G. A. ZIKA.

REINFORCED CONCRETE BLOCK STRUCTURE, &c.

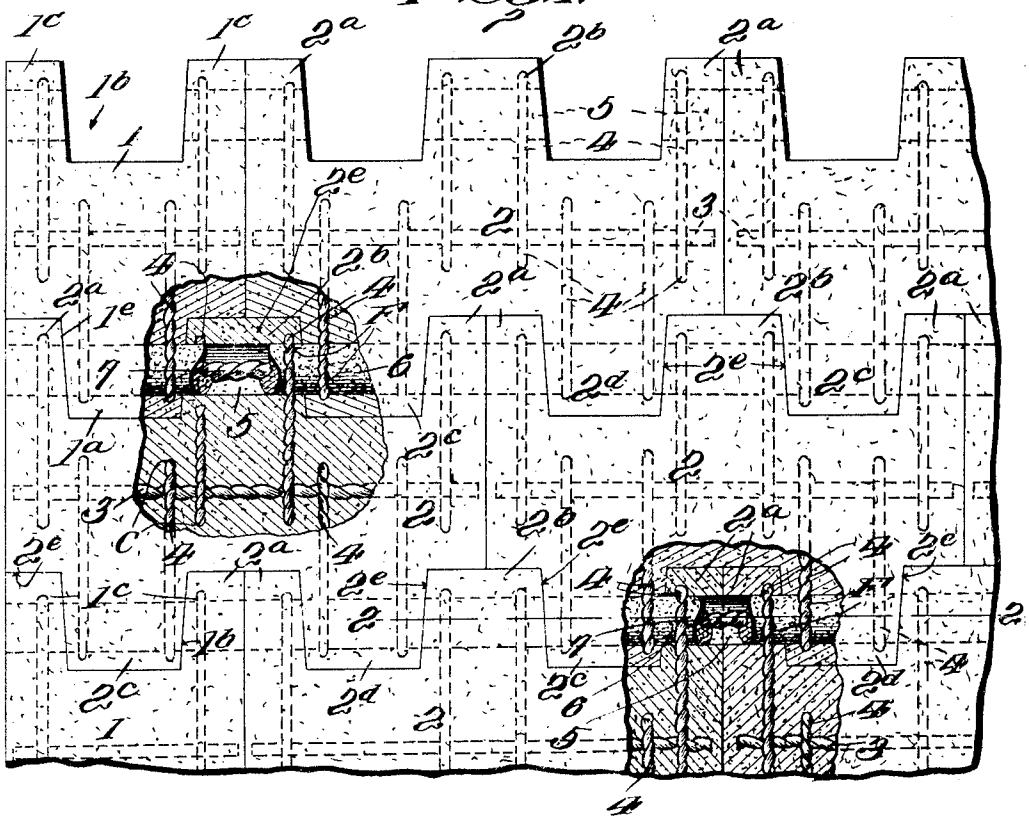
APPLICATION FILED JAN. 27, 1919.

1,322,390.

Patented Nov. 18, 1919.

2 SHEETS—SHEET 1.

FIG. 1.



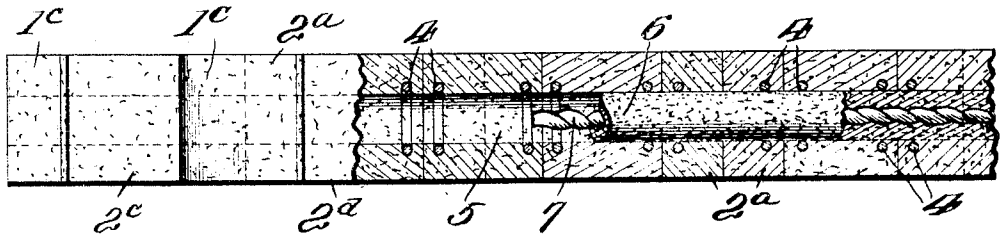


FIG. 2.

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2 SHEETS—SHEET 2.

FIG. 3.

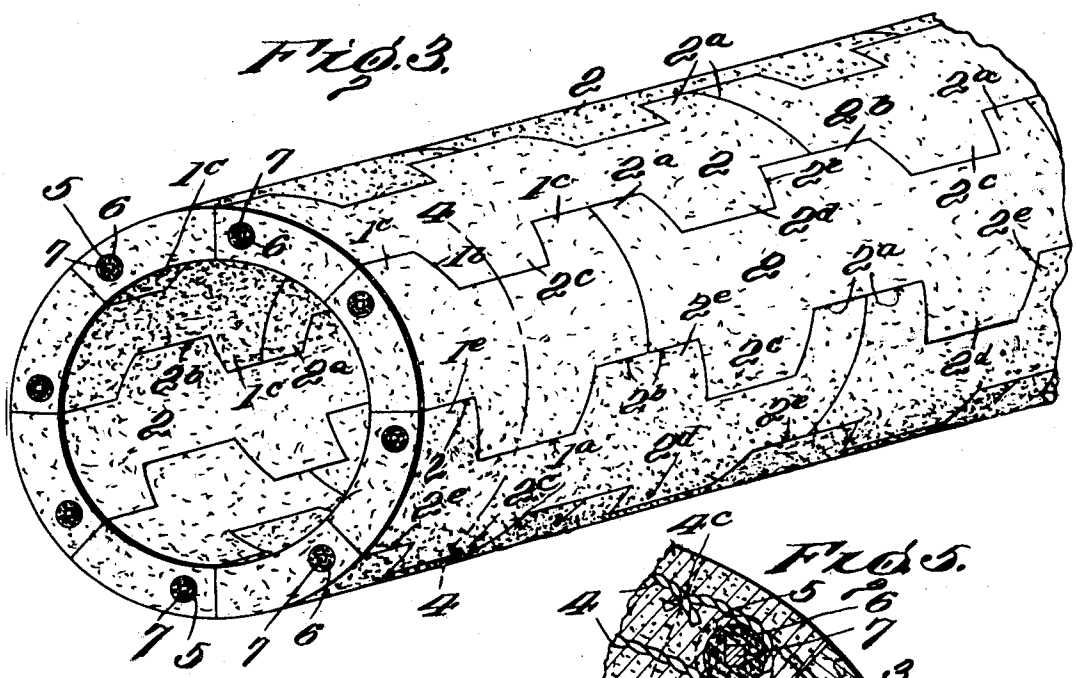


FIG. 5.

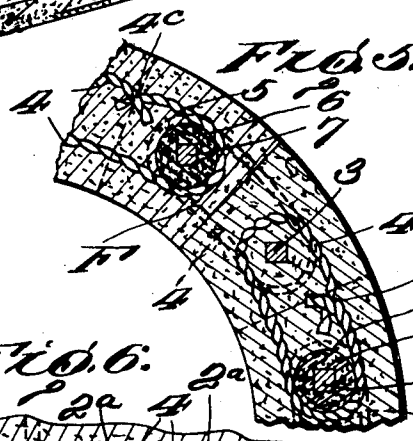


FIG. 4.

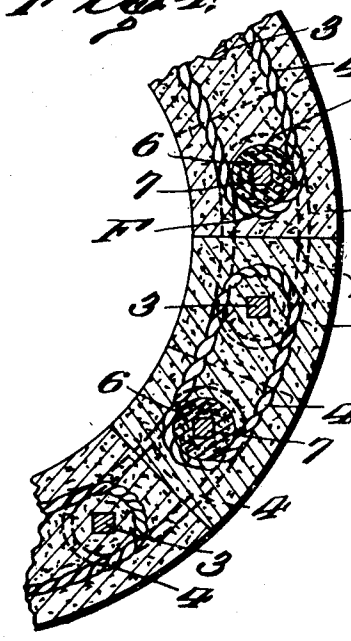
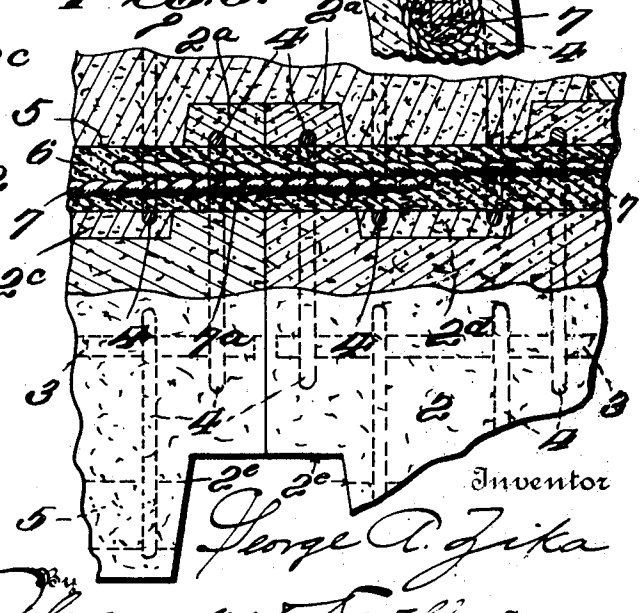


FIG. 6.



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UNITED STATES PATENT OFFICE.

GEORGE ALBERT ZIKA, OF OTTUMWA, IOWA.

REINFORCED-CONCRETE-BLOCK STRUCTURE, &c.

1,322,390. Specification of Letters Patent. Patented Nov. 18, 1919.

Application filed January 27, 1919. Serial No. 273,341.

To all whom it may concern:

Be it known that I, GEORGE A. ZIKA, a citizen of the United States, residing at Ottumwa, in the county of Wapello and State of Iowa, have invented certain new and useful Improvements in Reinforced-Concrete-Block Structures, &c.; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This invention has particular reference to the construction of culverts, sewers, silos and other structures of reinforced concrete or like material.

The object of the invention is to produce a construction which can be readily molded in sections or blocks and after they are assembled can be bonded together in a novel manner so that the whole forms a substantially integral reinforced concrete structure. The blocks can be made of various forms and sizes; which will interlock and can be readily assembled into various forms and structures. The blocks are preferably reinforced with metal so arranged that when the structure is completed the whole will be reinforced and bonded together both longitudinally and transversely in a novel manner.

I will explain the invention with reference to the accompanying drawings, which illustrate the essential features of the invention and one practical application thereof to enable others to readily understand, adapt and use the same; but I do not consider the invention restricted to the particular forms or constructions shown in the drawings and therefore in the claims I have summarized the novel essentials, and novel features of construction and novel combinations of parts for all of which protection is desired.

In said drawings:

Figure 1 is a diagrammatic view partly broken away of a series of interlocking blocks which are formed and bonded together in accordance with my invention.

Fig. 2 is a longitudinal section on line 2—2, Fig. 1.

Fig. 3 is a perspective view of part of a culvert or pipe constructed in accordance with my invention.

Fig. 4 is a detail sectional view of Fig. 3.

Fig. 5 is another detail sectional view of Fig. 3.

Fig. 6 is a detail sectional plan view partly broken away.

In the practical application of my invention I preferably mold blocks of the desired size and form from concrete or like material. In the drawings I have shown two forms of interlocking blocks, 1 and 2. The blocks 2 are used for the major portion of the structure, and are about twice the length of the blocks 1; or each block 1 may be considered as half of a block 2. Blocks 1 are principally used to complete or finish out the ends of a series or layer of blocks 2, as indicated in Figs. 1 and 3.

As shown each block 2 is preferably provided at one side with end projections 2^a and an intermediate projection 2^b spaced therefrom; and on its other side provided with spaced projections 2^c and 2^d. The spaces between the projections 2^a, 2^b correspond in form and location to the projections 2^c and 2^d on the other side of the block, and the spaces between the projections 2^c and 2^d correspond in size to the projections 2^b. The projections 2^a are preferably one-half the width and size of the projections 2^b. The recesses or spaces 2^e at the outer sides of the projections 2^c, 2^d correspond in size to the projections 2^a on the opposite side of the block. When two blocks 2 are abutted end to end their adjacent projections 2^a would enter and fill the space between the projections 2^c and 2^d of another similar block 2, as shown; and when two blocks 2 are arranged end to end the adjacent spaces 2^e correspond in size to one of the projections 2^b as shown. Any number of such blocks 2 may be arranged end to end and interlocked with a like parallel series of blocks 2 as indicated in the drawings.

The block 1 is preferably half the size of a block 2 and corresponds to one-half of a block 2, if the latter was transversely divided at center. Each block 1 has a recess 1^b on one edge corresponding in size to any one of the projections 2^b, 2^c or 2^d of a block 2; and has a projection 1^a on its other edge opposite the projection 1^b and corresponding in size thereto, and with the projection 2^c or 2^b of block 2. Block 1 has shoulders 1^c at opposite sides of the projection 1^a corresponding in size to the projections 2^a on block 2; and projections 1^c at opposite sides of recess 1^b corresponding in size to projections 2^a of the block 2.

When a block 1 is engaged with blocks 2, as indicated in Fig. 1, the outer end of

the block 1 will be flush with the outer ends of the blocks 2 with which it is interlocked, as shown in Figs. 1 and 3.

The projections and recesses of the blocks in adjacent series interlock and effectually prevent the blocks moving longitudinally relative to one another, or lengthwise in the assembled structure.

In molding each block a longitudinal opening 5 is preferably formed in each projection of the block for a purpose hereinafter explained.

Each block is preferably provided with longitudinal reinforcement 3 of metal which is shown as preferably disposed centrally of the block; but additional longitudinal reinforcements may be employed according to the width and thickness of the block. Each block is also provided with transverse reinforcement 4 of metal. The transverse reinforcement is preferably formed of a bar or strip of metal 4 bent into the form of a loop, and this reinforcement 4 preferably loops around the reinforcement 3, see Figs. 1–4 and 5; and such reinforcement 4 is preferably so arranged in the blocks as to extend from the reinforcement 3 into each of the projections 2^a, 2^b, 2^c and 2^d of each block 2, and similarly into the projections 1^a, 1^b of each block 1 as indicated in the drawings.

The arrangement of the reinforcements in each of the blocks is preferably alike. The ends of each loop reinforcement 4 may be united in any desired manner, or they may be over-lapped as indicated at 4^c in Fig. 4, and secured by being embedded in the concrete during the formation of the block.

I preferably use reinforcement 4 in the form of a loop, or at least make the portions of such reinforcement in the projections of the blocks in the form of loops or bends, so that such reinforcements can extend sufficiently around the longitudinal openings 5 formed in the several projections of the blocks and strengthen same, and serve to bond the blocks by engaging the tie bars in such openings.

When the blocks are assembled and interlocked as indicated in Figs. 1 and 3 the alined openings in the interlocked projections form continuous channels extending longitudinally of the series of blocks.

Preferably after two series of blocks are in position and interlocked as shown I fill such channels 5 with soft cement, or other substance, which when hardened forms a cement-core or tie bar 6, which bonds the interlocked blocks together.

Preferably also before the cement core 6 hardens, I reinforce this core by inserting any suitable metal reinforcement therein; which reinforcement may consist of a bar or bars 7 of suitable metal which reinforcement can be readily driven into the soft cement filling the channel 5. In some cases the holes 5 in the blocks could be filled with the soft concrete or like substance before assembling the blocks.

When the reinforcing bars 7 are forced into the fresh soft cement in the channels the cement is forced to spread and fill all crevices, and any slight openings between the blocks would be filled with the fresh cement displaced in the channel by the bar. When the cement sets it forms a solid concrete locking bar 6 reinforced with steel effectively preventing disengagement of the blocks. If desired a plurality of bars 7 may be used, or a series of short bars in place of long bars (see Fig. 6). In assembling the blocks with short bars 7^a such short bars 7^a should be driven in the channels so that their ends will overlap (as in Fig. 6). The cement core 6 will bond the various short bars 7^a together, and therewith form a complete reinforced bonding bar continuous from end to end of the structure. Short bars 7^a to be lapped and bonded by the cement cores 6, as described, would be convenient for shipping and installing.

By suitably curving the blocks they will when assembled form a complete tube or culvert (as in Fig. 3) reinforced both longitudinally and circumferentially, as shown.

Each block as stated is preferably reinforced, when molded, by one or more longitudinal bars 3 preferably extending full length of section; and by one or more transverse reinforcing bars 4 preferably making complete turns around bars 3 and openings 5 as shown. Therefore the interlocked projections of the blocks have reinforcing bars 4 extending from bars 3 to the locking bars 6 and 7; and these reinforcements (3—4—7) together form a complete interlocking system of metal reinforcing extending longitudinally and transversely throughout the series of blocks, and continuously around the culvert or pipe made from such blocks. The reinforcing extends as shown in Fig. 1 from each bar 3 to the adjacent bars 6, (or rods 7) throughout the structure.

I have shown two loop-bars 4 in each projection of the blocks, but their number can be varied as desired.

The shape of the blocks and the number of interlocking projections and recesses on the opposite sides thereof can be varied; the essentially novel features of the invention being the novel means for reinforcing the blocks and novel means for interlocking the blocks by metallic bonding.

The reinforcing loops 4 extending from opposite sides of bar 3 would pull thereon in opposite directions and thus give a perfect shear on bar 3 at the point C, Fig. 1. The reinforcing loops 4 in the interlocked projections of adjacent blocks would also pull on opposite sides of the locking core bar 6 and bar 7 therein, as indicated at F (Fig. 1).

Thus I obtain a complete chain of reinforcing through the whole structure, and extending entirely around a pipe or culvert formed from such blocks, by using the loop reinforcement bars 4, the longitudinal reinforcement bars 3, and longitudinal tie bars 6 and 7.

When a culvert is formed out of such blocks, as indicated in Figs. 3–5 it is as uniform rigid and permanent as if built in one solid and continuous piece; and there are no openings and no exposed metal reinforcement.

When the blocks are formed into a tube as in Fig. 3 the bars 7 below the center of the tube will take up tension; and such tube would act as a beam or girder, and, if supported at each end, will not sag.

The blocks are preferably made in such size that they can be easily handled by one or two men to save cost in handling and hauling.

The blocks could be pressed while damp after being moulded to eliminate any voids and to fully protect and preserve all steel embedded therein. The bars 7 and 7^a when properly placed will be as completely embedded and preserved in the concrete as in a unitary structure.

It would be impossible to remove any block from the structure after it is completed as the blocks are locked permanently together, and at the same time the reinforcing is continuous both longitudinally and transversely.

The invention can be readily adapted and used for flat, square, curved, angular and other shapes and forms of blocks according to the form of the ultimate complete structure it is desired to make therefrom. It will be seen that the invention is not limited to any particular form or size of blocks, which would vary according to the size and character of the structure to be built therefrom.

What I claim is:

1. A structure of the character described, composed of adjacent series of blocks having interlocking projections and recesses on their abutting sides, the projections being provided with openings forming continuous channels throughout the interlocked projections in adjacent series of blocks, longitudinal concrete bars filling such channels and bonding the sections together, each block having transverse metal reinforcement embedded therein extending into the projections thereof and tying the blocks to the longitudinal concrete tie bar.

2. A structure of the character described, composed of adjacent series of blocks having interlocking projections and recesses on their abutting sides, the projections being provided with openings forming continuous channels throughout the interlocked projections in adjacent series of blocks when the same are assembled, said channels being filled with concrete forming longitudinal concrete tie bars bonding the sections together; each block having longitudinal metal reinforcement embedded therein, and transverse metal reinforcement embedded therein and extending into the projections and bonding the longitudinal reinforcement to the longitudinal tie bars, substantially as described.

3. A structure of the character described, composed of adjacent series of blocks having interlocking projections and recesses on their abutting sides, the projections being provided with openings forming continuous longitudinal channels throughout the interlocked projections in adjacent series of blocks; said channel being filled with concrete forming a longitudinal concrete bar bonding the sections together, said concrete bar being reinforced by longitudinally disposed metal bars embedded therein; each block having transverse metal reinforcements embedded therein extending into the projections thereof and surrounding the openings therein and bonding the blocks to the longitudinal concrete tie bar, substantially as described.

4. A structure of the character described, composed of a series of blocks having interlocking projections and recesses on their abutting sides, the projections being provided with openings forming continuous longitudinal channels throughout the interlocked projections in the adjacent series of blocks when the same are assembled; said channels being filled with concrete forming longitudinal concrete bars bonding the sections together, said concrete bars being reinforced by longitudinally disposed metal bars embedded therein; each block having longitudinal metal reinforcement and transverse metal reinforcement embedded therein, the transverse reinforcement extending around the longitudinal reinforcement and into the projections thereof, and surrounding the openings in the projections, and bonding the blocks to the longitudinal bars, substantially as described.

5. In a structure of the character described; in combination, blocks having interlocking projections and recesses interlocking the rows, the projections having openings which form channels when the projections are interlocked; and a tie bar in said channel; each block having longitudinal reinforcement and a transverse reinforcement extending into the projections; whereby when the blocks are assembled into a structure the adjacent blocks in such structure are bonded together both longitudinally and transversely.

6. In a structure of the character described, blocks having interlocking projections and recesses, the projections having

openings which when the blocks are interlocked form a channel; and a tie bar in said channel; each block having longitudinal reinforcement and transverse reinforcement; said transverse reinforcement surrounding the longitudinal reinforcement and extending into the projections; whereby when the blocks are assembled into a structure the adjacent blocks in adjacent rows in such structure are bonded together both longitudinally and transversely.

7. In a structure of the character described; in combination, adjacent rows of blocks having interlocking projections and recesses interlocking the rows, the interlocked projections having openings which form a channel; each block having a longitudinal reinforcement and provided with transverse reinforcement surrounding the longitudinal reinforcement and extending into the projections and around the openings therein; and a tie bar in said channel; whereby when such blocks are assembled into a structure the adjacent blocks in adjacent rows in such structure are bonded together both longitudinally and transversely.

8. In a structure of the character described, adjacent rows of blocks having interlocking projections and recesses, the interlocking projections having openings which when the projections are interlocked form a continuous channel; each block having a longitudinal reinforcement and provided with a transverse reinforcement surrounding the longitudinal reinforcement and extending into the projections and around the openings therein; and a tie bar in said channel; whereby when the blocks are assembled into a structure the adjacent blocks in adjacent rows in such structure are bonded together both longitudinally and transversely, substantially as described.

9. A reinforced block of concrete or like material for the purpose specified, provided with projections and recesses, the projections being provided with longitudinal openings for the reception of locking members when similar blocks are assembled in adjacent rows, said block also having longitudinal reinforcement and transverse reinforcement extending from the longitudinal reinforcement into each of the projections; whereby the block when assembled in a structure is bonded transversely throughout, substantially as described.

10. A reinforced block of concrete or like material for the purpose specified, provided with projections and recesses on its opposite sides adapted to engage corresponding recesses and projections of similar adjacent blocks, the projections being provided with longitudinal openings for the reception of locking members when the blocks are assembled; said block also having longitudinal metal reinforcement, and transverse metal reinforcement extending from opposite sides of the longitudinal reinforcement into the projections, substantially as described.

11. In a structure of the character described; adjacent rows of blocks having interlocking projections, the interlocking projections having openings which when the blocks are assembled form a channel; each block having a central longitudinal bar, and transverse reinforcement surrounding the central bar and extending from opposite sides of said bar into the projections on opposite sides of the block; and a tie bar in said channel; the reinforcements being so disposed in the blocks relatively to the tie bar that when the blocks are assembled into a structure the transverse reinforcements in adjacent blocks are interlocked by the longitudinal tie bar, and the structure is reinforced both longitudinally and transversely throughout.

12. In a structure of the character described; adjacent parallel rows of blocks having interlocking projections and recesses interlocking the adjacent rows, the interlocked projections of the blocks in adjacent rows having openings which when the blocks are interlocked form a continuous channel extending longitudinally of the rows; and a tie bar in said channel; said blocks having reinforcement extending into the projections and around the openings therein whereby the tie bar is bonded to blocks in adjacent parallel rows and on opposite sides of the tie bar.

In testimony that I claim the foregoing as my own, I affix my signature.

GEORGE ALBERT ZIKA.