G. W. MATHEWS & R. E. FINDLAY.

HOLLOW WALL CONSTRUCTION.

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1,186,592.

Patented June 13, 1916

Fig. 1

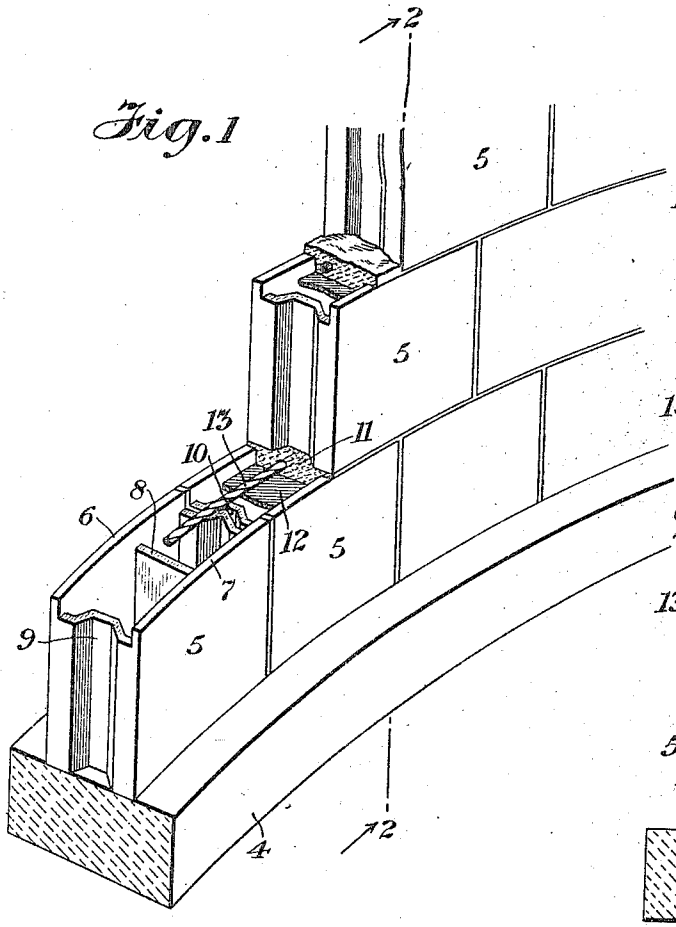


Fig. 2

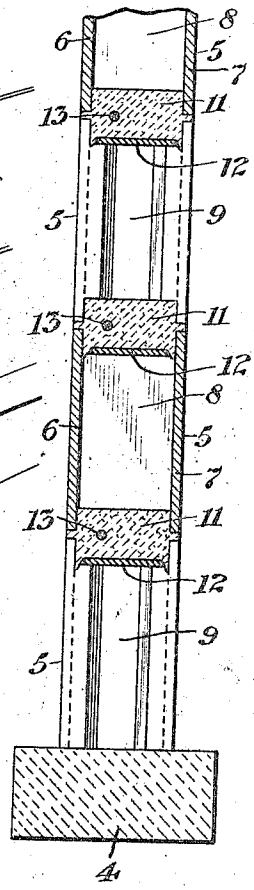
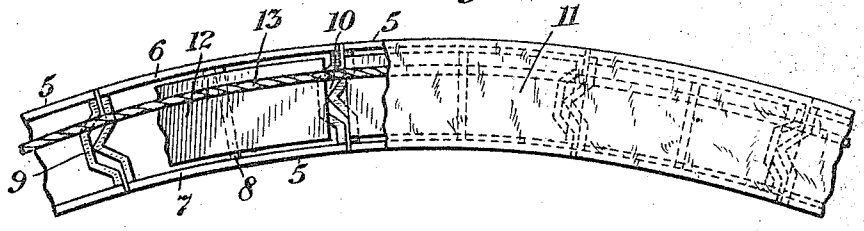


Fig. 3



WITNESS

Chas. J. Clagett

INVENTOR

George Waldron Mathews

Richard Edwards Findlay

BY

W. S. Oston

THEIR ATTORNEY

UNITED STATES PATENT OFFICE.

GEORGE WALDRON MATHEWS AND RICHARD EDWARDS FINDLAY, OF MACON, GEORGIA.

HOLLOW-WALL CONSTRUCTION.

1,186,592. Specification of Letters Patent. Patented June 13, 1916.

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To all whom it may concern:

Be it known that we, GEORGE WALDRON MATHEWS and RICHARD EDWARDS FINDLAY, both citizens of the United States, and residents of Macon, county of Bibb, and State of Georgia, have invented certain new and useful Improvements in Hollow-Wall Construction, of which the following is a specification.

Our invention relates in general to a built-up wall construction of the type formed from finished hollow plastic blocks and particularly relates to such a wall designed to form a silo.

One of the primary objects of our invention is to provide a silo which will be strong, durable, air and water tight, which will possess a neat uniform appearance and which can be constructed at low cost. With this object in view we provide an insulated wall constructed from units formed of a single type of insulated dead air chambered blocks with the units securely bound together, end to end, arranged in superimposed courses and provided with horizontal reinforcements formed *in situ* and designed to meet the demands for different strengths at different levels of the wall.

It is of primary importance in silo construction that the contents of the silo be protected from air or moisture which might percolate through the walls thereof either by reason of the character of the blocks forming the walls, by reason of the character of the joints between the blocks, or by reason of cracks developing in the outer or inner faces of the wall after it is constructed.

To insure a tight wall the blocks used are of plastic material vitrified to form the same practically impervious to both air and moisture. Each block is surrounded between its inner and outer sides by a thick incased binding material which in setting fills all possible openings between the blocks and insures a perfectly tight joint.

To further minimize the possibility of leakage through the wall, while retaining the advantages of an air insulation, the wall is formed of a multitude of chambered blocks, with the chambers of each block effectively insulated from the chambers of the other blocks.

From the standpoint of economy and uniform appearance to the wall, it is a further desideratum to form the same of a uniform type of preformed and cured blocks designed to withstand strains incidental to such walls.

In carrying out the invention it has been found desirable to utilize the type of hollow block which is cored therethrough vertically to provide one or more air chambers opened at top and bottom of the block. This type of block may be molded economically in large quantities and has all of its material disposed with advantage to offer the greatest possible resistance to vertical crushing strains. Preferably the walls and webs of these blocks are made as thin as possible to save material and to provide the contained air chamber of the largest possible volume. The binding material constituting the horizontal joints between the blocks is utilized to seal the air chambers.

Another object of the invention is to provide a hollow chambered silo wall strengthened against lateral strains by solid bands extending across the open ends of the individual chambers and formed without effecting the set of the superimposed preformed blocks. We attain this object by positioning the horizontal binder within channels formed in the upper faces of the blocks of each course and giving the binder a depth sufficient to form an interior girder of the desired strength about the silo. While a plastic girder of this type may be sufficient adjacent the top of the wall where internal strains are light, this would not be sufficient for the lower courses and accordingly another object of the invention is to provide a construction designed to receive any requisite amount of metal reinforcement necessary to withstand the internal strains on the walls at the different levels. The reinforcement is conveniently disposed in the material forming the horizontal girder as the wall is laid, which material offers a protecting covering for the same and provides sufficient space for any usual type or necessary amount of metal without special provision for mounting the same.

Various other objects and advantages of the invention will be in part obvious from an inspection of the accompanying drawings and in part will be more fully set forth in the following particular description of one form of mechanism embodying our invention, and the invention also consists in

certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

Referring to the accompanying drawings: Figure 1 is a perspective view of a portion of a silo wall illustrating a preferred embodiment of our invention; Fig. 2 is a vertical sectional view taken on the line 2—2 of Fig. 1; and Fig. 3 is a horizontal sectional view taken just above the lower horizontal filler course in Fig 1.

In the accompanying drawings, there is shown a concrete foundation bed 4 upon which is positioned a novel type of wall which may be considered as straight for the purpose of this disclosure, but to emphasize its peculiar adaptability to a circular silo construction it should be regarded as continuous, except for the possible door opening usual in silo constructions. The blocks 5 forming the wall are formed of curved vitrified salt glazed material but may be of concrete or similar plastic material designed for use in constructions of this character. The blocks are arranged end to end in horizontal courses with the blocks preferably arranged to break joint but such is not a necessary feature of the invention and the blocks may be arranged in the wall in the manner best suited to take advantage of any peculiar staggered or keyed arrangement. The blocks are of a vertical hollow cored type including an outer wall 6 and an inner wall 7, which walls in the blocks designed for circular silo construction are concentrically disposed and have longitudinal radii to form the desired configuration of silo. The thin shelled blocks of this type are thoroughly fired in a manner not possible with the thick walled blocks which are now necessary to give the requisite strength to tall silo walls. The ends of the blocks are defined by transverse end walls 9 and the walls of the blocks may be braced by an internal transverse web 8. The contiguous faces of the end walls of adjacent blocks are dissimilar in shape so that when the side walls of adjacent blocks are in contact or substantially in contact, a hollow cement receiving space 10 is formed vertically between the end walls of the adjacent blocks. A plastic filler 11 preferably of cement having a flowing consistency is disposed within this space and constitutes the vertical binding joint between the adjacent blocks. This vertical filler extends above and below the outlines of the blocks to unite with the horizontally disposed binding members hereinafter described to form an integral honey-combed structure formed *in situ* about the edges of the blocks and within the outlines of their abutting side walls.

An open top channel for the binding material forming the horizontal joints between adjacent courses is provided by spacing the upper edges of the web and end walls below the upper edges of the side walls of the blocks, a distance sufficient to give the requisite depths to the formed course or girder of plastic material between the preformed block courses. In order to prevent any possibility of this filler material falling into the air chambers in the blocks, each block is provided with a bed plate 12, supported on the seat provided by the depressed web and end walls. This plate has a length sufficient to cover the air pocket or pockets, but is less than the total length of the block and is positioned so that it will not overlap the vertical joints between adjacent ends of the blocks, or weaken the angled joint formed by the vertical and horizontal joints at each corner of the blocks. These plates do not need to have an accurate fit between the side walls of the block as the binding material used possesses little viscosity as applied and very little, if any, of the material can fall into the chamber through any small opening which might be present in the plate or between the edges of the plate and adjacent side walls of the block. In actual practice it has been found desirable to make this member in the form of a flat thin sheet tin plate, the ends of which are shaped to conform to the configuration of the end walls of the block upon which they rest. It is understood, however, that these bed plates have no particular reinforcing functions and are designed primarily to have a strength merely sufficient to support the filler material while hardening and preferably are thin so as not to take up any more of the air space than is necessary.

A metal reinforcement 13 is embedded in the horizontal course of filler material. This reinforcement is preferably under tension and, in the case of silo construction is in the form of a continuous band encircling the wall. While any type of reinforcement may be utilized the construction illustrated is provided with a twisted metal bar which has been found highly desirable in devices of this character, particularly due to its tensile strength and to the ease with which it may be bent to shape and to its bite in the filler material. In addition to these advantages the rods may be placed wherever desired across the width of the channel and toward the bottom of the wall more than one bar may be used, if desired, or bars of different strength or character may be used.

The blocks of each superimposed course are laid on the plastic filler of the course below and whatever of this material may be forced through the joints between the blocks is pointed off as is usual in building block construction. The vertical joints are filled as previously described, the filling material uniting with the horizontally formed plastic course forming a T therewith or in the cases

where the blocks do not break joints forming a solid cross therewith. The bed plates are positioned to cover the chamber, a filler is laid in the upper channel, the proper proportion of metal is laid in place and sufficient binding material added to give the desired depth to the girder element. Course after course of these blocks may be laid as described until the desired height of structure is obtained after which it is capped as is usual with such devices.

By means of a device of this character all of the structural advantages of a preformed vertically cored hollow block unit are retained. Pouring the plastic filling material between the end walls of the preformed blocks provides a secure vertical joint free of air holes or other openings. It has been usual with devices of this character to use tie bars between adjacent blocks, but these tie bars are not regarded as essential with this construction and require an amount of metal out of all proportion to their strengthening functions. The finished wall is formed in effect of a honeycombed integral skeleton frame formed of horizontal girders and vertical posts, with the openings formed thereby inclosed by the blocks which go to make up the wall. As these blocks are cured and therefore free from any possible distortion or shrinkage, the wall stands as laid and is not affected by any possible shrinkage of the formed skeleton frame. It is noted that each block has a completely closed air chamber contained within its outlines. By this construction air holes may extend through the inner or through the outer sides of each block, but the air will not penetrate to the interior of the silo unless an opening happens to be in both the inner and outer sides of the same block. As this is very unlikely it is seen that a substantially moisture and air-proof wall is provided with high insulating properties due to the dead air spaces throughout the wall.

The reinforcing material may be positioned at any place transversely of the interior of the block and any number of the reinforcements of the rod type may be used, depending upon the amount of metal necessary to constitute an efficient reinforcement, but the blocks used do not have to be modified in any way to accommodate the various amounts of material in the reinforcement.

It must be noted that the strength of a wall so constructed does not rely particularly either upon the strength of the blocks *per se* nor upon the skeleton plastic formed framework but rather upon a skilful combination of these two features.

In order to obtain a thoroughly fired vitreous block it is necessary that the walls thereof be designed as thin as possible but any weakening of the block in this design is compensated in this case by the solid girders between courses and by the vertical connecting end uprights forming the unitary skeleton frame.

The vertically disposed openings in the blocks not only provide a construction which includes webs and side walls positioned diametrically of the silo so as to receive edgewise the internal outwardly directed strains but these curved blocks are easily forced through the forming dies as the openings therethrough are straight.

A further advantage of this construction is that it is merely necessary to pour the plastic material into the vertical spaces between the blocks and along the open top channels at each course. The plastic material can readily be tamped into place and its natural course will be to fill up all openings and at the same time there is retained the vital element in this entire construction, the insulated dead air spaces. In this case of silo walls the reinforcement is continuous about the structure with the portion thereof extending across the door opening modified in character to form the usual door rungs.

While we have shown and described, and have pointed out in the annexed claims, certain novel features of our invention, it will be understood that various omissions, substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

Having thus described our invention, we claim:

1. A wall construction including a pair of open top chambered blocks disposed side by side and designed to be positioned at an angle horizontally to each other in the wall to form a wall of any desired curvature, each block provided with transverse end walls, the upper portions of which constitute supporting members positioned below the upper edges of the blocks, the supporting surfaces of the members in each block being flat and contained in one plane, a pair of flat retaining members, one for each block, positioned within the outlines of its correlated block and designed to rest flat on its corresponding supporting members to prevent air leakage across the end walls between the retaining members and their suppoits, said retaining members having their adjacent ends spaced apart to form an opening adapted to receive plastic material extending between the adjacent ends of the blocks, said retaining members being each substantially free of any intentional reinforcing properties and designed to seal the open top of its correlated block, and a formed plastic course surrounding the blocks within the outlines of the wall, so as to insulate the chambers of the blocks from

each other, said formed plastic course having the portions thereof which are positioned above the chambers supported by said retaining members and held from falling vertically into the chambers by the retaining members.

2. A wall construction including a pair of open top cored chambered blocks disposed side by side, each block provided with transverse end walls, the upper portions of which constitute supporting members positioned below the upper edges of the blocks, a pair of retaining members, one for each block positioned within the outlines of its correlated block and designed to have a close fit on its corresponding supporting members thereby to prevent air leakage across the end walls between the retaining members and their supports, said retaining members designed to have their adjacent ends angularly disposed and spaced apart so as to form an opening to receive a plastic material extending between the adjacent ends of the blocks, said retaining members designed to seal the open top of its correlated block, and a formed plastic course surrounding the blocks within the outlines of the wall so as to effectively insulate the chambers of the blocks from each other, said formed plastic course having the portions thereof which are positioned above the chambers supported by said retaining members and held from falling vertically into the chambers by the retaining members, and reinforcing members disposed in said plastic material and spaced above the retaining members.

Signed at Macon in the county of Bibb and State of Georgia this 2nd day of October A. D., 1915.

GEORGE WALDRON MATHEWS.
RICHARD EDWARDS FINDLAY.