Jan. 9, 1951 R. G. STEAD 2,537,715

REINFORCED WALL WITH RING INTERLOCK

Filed July 22, 1946 2 Sheets-Sheet 1

FIG. 1.

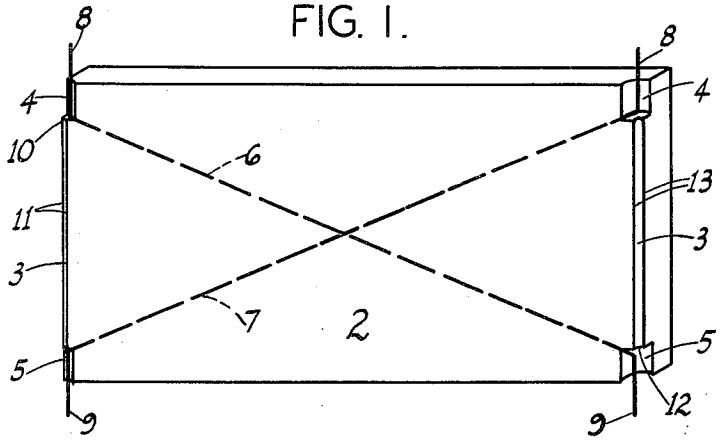


FIG. 2.

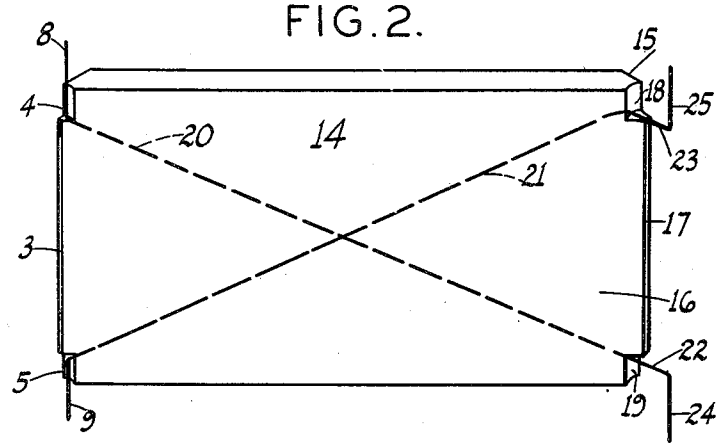


FIG. 3.

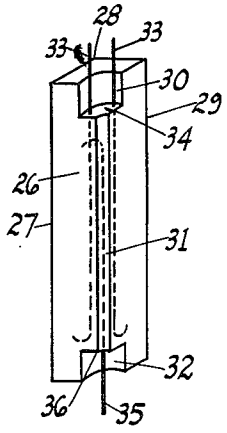
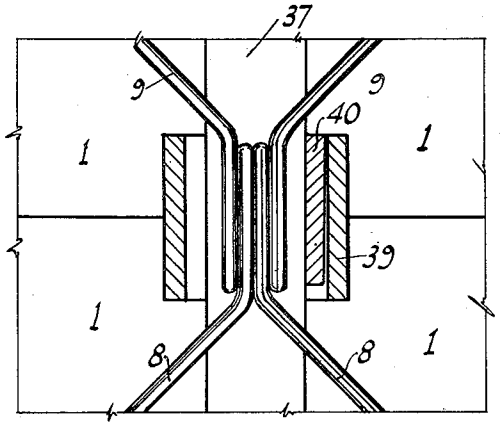


FIG. 6.



INVENTOR:
RUPERT GEORGE STEAD
BY Robert K. Jacob
AGENT.

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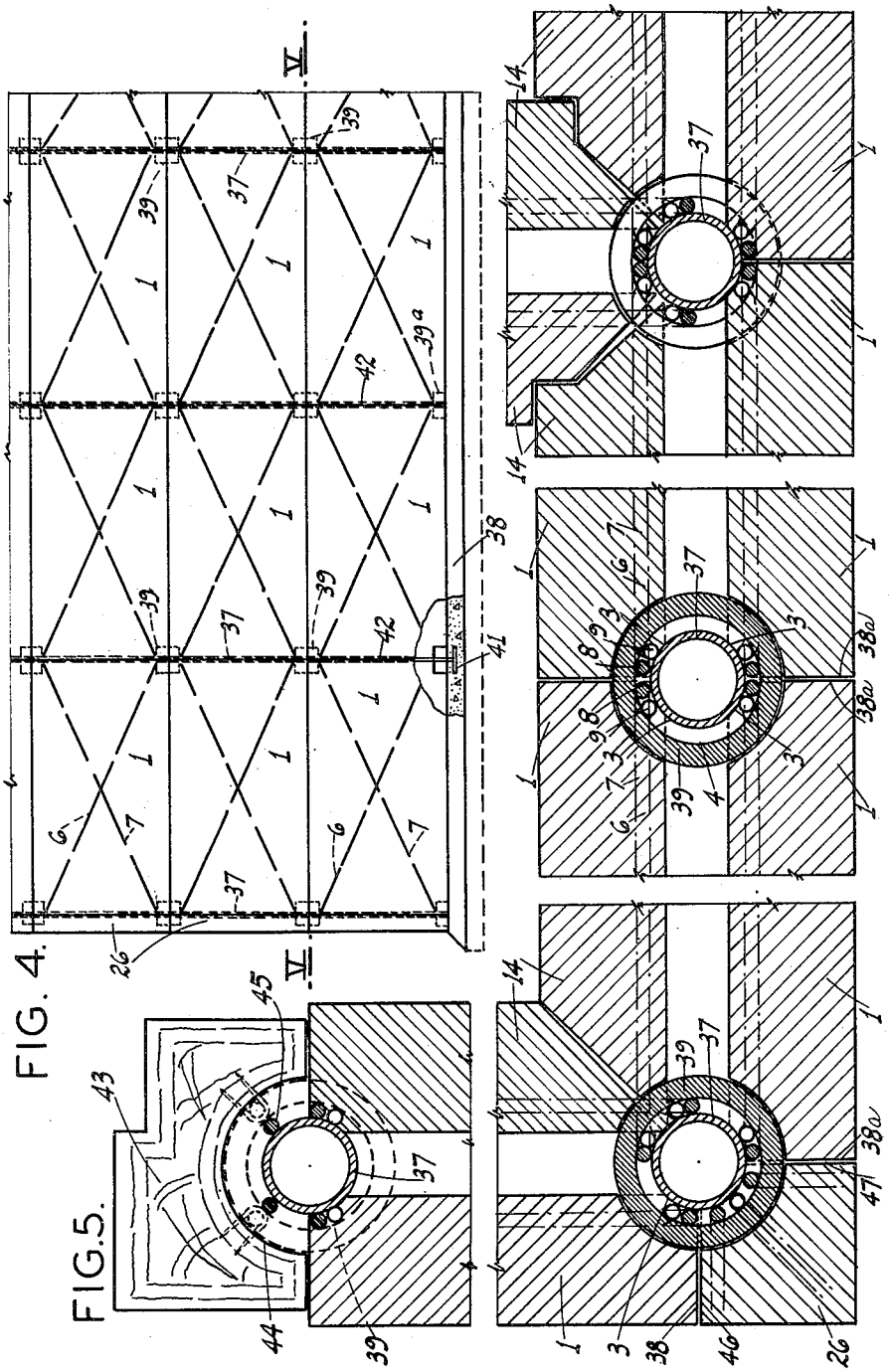


FIG. 4.

FIG. 5.

INVENTOR:
RUPERT GEORGE STEAD
BY Robert H. Jacob
AGENT.

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UNITED STATES PATENT OFFICE

2,537,715

REINFORCED WALL WITH RING INTERLOCK

Rupert George Stead, Durban,
Union of South Africa

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In the Union of South Africa December 5, 1945

13 Claims. (Cl. 72—44)

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This invention relates to prefabricated units for building structures, structures comprising such prefabricated units, and methods of erecting such structures.

One object of this invention is to provide prefabricated units for building structures, which units are of great mechanical strength and incorporate means for assembling them with other similar units. Another object of this invention is to provide such units which can be manufactured at low cost and with a high degree of precision. A further object of this invention is to provide a building structure comprising such units which can be quickly and easily assembled—and, if desired, dismantled—mainly with the use of unskilled labour. A still further object of this invention is to provide a method of erecting such structures.

This invention comprises a building unit such as a building block, made, e. g. by casting or moulding, from concrete or other suitable material, and including a reinforcing rod extending diagonally within said block in a plane materially parallel with one of the block faces, at least one end of said rod projecting from said block and providing means for assembling said block with other units of a building structure, the projecting end being preferably so bent that the extreme part of it is substantially parallel with some of the edges of the block.

This invention also comprises a building unit such as a building block made, e. g. by casting, from concrete or other suitable material and including two reinforcing rods extending materially diagonally with respect to one of the faces of the block and so as to cross one another, the ends of said rods at the same side of the block projecting from the block, and being so bent in opposite directions that they are parallel with one of the edges of the block and also parallel with one another, and so that the said ends are, in plan, next to one another but do not overlap one another.

This invention also comprises a building unit such as a building block made, e. g. by casting, from concrete or other suitable material and recessed along the full length of one of its edges, and providing near each end of the said recess a further recess opening from the first said recess and shaped suitably to accommodate and position part of a sleeve or similar connecting means.

This invention further comprises a building unit as specified in the last preceding paragraph and including connecting means which projects

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into the space of one of said end recesses; said means being preferably the end of a reinforcing rod as specified in the third or fourth preceding paragraph, and comprising a rod or part of a rod extending materially parallel with the longitudinal axis of said end recess.

This invention also comprises a building block suitably recessed along the whole length of each of two opposite edges of one block face to accommodate part of the circumference of supports extending parallel with said edges and providing at each end of each such recess a further recess suitable to accommodate part of the circumference of a sleeve or similar holding means, said block also comprising a reinforcing rod extending from one end recess to the diagonally opposite end recess and having its ends projecting into said end recesses, part of each projecting end being bent to extend materially parallel to the longitudinal axis of its respective end recess.

In a preferred form of this invention the building block specified in the last preceding paragraph further comprises a second reinforcing rod similar in all respects to the first reinforcing rod but arranged to cross the latter and to extend between the other two end recesses, the ends of the two rods at each side of the block being, in plan, next to one another but free from overlap with one another.

This invention also comprises a building block one end of which forms, in plan, an acute angle, and preferably an angle of about 45°, that edge of said block which passes through the point of said angle being recessed near each of its ends to accommodate part of the circumference of a holding sleeve or similar holding means, the opposite edge of the longest face of the block being preferably recessed along the whole of its length and also providing end recesses of the aforementioned kind.

This invention also comprises a block as specified in the last preceding paragraph and comprising a reinforcing rod as specified in the eighth preceding paragraph, said rod projecting through and extending beyond one of the end recesses of the edge that passes through the point of the acute angle.

This invention further comprises uprights of doors and/or window frames having a face provided with a recess extending along its whole length and/or end recesses of the kind hereinbefore mentioned, and also having connecting means extending into or beyond said end recesses.

This invention further comprises a hollow wall comprising a foundation course, vertical supports, which may consist of lengths of structural pipe, anchored at regular intervals in said course so as to define the outline of the wall, two vertical rows of preformed building blocks between each two successive supports, said two rows being spaced from one another to provide the hollow space of the wall, each of the blocks providing, at its respective edge adjacent one of the supports, a longitudinal recess accommodating part of the circumference of said vertical support and also providing a face which may make close contact with the adjacent face of the block of the same horizontal course on the other side of said support, connecting means on each side of said blocks arranged to lie against the surface of said support, and means for holding said connecting means in their respective positions against the surface of said support.

This invention also comprises the hollow wall specified in the last preceding paragraph, in which the holding means consists of or comprises circular sleeves, and in which each of the block edges is formed with end recesses, e. g. of the aforementioned kind, each of which recesses is arranged to accommodate one-half of the vertical extent of part of the circumference of one of said sleeves.

This invention also comprises a hollow wall as specified in either of the two preceding paragraphs, in which the connecting means comprises or consists of ends of reinforcing rods or other rods incorporated in the blocks, said ends being materially vertical and being located in the space between the vertical support and the holding means, which may consist of the aforementioned circular sleeves.

This invention also comprises a hollow wall as specified in any of the three preceding paragraphs, in which two adjoining vertical rows of blocks at one side of a vertical support are replaced by one vertical part of a door frame, for example as specified in the fourth preceding paragraph.

This invention also comprises a hollow wall including building units as specified in any of the preceding paragraphs referring to single units.

This invention further comprises the method of erecting hollow walls which comprises the steps of providing a foundation course and vertical supports secured to said foundation course, providing on each of said supports a holding means, such as a circular sleeve, and inserting between each two successive supports two preformed building blocks so that they rest against said supports and so that their connecting means extend into the spaces between the supports and the holding means and are held within said spaces against lateral movement.

This invention also comprises a double wall and/or a method of erecting such double wall as hereinbefore described, in which the connecting means are wedged between the supports and the holding means.

This invention also comprises a double wall and/or a method of erecting such double wall as hereinbefore described, in which means are provided for centering those holding means that rest on the foundation course with respect to their respective vertical supports.

The invention is illustrated by way of example in the accompanying drawings, in which:

Fig. 1 is a perspective view of a building block suitable for use in the construction of a straight hollow wall; said block being shown in its vertically upright position.

Fig. 2 is a perspective view of a block suitable for use in the construction of internal wall corners; said block being shown in its vertically upright position.

Fig. 3 is a perspective view of a block suitable for use in the construction of external wall corners; said block being shown in its vertically upright position.

Fig. 4 is a partly sectioned elevation of a hollow wall structure providing a corner of a building.

Fig. 5 is a section on V—V of Fig. 4 drawn to a larger scale and showing the plan arrangement of the blocks and of their reinforcement.

Fig. 6 is a partly sectioned elevation of one of the joints shown in Figs. 5 and 6.

As illustrated in Fig. 1, a block 1 of the kind suitable for use in the construction of a straight portion of a hollow wall is formed along two opposite vertical edges of a substantially rectangular face 2 with grooves or recesses 3 each of which opens at its top into an end recess 4 and at its bottom into a second end recess 5, said two end recesses 4 and 5 being concentric with the recess 3 but of substantially greater diameter than the latter. As explained below, each recess 3 is shaped suitably to accommodate part of a support extending parallel with said edge, whilst each of the end recesses 4 and 5 is of a shape suitable to accommodate part of a collar or sleeve or similar connecting means. In the examples, the recesses are shown as being of part-circular shape; but said recesses may be also of rectangular shape or of any other shape suitable to bear against the pipes or collars, in cross-section, at two or more points and thus to define the position of said tubes or collars within said recesses.

6 and 7 indicate two reinforcing rods which are incorporated in the block 1 and extend materially diagonally with respect to its face 2, so that each of said rods extends from the top end recess 4 at the one edge of face 2 to the bottom end recess 5 at the opposite edge of said face. The ends 8 and 9 respectively of the rods 6 and 7 at each side of the block 1 project from said block and are so bent that they are parallel with the recess 3 and also parallel with one another, and so that said ends, 8, 9 are, in plan, next to one another but do not overlap one another.

The ends 8 and 9 are preferably equal to the length of the sleeves or half-sleeves mentioned below, and are not longer than such sleeves or half-sleeves respectively. In the block illustrated in Fig. 1, the end 8 projects upwards from the bottom 10 of the recess 4 and so as to adjoin in plan, the periphery 11 of the recess 3. Similarly, the end 9 projects downwards from the bottom 12 of the end recess 5 and so as to adjoin in plan, the periphery 13 of the recess 3 but so as not to overlap, in plan, with said end 8.

The inner corner block 14, illustrated in Fig. 2, has one face 15 which extends at an angle of about 45° to the largest face 16 of said block 14. The edge 17 of said face 16 provides two end recesses 18 and 19, whilst its opposite edge provides three recesses 4, 3 and 5 of identically the same shape, size and arrangement as the aforementioned recesses 4, 3 and 5 respectively of block 1. Incorporated in the block 14 are two reinforcing rods 20 and 21 which extend materially diagonally of said face 16. The ends 8

and 9 of said rods are shaped and arranged within the recesses 4 and 5 in identically the same manner as the aforementioned ends 8 and 9 of the rods 6 and 7 of the block 1. The ends 22 and 23 of the rods 20 and 21, however, extend beyond the edge 17 of the block 14. They are formed with ends 24 and 25 respectively which, similarly to the ends 8 and 9 are bent downward and upward respectively parallel with one another and the edge 17, and which, in plan, are next to but do not overlap one another.

The outer corner block 26, illustrated in Fig. 3, is preferably a cube, three vertical edges 27, 28 and 29 of which are unrecessed. The fourth edge provides three recesses 30, 31 and 32 respectively, the height and diameter of which is the same as that of the aforementioned recesses 4, 3 and 5 respectively but the angular extent of which is substantially greater than that of said recesses 4, 3 and 5. Block 26 is preferably provided with three reinforcing rods, the ends 33 of two of which extend upwards from the base 34 of recess 30 while the end 35 of the third extends downwards from the base 36 of recess 32. Again, the ends 33, 33 and 35 are parallel with one another and with the axis of the recess 31, and are, in plan, next to but do not overlap one another.

Said blocks 1, 14 and 26 are formed, moulded or cast from concrete, cement, plaster of Paris, or other suitable material, and pre-formed reinforcing rods are inserted in predetermined positions in the moulds during such forming, casting or moulding so that the projecting ends of said rods are in an exactly predetermined relationship to their respective blocks and so that the shape and arrangement of corresponding rod ends in like blocks is identical.

In a hollow wall as illustrated in Figs 4 and 5, the building blocks are anchored to vertical supports 37, each of which consists in the example of a suitable length of structural 1¼" piping which is anchored in the foundation course 38.

The hollow wall comprises, as usual, two single walls spaced from one another. Each of said single walls is composed of vertical rows and horizontal courses of pre-formed blocks, each horizontal course of the double wall accordingly comprising two spaced horizontal courses.

Each vertical joint in a straight part of the hollow wall comprises in each course the ends of four blocks 1 joined at a vertical support 37. Each of the blocks 1 in each course provides a face 38a which may rest against the corresponding face 38a of the adjacent block, and also provides as aforementioned a rounded recess 3; the two rounded recesses 3 in the adjacent edges of the blocks 1 of each course forming together a single rounded recess which surrounds part of the periphery of the vertical support 37 which latter spans, in plan, the space between the two single walls.

The blocks are secured to the supports 37 by the projecting ends 8, 9 of their reinforcing rods 6, 7 being held to said support 37 by sleeves 39 which are seated in the end recesses 4, 5 of the blocks; the height of the sleeves is twice the height of said recesses. As indicated in Fig. 6, the rod ends 8, 9 may be additionally secured in position between a support 37 and its surrounding sleeve 39 as by wedge members 40.

In erecting the wall, a foundation course 38 is laid and the supports 37 are anchored at predetermined positions to said course. For this purpose flat steel members may be provided

which are formed with holes or provided with welded-on sockets; said holes or sockets being arranged at the required distances from one another. Said flat steel member is then anchored to the foundation as by say, bolts or other suitable means; and the uprights are secured in said holes or sockets as by screwing. After the supports have been anchored to the foundation course, a half-sleeve 39a is placed in position on the foundation course concentrically with each support 37, and is centered with respect to the latter as by a flange 41 or any other suitable means provided on the support or on the flat steel member. Four blocks 1 are thereupon placed onto said foundation course 38 and their rod ends 9 are forced into the space between said half-sleeve 39a and the support 37, thus securing the blocks 1 against lateral movement.

To build up the next course, a holding sleeve 39 is placed in the recess collectively provided by the top end recesses 4 of said four blocks 1. Said holding sleeve 39 holds in position against the surface of the support the upwardly bent rod ends 8 provided by the four blocks 1 of the bottom course. Said sleeve 39 also provides between itself and the tubular support 37 a socket for the four downwardly bent rod ends 9 of the four blocks 1 of the next course; the arrangement being such that the rod ends 8 provided by the blocks of the bottom course at each side of the hollow wall are placed between the rod ends 9 projecting from the blocks of the next course on the same side of the wall.

Since, as stated before, the depth of the top end recesses 4 is equal to only half the height of the sleeve 39, it will be understood that half of said sleeve 39 will project upwards from the upper surface of the blocks 1 of the bottom course, and will be accommodated in the bottom end recesses 5 of the blocks of the next course when these are placed in position onto the blocks of the bottom course. It will be further understood that the vertical support 37, the rod ends 8, 9, the sleeves 39 and the block recesses 4, 5 co-operate to hold the wall elements rigidly in position against lateral movement. Where it is intended to erect a permanent structure, the vertical joints 42 between adjoining blocks may be grouted.

A connection between a door frame or similar element and the hollow wall of the invention differs, in one form of the invention, from the aforedescribed joint in a straight hollow wall only in that the two vertical rows of the building blocks 1 on one side of the tubular support 37 are replaced, to the required height, by a vertical door frame element 43. Said element provides in its side face a vertical half-circular groove 44 which extends along the whole length of said element and is of suitable size to accommodate about half of the periphery of the vertical support 37, and provides also at intervals prescribed by the height of the building blocks, recesses suitable to co-operate with the end recesses 4, 5 of the blocks 1 to accommodate the holding sleeves 39. Furthermore, said door element 43 also provides connecting means which may include upwardly and/or downwardly directed rod ends 45, and which are arranged to extend into the spaces between the supports 37 and the holding sleeves 39. Said vertical groove 44 as well as the end recesses may be of rectangular or any other shape that is suitable to bear, in cross-section, against the pipes or sleeves respectively at at least two points so as to posi-

tion such pipe or sleeve with respect to said door frame element. The element 43 may be hollow.

At a junction of two hollow walls, the outer component wall and the general arrangement of the tubular support 37 and of the holding sleeves 39 remains the same as hereinbefore described with reference to the joint in the straight hollow wall. But each of the two adjoining blocks of each course of the opposite component wall is replaced by two blocks 14 of the kind hereinbefore described with reference to Fig. 2 which are joined at right angles to one another, the arrangement being such that the blocks 14 of the two new component walls extending from said opposite component wall and at right angles thereto have the same spacing from one another as the component walls of the first hollow wall. Each two of said blocks 14 joined at an angle provide together a vertical recess suitable to accommodate part of the circumference of the vertical support 37, and provide also end recesses to accommodate the holding sleeves 39. Because each of said blocks provides one downwardly and one upwardly bent connecting rod end 24 and 25 respectively, in this case twelve rod ends are arranged within each holding sleeve 39 instead of the eight rod ends of the straight wall joint. In order to enable this greater number of rod ends to be accommodated within the sleeve, the rod ends 24 and 25 projecting beyond the edges 17 project to such extent beyond said edges 17 and are so bent as is necessary to distribute them on a greater arc of the annular space between a holding sleeve 39 and the tubular support 37.

An outer corner comprises, in one form of this invention, a corner block 26 as described with reference to Fig. 3, which is joined at each of two adjoining faces 46, 47 to an ordinary wall block 1 of the kind hereinbefore described with reference to Fig. 1, the three adjoining edges of the three blocks providing the aforementioned recesses for the vertical support 37 and the sleeves 39, and also providing upwardly and downwardly directed rod ends 8, 9 and being connected to a vertical tubular support 37 in the same manner as the blocks 1 of the straight wall joint. The inside of the corner is formed by two angularly joined blocks 14, the edges 17 of which provide recesses 4, 5 for the holding sleeves only, but which do not provide a vertical recess 3 for the support 37 because said edges are too far distant from said support 37 to necessitate the provision of such vertical recess.

I claim:

1. A building block recessed along the whole length of each of the two opposite vertical edges of one block face and providing at each end of each such recess an end recess suitable to accommodate part of the circumference of a sleeve, said block also comprising a reinforcing rod extending from one end recess to the diagonally opposite end recess and having its ends projecting into said end recesses, part of each projecting end being bent to extend materially parallel to the longitudinal axis of its respective end recess, and to said vertical edges.

2. The block claimed in claim 1, comprising a second reinforcing rod similar in all respects to the first reinforcing rod but arranged to cross the latter and to extend between the other two end recesses, the ends of the two rods at each side of the block being when the block is in its vertically upright position, in plan, next to one another but free from overlap with one another.

3. A building block, according to claim 1, one vertical end face of which is inclined at an acute angle towards the block face the opposite vertical edges of which are recessed.

4. A hollow wall comprising a foundation course, vertical supports anchored at regular intervals in said course so as to define the outline of the wall, two vertical rows of preformed building blocks between each two successive supports, said two rows being spaced from one another to provide the hollow space of the wall, each of the blocks providing at its respective edge adjacent one of the supports a longitudinal recess accommodating part of the circumference of said vertical support and at each of its ends an end recess which is suitable to accommodate one half of the vertical extent of part of the circumference of a connecting sleeve, said edge also providing a face which makes contact with the adjacent face of the block of the same horizontal course on the other side of said support, reinforcing rods partly incorporated in said blocks and having ends projecting from said respective edges of adjoining blocks, said ends being materially vertical and being arranged to lie against the surface of said support; and a holder sleeve located in the space provided by the end recesses of adjoining blocks and holding said vertical ends against the surface of said support.

5. A rectangular building block the upper and lower extremities of the vertical end faces whereof are provided with vertical recesses each suitable to embrace part of the circumference of a vertical sleeve by means of which adjacent blocks are locked together; said block incorporating at least one reinforcing rod at least one end of which projects from the block into a recess and is so bent that the extreme part of it is substantially parallel to said vertical face; and the recesses on at least one end face being connected by another vertical recess of smaller cross-sectional area than the recesses which it connects.

6. A building block, according to claim 5, in which the reinforcing rod extends diagonally within said block in a plane materially parallel with the front face thereof.

7. A building block, according to claim 5, in which the depth of the recesses, measured in a vertical direction, is approximately half the axial length of the collar.

8. A building block, according to claim 5, in which two reinforcing rods are used which cross one another and extend materially diagonally with respect to the front face of said block, the ends of said rods projecting from the block into the recesses and being bent as defined in claim 5.

9. A building block, according to claim 8, in which the bent rod ends projecting from one end face of the block are, when viewed in plan, adjacent to one another without overlapping one another.

10. A building block, according to claim 8, in which the extent to which the extremities of the rods project from one vertical face is materially greater than the extent to which they project from the opposite vertical face, measured in the horizontal plane.

11. A building block recessed along the whole length of one of the vertical edges of one block face and providing at each end of such recess an end recess suitable to accommodate part of the circumference of a sleeve, similar end recesses being provided at each end of the opposite vertical edge of said block face; said block also com-

prising a reinforcing rod extending from one end recess to the diagonally opposite end recess and having its ends projecting into said end recesses, part of each projecting end being bent to extend materially parallel to the longitudinal axis of its respective end recess and to said vertical edges; the vertical end face of said block remote from the vertical edge which is recessed along its whole length being inclined at an acute angle towards the said block face.

12. A hollow wall comprising a foundation course, vertical supports anchored at regular intervals in said course so as to define the outline of the wall, two vertical rows of preformed building blocks between each two successive supports, said two rows being spaced from one another to provide the hollow space of the wall, each of the blocks providing at its respective edge adjacent one of the supports a longitudinal recess accommodating part of the circumference of said vertical support and also providing a face which makes contact with the adjacent face of the block of the same horizontal course on the other side of said support, reinforcing means projecting from opposite vertical sides of adjoining blocks arranged to lie against the surface of said support, and sleeve-like means holding said reinforcing means in their respective positions against the surface of said support.

13. A hollow wall, according to claim 12, incorporating a frame unit having a vertical face providing at least two coaxial recesses longitudinally spaced from one another, each such recess being adapted to accommodate part of the circumference of a sleeve; reinforcing means being provided in the unit which projects from the unit into each of the recesses and is parallel to said vertical face.

RUPERT GEORGE STEAD.

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