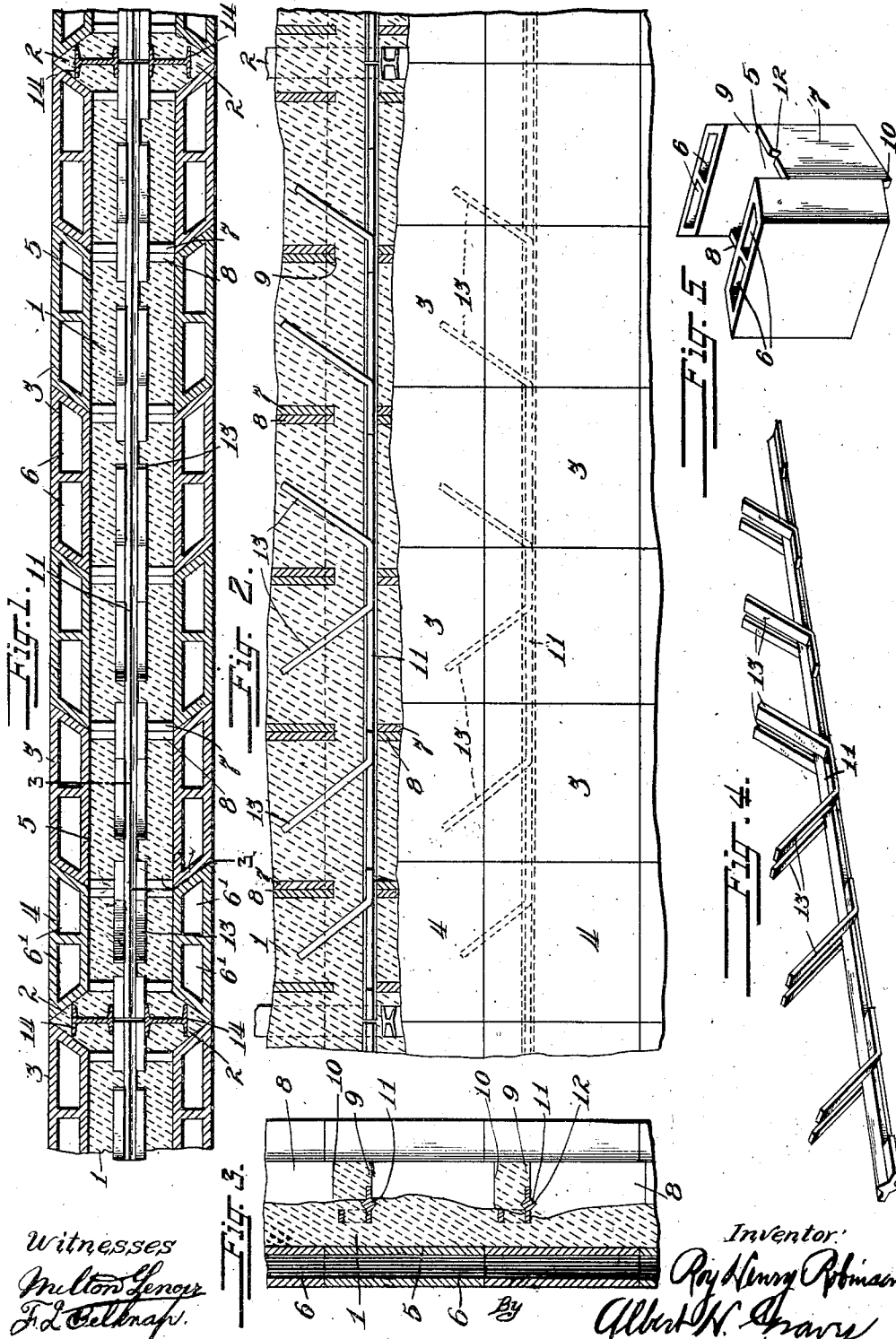


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COMPOSITE WALL CONSTRUCTION.
APPLICATION FILED NOV. 18, 1907.

969,408.

Patented Sept. 6, 1910.



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Specification of Letters Patent.

Patented Sept. 6, 1910.

Application filed November 18, 1907. Serial No. 402,638.

To all whom it may concern:

Be it known that I, ROY HENRY ROBINSON, a citizen of the United States, and a resident of the city of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Composite Wall Constructions, of which the following is a specification.

This invention relates to composite wall constructions and refers more specifically to a novel type of wall in which tile and concrete are combined with a metallic skeleton framework in such manner as to produce a wall at once rigid, durable and inexpensive and capable of being built rapidly and without the delays usually incident to building structures in part or in whole of concrete.

Among the salient objects of the invention are to provide a wall which may be constructed without the use of preliminary forms to support and give form to the concrete while plastic; to provide a wall which while possessing perhaps as great strength and rigidity as though made of solid concrete, is nevertheless less expensive, much lighter and of such cellular structure as to form a much superior insulator of heat, cold and moisture; to provide a construction which may be built from foundation to roof without at any stage waiting for constituent parts of the wall to "set"; to provide a construction in which each of the three chief constituent parts, viz. the concrete, the tile and the metallic reinforcements, mutually strengthen and reinforce each other; to provide a construction in which the tile members are interposed between solid or substantially solid vertical piers or pilasters of concrete and are, by the metallic skeleton framework, practically suspended between the piers; to provide a construction which enables well known and approved types of metallic reinforcements to be used; to provide a construction in which the skeleton frame forming a part thereof serves to accurately determine the positions of the tiles forming another part of the wall and in this way enables the major part of the work to be performed rapidly by unskilled labor and in general to provide a wall of characteristically new and improved construction.

The invention consists in the matter hereinafter described and more particularly pointed out in the appended claims.

In the drawings; Figure 1 is a horizontal

sectional view of a preferred embodiment of the invention, taken in the plane of the joint between two tiers of tiles; Fig. 2 is an elevation of a portion of wall, parts being shown in central vertical section; Fig. 3 is a transverse sectional view taken on the indirect line 3—3 of Fig. 1 and showing the ends of the tiles in elevation; Fig. 4 is a perspective view of the metal reinforcements; Fig. 5 is a perspective view of one of the tile blocks.

In constructing the wall of the invention, I provide a central inner wall or filling of concrete 1, reinforced at suitable intervals with integral concrete piers 2, which are of a transverse width about equal to the maximum thickness of the wall and so project at both sides beyond the faces of the main concrete filling. Between the piers I interpose horizontal tiers of tiles 3, 4, made in such shapes and of such size as to form longitudinally-disposed sets which approximately fit and fill the spaces between contiguous piers.

In the preferred embodiment of my invention, each tile block is of a width equal to the full thickness of the wall, is hollow and internally subdivided to form a central vertical main tubular passage 5 therethrough and separate, laterally outer passages, as 6, 6, and 6'. The end walls 7 and 8 are desirably of such form that when the blocks are abutted together end to end, they interfit and form in effect a flat or straight arch between the vertical metal reinforcement for the piers; each of the tiles 3 having a concave and a convex end while the tiles 4 have both ends concave or centrally inset so as to constitute key-blocks. The end walls of the central portion of each tile are in part omitted, so as to provide openings 9 through which the concrete filling and metal reinforcement extend between adjacent tiles and thus form a monolithic structure or integral whole. Each central and wall portion, moreover, projects flange-fashion below the main bottom of the tile as indicated at 10 and into the correspondingly cut-away portion at the upper side of the next adjacent tile, thus serving to interlock the tiers together and facilitate the placing of them in exact superposed register.

Each set or tier of tiles is further united with the piers at each end thereof, supported, confined and reinforced generally by a corresponding horizontal metal reinforce-

ment 11, which is preferably of that type known as a Kahn bar. These bars each extend from center to center of the piers, about centrally of the concrete filling wall portion, and to accommodate them and interlock the several tile blocks therewith, each block is notched in its end walls, as indicated at 12 to receive the body of the bar. The bars 11 are provided with fins or arms 13 disposed obliquely and oppositely from the central portion of each bar, so as to best reinforce the wall against settling stresses. It is to be noted that the fins of each bar rise above its own tier and into the next tier above, thus effectually tying or bonding the tiers together.

The several piers are each reinforced with metal frame or bonding members 14, these being preferably I-beams, one in each side of the pier and arranged with their webs transversely of the wall, so as to most efficiently increase its rigidity.

In building the wall, the I-beams are sealed and anchored at their lower ends on the foundation or footing before the wall proper is begun. The tiers of tiles are then arranged accurately in position and the Kahn-bars set in place and the plastic concrete then filled into the forms or molds so formed. If desired a tier of tiles may first be arranged accurately in position and the I-beams next set up and supported in proper vertical positions.

It is to be noted that as soon as the I-beam reinforcements are set up in position for the piers, they serve to form definite guides and supports between which the tiles may be set and interlocked to form the arches hereinbefore referred to and the skeleton frame members thus serve to hold the tiles positively in place independently of the subsequently filled in concrete.

It will be noted that as the concrete is filled in it surrounds the I-beams to form the piers between the inset ends of adjacent sets of tiles, and at the same time effectually ties together the ends of the Kahn-bars within each pier, thus producing in effect a skeleton metallic frame united throughout the entire wall. So also the concrete as it fills the tubular spaces within the tile blocks flows through the openings of the end walls of the latter and bonds the wall together between the ends of each tile and at the same time embeds and surrounds the Kahn-bar in such manner as to unite the tile blocks rigidly thereto and at the same time set around the fins of the Kahn-bar holding the latter rigid in their several angular positions. When the next tier of tiles is set in place and the concrete filled in, the fins of the subjacent Kahn-bar rise into the lower portions of the tiles of this pier and upon the subsequent filling in of the concrete, the two tiers are thus positively bond-

ed together by the fins and the latter cemented rigidly in the solid masses of concrete.

In accordance with well understood principles, the Kahn-bars with their fins thus most effectively reinforce the walls against settling between the several piers so that the tile construction is in effect suspended between the piers. Owing to the pilaster form of the concrete portion of the wall,— that is owing to the fact that the piers are of substantially the full thickness of the wall, maximum rigidity against lateral stresses is secured with the use of a comparatively small amount of concrete thus at once making the wall relatively light and providing space for the external veneerings of cellular tile structure.

It will be seen from the foregoing that I accomplish the several objects of the invention hereinbefore set forth in a highly practical and efficient degree.

It will be understood that the invention is not, in its broader aspects, limited to the details herein shown.

I claim as my invention:

1. A composite wall, comprising a series of spaced-apart upright stud-like metallic reinforcements constituting pier-nuclei, located in the laterally outer portions of the piers of the completed wall, sets of pre-formed hollow blocks interposed between said stud-like reinforcements, the end members of each set abutting against said reinforcements and held in position thereby, concrete filling between the adjacent ends of the sets of pre-formed blocks disposed around said stud-like reinforcements and forming therewith continuous piers, and concrete filling occupying the interiors of the hollow pre-formed blocks and forming an internal concrete frame extending from pier to pier and monolithically joined with the piers.
2. A composite wall, comprising reinforced concrete piers arranged at intervals, each pier having stud-like metallic reinforcements embedded and extending vertically within its laterally outer portions, sets of hollow pre-formed blocks extending from pier to pier and at their ends semi-embracing the piers, and concrete filling the interior of said blocks forming an internal concrete wall frame extending from pier to pier and monolithically joined with the piers.
3. A composite wall, comprising a series of spaced-apart upright stud-like metallic reinforcements constituting pier-nuclei, located in the laterally outer portions of the piers of the completed wall, sets of pre-formed hollow blocks interposed between said stud-like reinforcements, the end members of each set being concave, abutting against said stud-like reinforcements and defining the pier spaces, concrete filling between the adjacent ends of the sets of blocks,

disposed around said stud-like reinforcements and forming therewith continuous piers, horizontal metallic reinforcements extending from pier to pier through the sets of hollow blocks at vertically separated intervals and at their ends embedded in the piers, and the concrete filling occupying the interiors of the hollow pre-formed blocks and forming an internal concrete wall frame extending from pier to pier and monolithically joined with the piers.

4. A composite wall, comprising a series of spaced-apart upright stud-like metallic reinforcements constituting pier-nuclei, located in the laterally outer portions of the piers of the completed wall, sets of pre-formed hollow blocks interposed between said stud-like reinforcements, the end members of each set being concave, abutting against said stud-like reinforcements and defining the pier spaces, concrete filling between the adjacent ends of the sets of blocks, disposed around said stud-like reinforcements and forming therewith continuous piers, horizontal metallic reinforcements extending from pier to pier through the sets of hollow blocks at vertically separated intervals and at their ends embedded in the piers, and the concrete filling occupying the interiors of the hollow pre-formed blocks and forming an internal concrete wall frame extending from pier to pier and monolithically joined with the piers, said horizontal metallic reinforcements being provided with obliquely disposed truss extensions.

5. A composite wall, comprising a series of spaced-apart upright stud-like metallic reinforcements constituting pier-nuclei, sets of pre-formed hollow blocks interposed between said stud-like reinforcements, the end members of contiguous sets being concave and together defining the pier spaces of the wall, and the several blocks being of the full thickness of the wall so that their outer faces constitute the faces of the latter, concrete filling occupying the pier spaces between the adjacent ends of the sets of blocks and disposed around said stud-like reinforcements, and concrete filling occupying the interiors of the hollow pre-formed blocks and forming an internal concrete frame extending from pier to pier and monolithically joined with the piers.

6. A composite wall, comprising a series of spaced-apart upright stud-like metallic reinforcements constituting pier-nuclei, sets of pre-formed hollow blocks interposed between said stud-like reinforcements, the end members of contiguous sets being concave and together defining the pier spaces of the wall, and the several blocks being of the full thickness of the wall so that their outer faces constitute the faces of the latter, and each having a cellular laterally outer portion, concrete filling occupying the pier

spaces in the adjacent ends of the sets of blocks and disposed around said stud-like reinforcements, and concrete filling occupying the interiors of the hollow pre-formed blocks and forming an internal concrete frame extending from pier to pier and monolithically joined with the piers.

7. A complete wall, comprising a series of spaced-apart upright stud-like metallic reinforcements constituting pier-nuclei, sets of pre-formed hollow blocks interposed between said stud-like reinforcements, the end members of contiguous sets being concave and together defining the pier spaces of the wall, and the several blocks being of the full thickness of the wall so that their outer faces constitute the faces of the latter, and each having a cellular laterally outer portion, concrete filling occupying the pier spaces in the adjacent ends of the sets of blocks and disposed around said stud-like reinforcements, and horizontal metallic reinforcements extending from pier to pier through the sets of blocks at vertically separated intervals and having their ends bonded into the piers between which they extend.

8. A composite wall, comprising a series of spaced-apart upright stud-like metallic reinforcements constituting pier-nuclei, located in the laterally outer portions of the piers of the completed wall, tile blocks interposed in sets between said pier-nuclei and interlocked with each other and with the pier nuclei, to form in effect keyed-in flat arches, said tile blocks being severally provided with communicating vertical tubular passages and communicating transverse passages, fillings of concrete between the contiguous ends of the sets of tile blocks incasing the stud-like reinforcements and forming continuous piers, and fillings of concrete occupying the interiors of said blocks and monolithically joined throughout the wall and with the piers.

9. A composite wall, comprising concrete piers arranged at intervals apart, each of a transverse width equal to the maximum thickness of the wall and provided in its laterally outer portions with upright metallic reinforcements, hollow pre-formed blocks interposed in sets between said pier, and a monolithic concrete filling occupying the interiors of the blocks and monolithically joined to the piers.

10. A composite wall, comprising concrete piers arranged at intervals apart, each of a transverse width equal to the maximum thickness of the wall and provided in its laterally outer portions with upright metallic reinforcements, hollow pre-formed blocks interposed in sets between said pier, horizontal beam-like metallic reinforcements extending from pier to pier through the hollow blocks at vertically separated

intervals and at their ends bonded into said piers, and a monolithic filling of concrete occupying the interiors of the blocks, embedding said horizontal reinforcements and monolithically joined with the piers.

11. A composite wall, comprising a series of spaced-apart upright metallic studs constituting pier-nuclei, located in the laterally outer portions of the piers of the completed wall, other metallic reinforcements extending from pier to pier and held in position against lateral displacement by engagement with said studs, sets of hollow pre-formed blocks interposed between said metallic studs, the end members of which sets engage the studs and the intermediate members of which engage the metallic reinforcements extending between the studs, whereby their positions are determined and they are initially held against displacement, concrete filling occupying the spaces between the adjacent ends of sets of blocks, surrounding said studs and forming piers, and concrete filling occupying the hollow blocks, surrounding the metallic reinforcements extending through the latter and monolithically joined throughout the wall and to the piers.

12. A composite wall, comprising con-

crete piers, the laterally outer portions of which are of converging form in cross-section, tile blocks interposed between said piers and interlocked with each other, said tile blocks being each of the full thickness of the wall and maximum thickness of the piers and arranged to overlie and substantially inclose the lateral sides of said piers so as to constitute a complete facing for each side of the wall, a monolithic filling of concrete occupying the central hollow interiors of the tiles and united both vertically and laterally through suitable communicating openings of the tiles, vertical metallic reinforcements in the laterally outer portions of each of the several piers and transverse metallic reinforcements extending through the tile blocks from pier to pier and embedded in the concrete filling of the latter, said transverse metallic reinforcements being provided with outstanding fins or reinforcing arms at longitudinally separated intervals extending into an adjacent tier of tiles.

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