May 20, 1958 A. PAOLELLA 2,835,126

BUILDING WALLS

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Fig. 1.

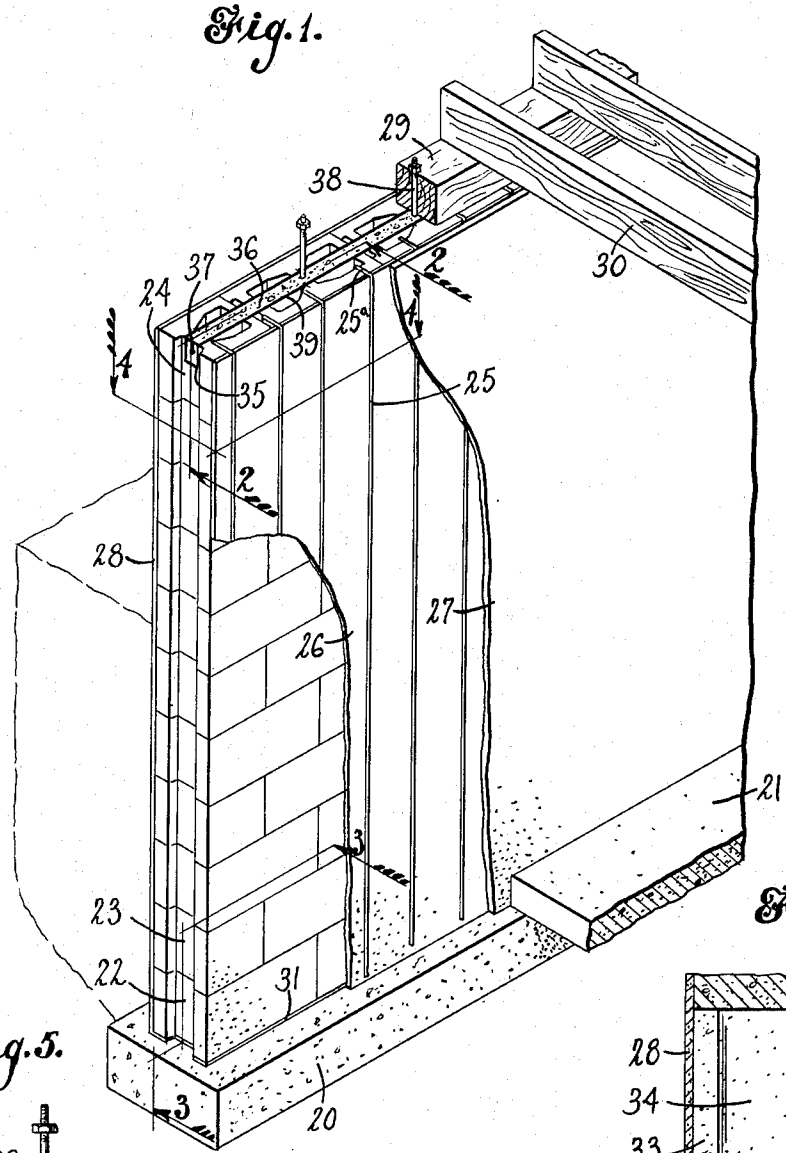


Fig. 5.

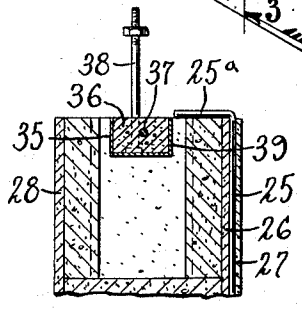
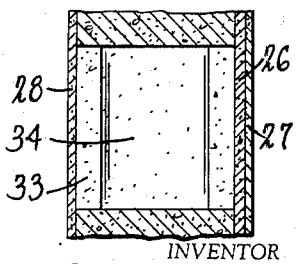


Fig. 6.



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Fig. 2.

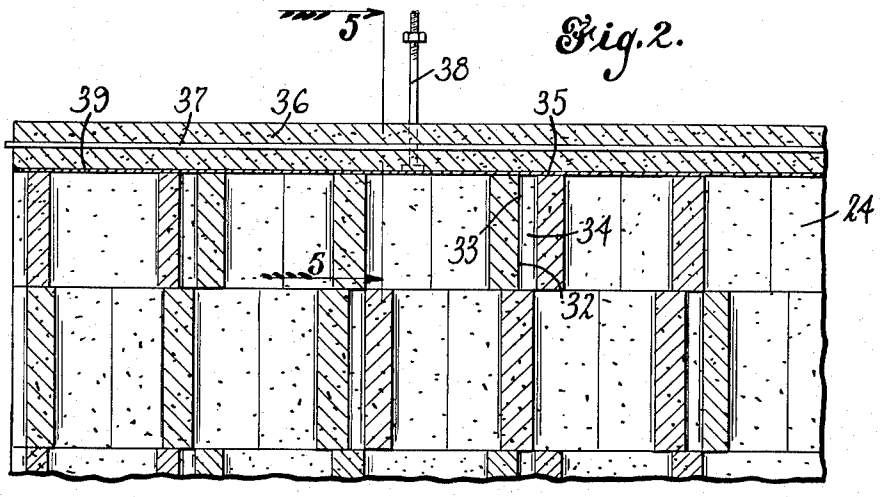


Fig. 3.

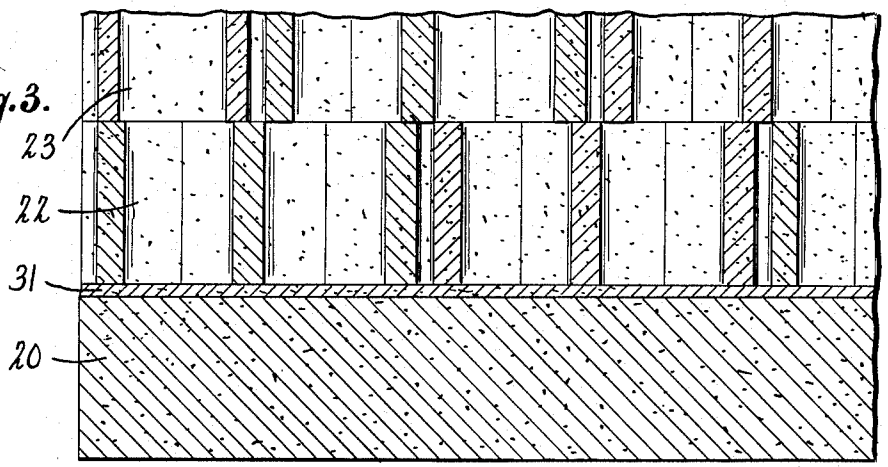
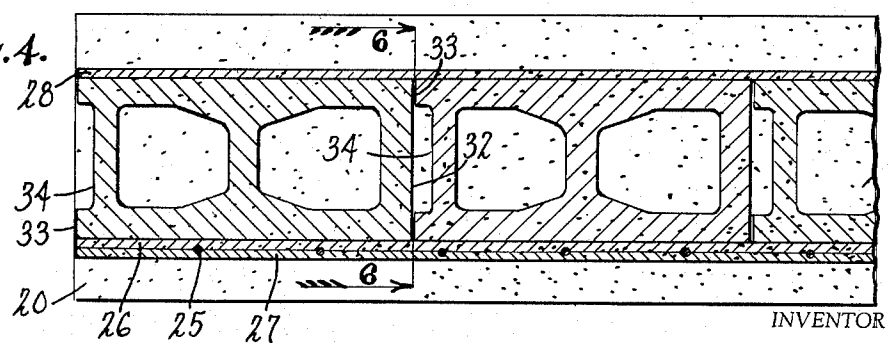


Fig. 4.



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Fig. 7.

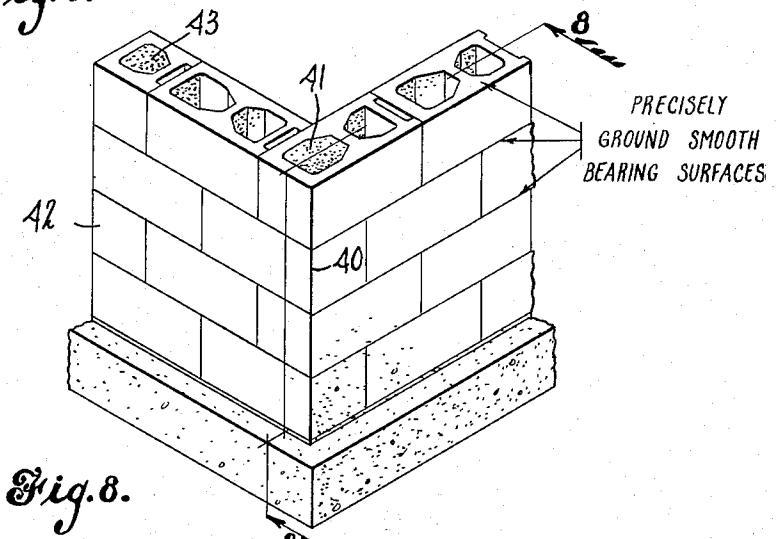
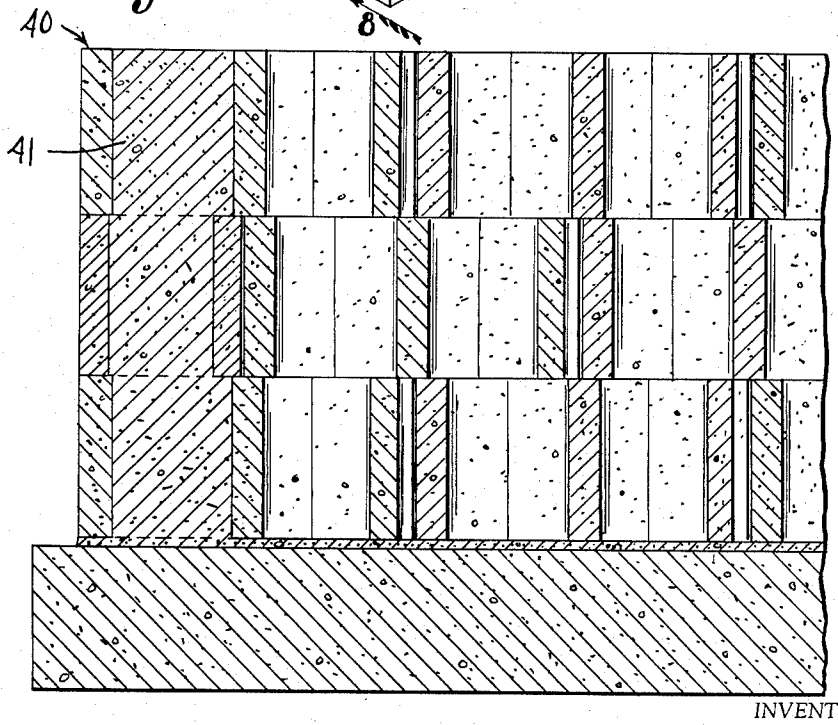


Fig. 8.



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Fig. 9.

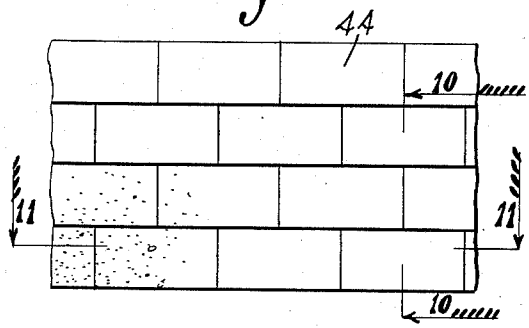


Fig. 10.

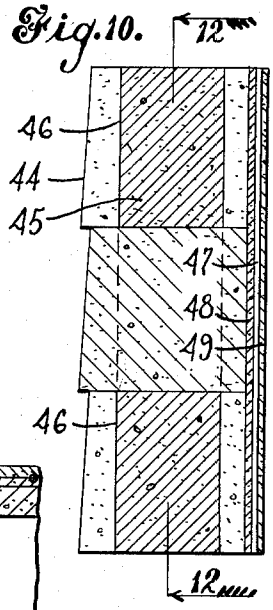


Fig. 11.

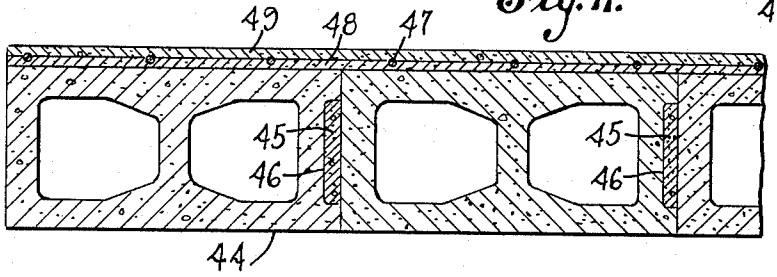
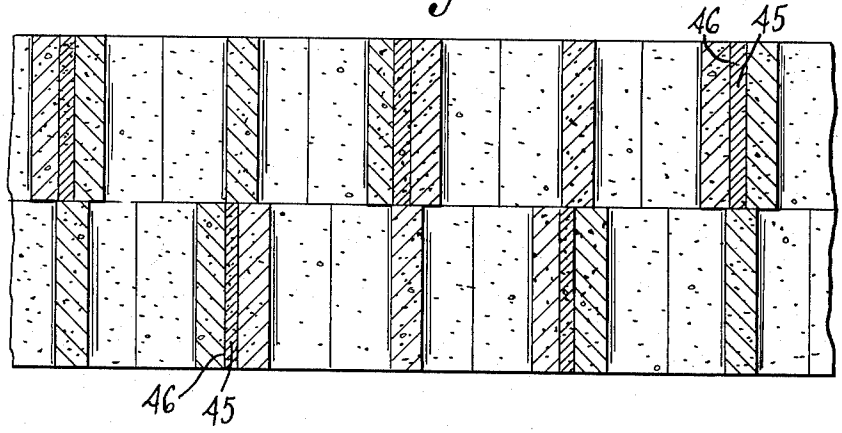


Fig. 12.



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BUILDING WALLS

Alfred Paolella, Hamden, Conn., assignor to Plasticrete Corporation, Hamden, Conn., a corporation of Connecticut

Application May 22, 1953, Serial No. 356,656

4 Claims. (Cl. 72—32)

This invention relates to building walls and it has particular reference to a new method of erecting a wall of a building and to a new wall construction or assembly, the invention being of particular advantage as applied to exterior walls such as foundation walls which are subjected to soil pressure, although not limited to this particular application.

An object of the invention is to improve the practice or procedure and the wall construction especially in making a foundation wall, with a view to reducing the amount of skilled labor which is required and speeding up the erection process.

Another object is to provide a wall structure of low cost possessing great strength and durability.

A further object is to provide a foundation wall which can be erected in a comparatively short time with a minimum amount of skilled labor and which is nevertheless of such structure that a wall comprising relatively narrow blocks is hightly resistant to soil pressure.

In the accompanying drawings:

Fig. 1 is a fragmentary somewhat diagrammatic perspective view partially broken away, showing a portion of a foundation wall constructed in accordance with the invention, the back fill being shown in broken lines;

Fig. 2 is an enlarged section on line **2—2** of Fig. 1;

Fig. 3 is an enlarged section on line **3—3** of Fig. 1;

Fig. 4 is an enlarged section on line **4—4** of Fig. 1;

Fig. 5 is a section on line **5—5** of Fig. 2;

Fig. 6 is a section on line **6—6** of Fig. 4;

Fig. 7 is a perspective view showing a stage in the construction of a corner portion of a building;

Fig. 8 is an enlarged section on line **8—8** of Fig. 7;

Fig. 9 is an elevation of a portion of a building wall in which the blocks are of modified form;

Figs. 10 and 11 are enlarged sections respectively on lines **10—10** and **11—11** of Fig. 9; and

Fig. 12 is a partial section taken on line **12—12** of Fig. 10.

The wall construction shown in Figs. 1 to 8, inclusive, by way of example, may be assumed to be part of a foundation wall of a house or other building where a substantial part of the wall is below grade, several wall sections being built up from concrete footings to a sufficient distance to support floor joists of a first story. The concrete footings report wall sections including concrete blocks, and the footings, in this particular instance, also support a concrete floor. The corner construction shown in Figs. 7 and 8 may be assumed to be part of the building which is partially shown in Fig. 1. The concrete blocks which are used are in this example rectangular cellular blocks of the same general type shown in Patent

No. 2,493,547 of Paolella and Paolella, dated January 3, 1950, each having a planar end and a vertically channeled end with intervening cells or compartments which are open from top to bottom.

In the wall structure shown in Fig. 1, which is part of a wall section, a number of blocks of the general form just mentioned are employed, but these blocks, instead of being the ordinary blocks having molded upper and lower surfaces, are of a different kind in that their upper and lower surfaces are ground to smooth them and to provide them with very accurately placed upper and lower bearing surfaces. The first course is laid very accurately upon the concrete or other footing which is provided and the second course laid upon the first without mortar between the courses and without mortar in the end joints, the pregrinding of the upper and lower surfaces of the blocks enabling the second and subsequent courses to be built up on the first to form a wall of the requisite height in which all of the blocks are in correct relationship to each other. The uppermost course of blocks has its component blocks bonded together in a suitable manner, as hereinafter described, and there is provided a member upon which floor joists can subsequently be supported. After all of the blocks of the section have been set in place, a scratch coat of cement-sand plaster is applied to the inside face of the wall. The next step is to apply upright reinforcing rods to the inside face of the wall and press them into the scratch coat before it sets, after which a damp-proofing coating of plaster is applied to the outside face of the wall. The next step is to apply additional plaster to the inside face of the wall so as to cover over the reinforcing rods which are exposed at the inner face of the wall.

In the drawings, the concrete footing is shown at **20**, a portion of the concrete floor at **21**, the first course of blocks at **22**, the second course at **23**, the top course at **24**, the reinforcing rods at **25**, the first coat of plaster in which the rods are embedded at **26**, and the second or finishing coat at **27**. The water-proofing coating at the outer face of the wall is shown at **28**. On the uppermost course **24** is laid a sill **29**. Resting on the sill **29** are floor joists **30** of which only two are shown in Fig. 1.

After the footing **20** has been provided, the first block course **22** is placed upon it, using a suitable mortar which forms a layer **31** between the footing and the superposed blocks. On this layer the blocks are placed so as to be in line, with each block level and plumb. The blocks used are of the kind mentioned previously, each having a planar face **32** at one end and a face **33** at the opposite end which is provided with a vertically extending channel **34**, and the upper and lower faces being ground as mentioned hereinafter. In this particular form of block, the body of the block is provided with cells or openings extending from top to bottom and of the profile shown in the drawings. As shown in Fig. 4, the blocks in this course are set end to end and their adjacent ends are in contact with each other, but without mortar being used in the end joints.

The first course of blocks having been set in place as described, the blocks of the second course **23** are then laid. These, like those of the first course, are blocks differing from ordinary concrete blocks in that they have upper and lower surfaces which are ground with great precision so as to smooth them and insure the accurate parallelism of their upper and lower surfaces and insure

also that these surfaces are at right angles to the vertical axis of the block. These blocks of the second course, therefore, when placed upon those of the first course in direct contact, that is, without any intervening mortar, provide a course of blocks which are directed accurately horizontally and in end to end contact, with each block level and plumb; and then the third course is laid on the second course in a similar manner and this procedure is continued until the uppermost course **24** has been placed in position. The blocks are in the usual staggered relationship, as shown.

The blocks of the course **24** have their upper surfaces cut away to present in each block a discontinuous channel **35** disposed in the longitudinal median line of the block. These channels of the blocks receive a longitudinal sill or bonding member **36** which, in this example, is of concrete. The sill has embedded therein a longitudinal reinforcing rod **37** which extends through the length of the sill. Also embedded in the sill are a number of upright rod-like anchoring members **38** which project from the upper surface of the sill and are used for anchoring a floor structure, for example, by being connected to a wooden sill **29**. Before the body of concrete **36** is placed in position in the blocks, a piece of tar-paper **39**, or other suitable material, is placed in the channel portions **35** to receive the wet concrete and, upon drying of this concrete, the concrete in the channels will form a continuous beam or bonding member which will bond together all of the blocks in the uppermost course.

It is preferred to apply the coating **26** first, consisting of cement mixed with sand to form a plaster. The rods **25** are then placed in position and pressed into the coating **26** before the latter sets, so as to be partially embedded. The form of the reinforcing members **25** may vary, but it is preferred to employ straight steel rods, the upper end portions of which are bent at a right angle, as shown at **25a**, so as to provide a short portion by which the rod before being embedded will be suspended from the upper edge of the wall. The lower ends of the rods, which may be straight, will preferably extend almost to the mortar joint between the footing and the first course of blocks. The next step is to apply the waterproofing coating **28**, and finally the coating **27** is applied. This coating is usually slightly thicker than the coating **26** and is sufficient to cover fully the reinforcing rods, and in the final structure these reinforcing rods are embedded in the coating in the manner shown in Fig. 4. The rods **25** are laterally spaced from each other at a suitable distance. In the example shown, the rods are about six inches apart, but obviously variation in this respect may be made as well as in others.

In using this procedure in erecting two walls meeting at a corner, it is advisable at least in some cases to reinforce the wall at the point where the two sections meet in order to insure against dislocation of the blocks. This is shown by way of example in Figs. 7 and 8 of the drawing. Here the corner formed by the meeting of the two walls is indicated at **40**, and a block which has a corner location in one wall section lies over a block in the adjacent wall section in the customary manner. The blocks being used in this instance are cellular blocks of the type indicated above. A corner block in one course has a cell or opening registering at least in part with that of a block in the next course, as shown in Fig. 8. This permits the upright opening provided close to the corner to be filled with a body of mortar or concrete as indicated for example at **41** in Fig. 8 and this will act by its weight to anchor the blocks against displacement out of the positions in which they have been set even before the body **41** begins to harden and, in this manner, the formation of a corner from the ground blocks laid against each other in the manner described will be facilitated. This same procedure may also be employed where a door-opening or the like is to be provided in the wall, and in

Fig. 7 there is indicated at **42** a lateral margin of a door-opening. In this case also a body of mortar or concrete may be placed in several blocks having intercommunicating openings or cells, the anchoring body in this case being indicated at **43**.

In practice, the steel rods have been relatively light so-called pencil rods having a cross-sectional area of, say, 0.038 square inch. The scratch coat of mortar on the inner side of the wall has had a thickness of ⅜ inch and the finishing mortar a thickness of ⅞ inch, these dimensions being given only by way of example.

A construction as previously described has been demonstrated to offer surprisingly high resistance to pressure such as exerted by the surrounding soil against a foundation wall. Due to the steel rods embedded in the mortar on the inside face of the wall, the wall section is in the nature of a reinforced concrete slab of wall section width spanning from basement floor to first floor. The outer shells of the concrete blocks act as the flanges of T-beams to take the compression due to soil pressure; the pencil rods function as the tensile reinforcement in ordinary T-beam design. The mortar coating in which the rods are embedded serves to protect them from corrosion, provides lateral integrity to the wall, and bonds the reinforcement to the concrete blocks.

It is understood that in the wall structure, as herein described, the second course of blocks has the lower surfaces of its blocks in direct bearing contact with the upper surface of the first course blocks so that the bearing surface of a lower block is responsible for the positioning of the block next above. Thus it is apparent that the precise positioning of the first course, as above described, which is accomplished, among other things, by tapping the blocks into the underlying mortar so that their upper surfaces will be exactly level, is of great importance. This part of the work should be done by a qualified mason for it is apparent that an error at this stage would be compounded in the laying of additional courses. The need for precision in the elimination of the customary horizontal mortar joints is such that it is considered desirable in the practice of the present method to have the upper and lower surfaces of the blocks ground to true planes within a tolerance of 0.007 of an inch. This signifies a substantial change in the character of the rectangular concrete block formed in a mold by the methods customary in the trade. As far as the end joints between the blocks are concerned, there is no difficulty in laying the blocks so that their adjacent ends are in contact or substantially so. In this method of procedure, moreover, while it is of the greatest importance to have the upper and lower bearing surfaces formed very accurately, other parts of the block do not have such importance from the structural standpoint, and blocks having slight defects in other portions can be used, especially where the defects will be covered over in the completed wall. For example, if an end face of a block is slightly chipped, this may be remedied by the application of mortar if such treatment seem to be indicated.

The construction described makes it possible to erect a foundation wall which is very strong and highly resistant to soil pressure and which employs blocks of smaller lateral dimension than those customarily used in foundation walls under the same conditions. Together with these advantages, the procedure has the notable advantage that less skilled labor is necessary in erecting the wall than has been required heretofore, and also that the work is considerably expedited.

In Figs. 9 to 12, there is shown a modified form of the wall. The wall portion shown here is intended to represent a part of a wall which is entirely above grade, as in the first story of a house, for example. Such a wall portion may rest on any suitable foundation and the foundation is not shown, nor is the lowermost course of blocks. This may be assumed to be an external wall comprising concrete blocks of the general type above mentioned, the

external faces of the blocks being in this particular case of so-called clapboard design. Each block has an exposed face which is on a downward and outward taper so as to have a slight overhang at the bottom, giving with other blocks the effect of wood clapboards. In this form also, the blocks have accurately ground upper and lower faces as in the form first described. The tapered or inclined faces referred to above are indicated at **44**. These blocks are laid as in the form first described. As before, mortar is not used between courses, but in this particular case, it is of advantage, in view of the fact that the external faces of the blocks are not to be coated or otherwise covered, to place mortar, indicated at **45**, in the end channels **46** of the blocks so as to interconnect the blocks. The inner face of the wall is treated in the same way as in the first form, pencil rods **47** being employed, embedded between a scratch coat **48** and a finishing coat **49** of a plaster containing hydraulic cement.

In the broader aspects of the invention, the particular form of the block with its smooth upper and lower load-bearing surfaces, can be considerably varied. In more specific aspects, it is of distinct advantage to employ a block having one planar end and one channeled end, the block having cells or compartments which extend through the block in a vertical direction, the structure being such as to provide an enclosing shell disposed about two or more cells or compartments. The cells are used for providing air spaces and for reducing the weight of the block and the reinforcement which is given the wall structure for the purpose of resisting lateral pressure, is external to the blocks so as not to interfere with the air cell provisions. In a block of this type, the ground bearing surfaces are those of the block shell which extend around the air cells including the transverse septum or septums which are a part of the block structure.

The upright reinforcing rods, as will be noted, are not pretensioned and are a part of a composite reinforcing layer applied to the wall face, which layer does not present a tension member until the wall is subjected to pressure in a lateral direction from one side, such as is exerted by soil pressure or wind pressure. It is, of course, apparent that in the external reinforcing layer the steel rods are the elements which are tensioned to resist bending or buckling of the wall. In a foundation wall, for example, the soil at the outer side of the wall exerts a considerable bending movement if the base of the wall is considerably below grade and under such conditions the reinforcement provided by the steel rods enables the wall, when properly constructed, to take a very heavy load.

It is to be understood that the forms of the structure herein described are by way of example only and that various changes in the procedure and in the wall construction may be made without departure from the principles of the invention or the scope of the claims.

What I claim is:

1. In a masonry wall suitable for use as a foundation wall of a building and subject to pressure of an outstanding body of soil, the combination of an elongated below-grade footing having a substantially level upper surface and having a layer of mortar applied to said surface, a first course of rectangular cellular blocks having their lower parts set in said mortar layer, said blocks having precisely ground planar upper surfaces positioned so that they are precisely level, the blocks of said course being abutted at their adjacent ends without interbonding, a second course of rectangular cellular blocks having precisely ground upper and lower surfaces precisely parallel to each other of which the lower surfaces are in bearing contact with the upper surfaces of the first course blocks, the blocks of said second course having adjacent ends in abutting relationship without interbonding, a third and additional courses of superimposed blocks reaching to a level substantially above said footing, the blocks of said third and additional courses being precisely ground blocks similar to those of said second course and laid in a similar manner, the blocks of the uppermost course being cut away at their upper faces to provide lengthwise channels, a lengthwise continuous bonding member anchored in said channels so that said uppermost course of blocks forms a beam at the upper boundary of the wall section extending through the width of the wall section, a cementitious coating on the exterior face of the wall section presented by said blocks, which exterior face is at that side or face of the wall disposed toward the interior of the building, and a plurality of laterally spaced rod-like elements extending substantially throughout the height of the wall section embedded in said cementitious coating, which rod-like elements are subject to tension when the wall section is subjected to tensioning lateral and inward pressure by an outstanding body of soil.

2. In a building wall suitable for use as a foundation wall subject to lateral and inward pressure from an exterior body of soil, the combination of an elongated below-grade footing, a plurality of courses of rectangular blocks with open ended vertical cells superimposed on said footing, said blocks having upper and lower surfaces precisely ground so that said surfaces are smooth and accurately parallel to each other, the first course of blocks being set in a layer of mortar on said footing and being so placed that said blocks are plumb and their upper surfaces precisely level, the upper surfaces of said blocks directly contacting the lower surfaces of the blocks of the second course and the blocks of the several courses having bearing contact by and through their precisely ground surfaces, the blocks of all of said courses having adjacent ends in contact with each other without interbonding of the blocks in a course except for the uppermost course, the blocks of said uppermost course being provided at their upper faces with lengthwise channels, a continuous bonding member extending through the width of the wall section anchored in said channels of the uppermost course blocks so as to form from said blocks a bonding beam at the upper boundary of the wall section, laterally spaced upright rod-like reinforcing members fixed to the wall section exteriorly of the blocks at that side of the wall section facing toward the interior of the building, said members extending substantially throughout the height of the wall section, and a cementitious coating applied to the inwardly facing surface of the wall section and embedding said members, said wall section being of slab-like nature and said upright members being reinforcing tension members for the slab-like section.

3. In a masonry wall suitable for use as a foundation wall of a building and subject to pressure of an outstanding body of soil, the combination of an elongated below-grade footing having a substantially level upper surface, a first course of rectangular cellular blocks supported on said footing, said blocks having precisely ground planar upper surfaces and being positioned and fixed to said footing so that said upper surfaces are precisely level, a second, third, and additional courses of rectangular cellular blocks having precisely ground upper and lower surfaces precisely parallel to each other and supported upon the blocks of said first course with the ground surfaces of the blocks of said courses in load-bearing contact, the blocks of all of said courses having adjacent ends in abutting relationship without interbonding, an uppermost course of blocks on one of said additional courses formed at their upper parts to provide lengthwise channels, a lengthwise continuous bonding member anchored in said channels so that said uppermost course of blocks with said bonding member forms a beam at the upper boundary of the wall section, and laterally spaced upright rod-like reinforcing members fixed to the wall section exteriorly of the blocks at that side of the wall section facing toward the interior of the building, said members extending substantially throughout the height of said wall sec-

tion, said wall section being of slab-like nature and said upright members being tension members for the slab-like section.

4. The structure defined in claim 3, in which said upright rod-like reinforcing members have offset upper ends engaged with said bonding beam so that said members are suspended from said beam.

References Cited in the file of this patent

UNITED STATES PATENTS

501,622	Lee	July 18, 1893
844,296	Winslow	Feb. 12, 1907
1,154,546	Peters	Sept. 21, 1915
2,089,495	Lewis	Aug. 10, 1937
2,102,447	Whitacre	Dec. 14, 1937
2,176,986	Briscoe	Oct. 24, 1939
2,208,191	Kerr	July 16, 1940
2,493,547	Paolella et al.	Jan. 3, 1950
2,696,102	Zagray	Dec. 7, 1954
2,708,358	Schels	May 17, 1955

OTHER REFERENCES

"Construction Methods," a publication, June 1948, pages 96 and 97.