a short finger hold on the block, but rather the hand is permitted to assume a natural unstrained gripping position in which the hand and fingers comfortably grasp the block in what may be designated as a long hold. The novel block may accordingly be efficiently manipulated with one hand and without causing the bricklayer to experience undue strain and fatigue.

By a combination of the novel units of the two heights hereinbefore referred to to secure certain predetermined points with the face brick, a very desirable condition results, in that the bed joints of the forward portion of the backup break with the bed joints of the inner portion of such backup. This breaking of the bed joints to the end of the wall prevents the passage of moisture and water through the wall and thereby avoids the necessity for furring and damproofing. This is an important advantage for the reason that in structures such as large office and other buildings, it is the architect's greatest desire to secure a waterproof or dampproof wall; it has generally been found that on all large buildings dampness or water penetrates through the mortar joints. The walls in practically all cases are non-load bearing or simply curtain or spandrel walls and the architect accordingly is most anxious to have the backup wall as waterproof or dampproof as possible. Complete end set construction to the end of the wall in brick lengths is a big step in this direction, but a complete breaking of all horizontal bed mortar joints in this backup wall gives still greater insurance against dampness. By a combination of the novel units of the two heights hereinbefore referred to, to secure certain predetermined points with the face brick, a very desirable condition results, in that the bed joints of the forward portion of the backup break with the bed joints of the inner portion of such backup. This breaking of the bed joints prevents the passage of water or moisture through the wall and results in a much drier construction than otherwise is the case.

In Figs. 12 to 20 inclusive nine different ways are shown in which to use the novel

blocks to build backup walls with sixth course headers and complete end set construction in brick lengths; the construction shown in Figs. 14 and 15 in addition illustrates two methods of arranging the novel blocks in a manner to secure the above water and dampproof results and to provide complete end set back up construction in brick lengths. It will be noted that, with the novel blocks, it is possible to start the construction on a level without the necessity for special shapes and to bring it to the level desired without the need for an increased mortar bed or special slab as generally is the case with existing units where it is attempted to break or stagger the mortar joints.

Various changes in the specific forms shown and described may be made within the scope of the claims without departing from the spirit of the invention.

I claim:

1. A hollow building block for end set construction comprising a shell dimensioned in proportion to standard brick sizes, a double web dividing said shell to form vertical cells, said web being provided with a cleavage opening, said web and cleavage opening being located at a distance from one end of the block substantially equal to one-third of the complete block length whereby the block may be divided into two sections, one of which is substantially half the length of the other and both of which correspond substantially to at least one dimension of said standard brick sizes, said web and cells forming an easily gripped portion whereby it may be grasped with one hand for placing it in end set position.

2. A hollow building block adapted to be end set in a back-up construction, comprising a shell having a length one and one-half that of a brick length, a double web dividing said shell to form vertical cells, said double web being provided with a cleavage opening having tapered ends, said web and cleavage opening located a distance from one end of the block corresponding substantially to the length of a brick whereby the block may be divided into two sections, one of which sections is half the length of the other, said web and vertical cells cooperating to form a hand grip whereby the block may be placed in an end set position with one hand.

3. A hollow building block adapted to be end set in a back-up construction, comprising a shell, a vertical web dividing the shell into two vertical cells, a vertical double web crossing said first web substantially at right angles and dividing said two first mentioned cells to form four cells, said second web being provided with a cleavage opening, said shell having a length substantially equal to that of one and one-half bricks, the said cleavage opening being spaced from one end of the block a distance corresponding substantially to the length of one brick whereby the block may be divided into two unequal sections, the juncture of said web cooperating with said vertical cells to form a hand grip whereby the block may be placed in an end set position with one hand.

In testimony whereof I have hereunto set my hand.

VERN A. BARNHART.