H. J. CATHROE.

SEWER CONSTRUCTION.

APPLICATION FILED APR. 23, 1917.

1,367,511.

Patented Feb. 1, 1921.

2 SHEETS—SHEET 1.

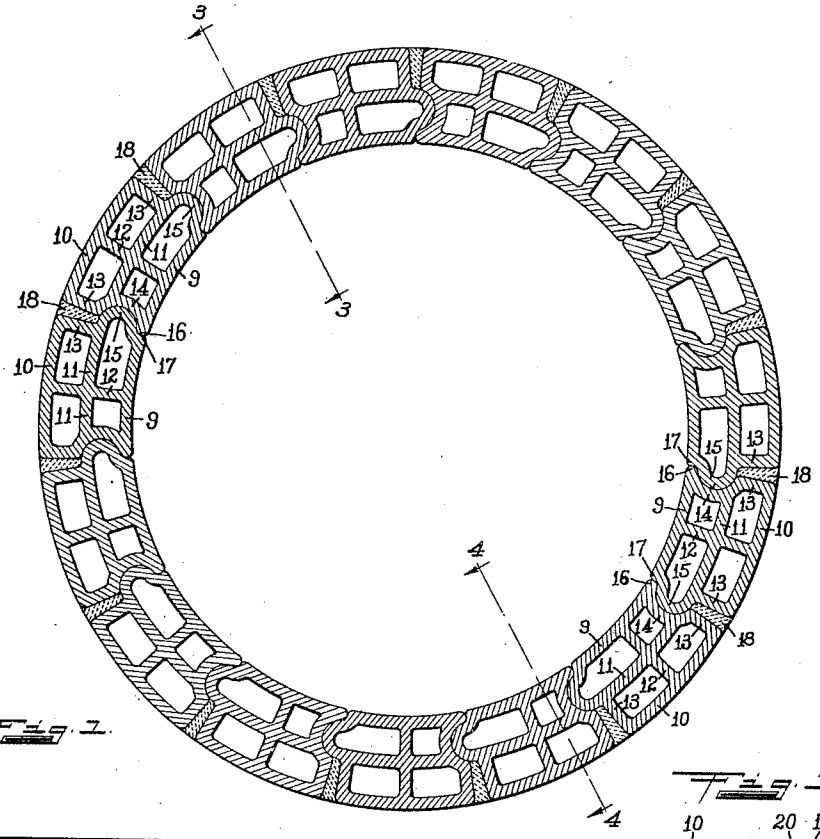


Fig. 1.

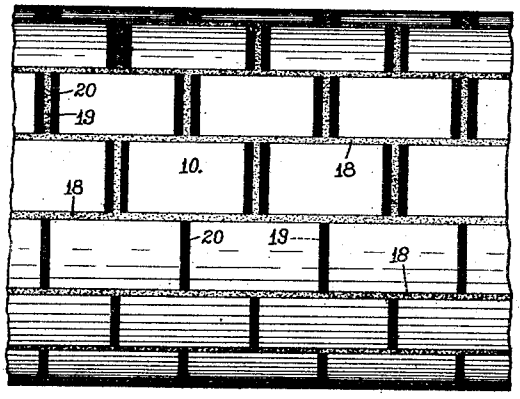


Fig. 2.

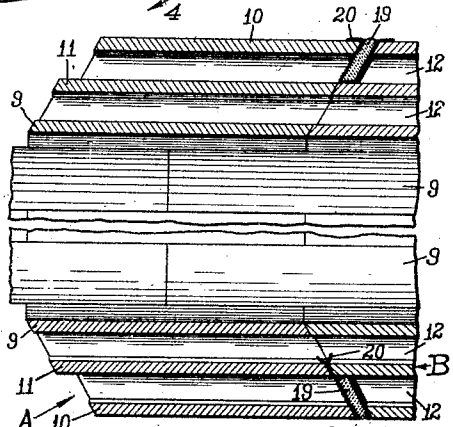


Fig. 4.

Fig. 3.

Witness:

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2 SHEETS—SHEET 2.

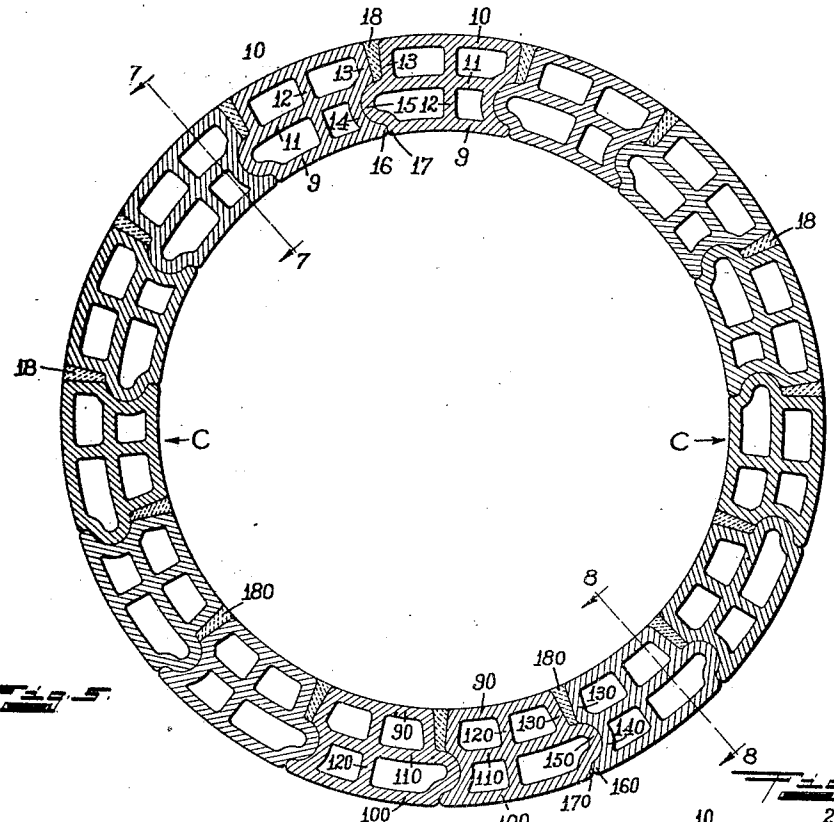


Fig. 5.

Fig. 7.

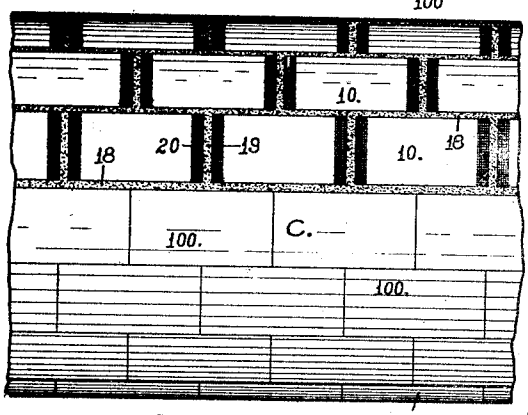


Fig. 6.

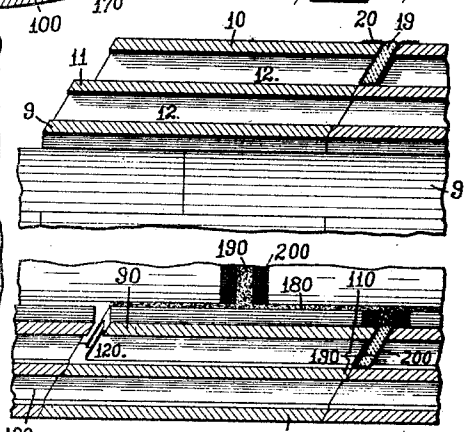


Fig. 8.

Witness:

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UNITED STATES PATENT OFFICE.

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SEWER CONSTRUCTION.

1,367,511. Specification of Letters Patent. Patented Feb. 1, 1921.

Application filed April 23, 1917. Serial No. 164,075.

To all whom it may concern:

Be it known that I, HAROLD J. CATHROE, a citizen of the United States, and a resident of Omaha, in the county of Douglas and State of Nebraska, have invented certain new and useful Improvements in Sewer Construction, of which the following is a specification.

My invention relates to the construction of sewers or like tubular conduits, and particularly to structures of this class formed from hollow blocks or tiles laid together with joints or bonds of plastic material such as cement between them. It is the object of my invention to provide a structure of this class in which plastic bonding material is securely retained in the joint-spaces between the blocks, so as not to be liable to displacement therefrom after completion of the structure; to provide blocks or units of such form that in the assembled structure each of the same may have a direct bearing or engagement at all sides with the adjacent blocks or units; to provide blocks of such form that the same may be first placed in assembled relation and the plastic bonding material afterward placed in the joint-spaces between them; to provide means for confining the bonding material or cement adjoining the hollow or open end-portions of the blocks; and to provide in structures of this class certain other advantageous features which will be more fully set forth hereinafter.

In the acompanying drawings, Figure 1 is a transverse sectional view of a structure embodying my invention, Fig. 2 is a side view of the same, Figs. 3 and 4 are detail longitudinal sections thereof on the lines 3—3 and 4—4, respectively, of Fig. 1, Fig. 5 is a transverse section of a modified form of the structure, Fig. 6 is a side view of the same, and Figs. 7 and 8 are detail longitudinal sections on the respective planes of the lines 7—7 and 8—8 of Fig. 5.

In carrying out my invention the sewer or conduit is constructed of tiles or blocks which are preferably of uniform size throughout the structure, and in that embodiment of the invention shown in Figs. 1 to 4, inclusive, all of the blocks are of identical form. Each of said blocks has an inner wall 9, an outer wall 10 and an intermediate wall 11, all curved transversely of the block, and extending concentrically to a common axis. A web or plate 12, extending radially of said axis, connects the central portions of the curved walls 9, 10 and 11. The outer side-portions of each block, adjoining the lateral edges of the wall 10, are formed by flat portions 13 which are substantially radial to the axis of curvature of the walls. The inner side-portions 14 and 15, adjoining the lateral edges of the wall 9, are semi-cylindrical in form, being concave and convex respectively, so that the concave portion 14 of one block forms a seat or bearing for the convex portion 15 of the adjoining block. The surfaces of the seat-portions 14 and 15 are of like curvature and are adapted to fit together without leaving a space between them for bonding material. Preferably at the juncture of the concave portion 14 and the inner wall 9 there is a convex rounded portion 16 which is adapted to fit in a concave seat 17 provided at the juncture of the parts 9 and 15 of the adjoining block. The lateral portions of the blocks are so proportioned that when the parts 14, 15, 16 and 17 of two blocks are fitted together the flat side-portions 13 are spaced or held apart to form a space or recess between them for receiving plastic bonding material 18, such as cement-mortar. The end-surfaces of the blocks are beveled or inclined to the axis of the conduit, parts of said end-surfaces being adapted to fit directly together without having bonding material between them, and other parts being spaced to receive bonding material 19, as shown in Figs. 3 and 4. The spaced portions of the end-surfaces are preferably provided by offsetting or shouldering one end of each block, as by cutting back or shortening the outer wall 10, the side-portions 13 and the outer portion of the center-web 12, so that the end-surfaces thereof are in a plane parallel with the end-surfaces of the full-length portions formed by the inner wall 9, the intermediate wall 11, and the connecting radial parts between said inner and intermediate walls. For preventing the bonding material 19 flowing into the longitudinal openings or passages through the blocks, said material is partially confined by sheets or strips 20 of thin loosely-woven

fabric or cloth, disposed as hereinafter described.

It will be noted that in the described structure the inner portions of the sides and ends of the blocks are all adapted to have a direct bearing or engagement with the corresponding portions of the adjoining blocks, while the outer portions of the sides and ends are spaced to receive the bonding material 18 and 19. The method of assembling those blocks forming the lower portion of the sewer or conduit differs somewhat from the method of assembling the upper half or arch thereof. Ordinarily, the structure is assembled in a suitable trench or excavation, of which the bottom is rounded to the radius of the sewer-wall, thus providing a formed support for the lower half of the structure. In assembling said lower portion of the structure a longitudinal row of the blocks is first laid at or near the center of the bottom of the trench, and the bonding material 19 is introduced between the successive blocks of the row as they are laid, being effected as follows: Referring to Fig. 4, and assuming the block A to be in position and the block B about to be placed, a suitable quantity of the cement or other bonding material is inclosed in the fabric strip 20 by placing the cement upon a part of the fabric and folding another part thereof over the plastic mass, the same then being laid against the inclined end-face of the block A at the lower part thereof, with the edges of the fabric 20 extending above the end of the intermediate wall 11. The shouldered end of the second block B is then placed against the first, so that the edges of the fabric are held between the ends of the walls 11, while the fabric-confined plastic material fills the space provided therefor by the shoulder of the block B. Obviously, the plastic material may bulge out somewhat into the ends of the longitudinal openings through the blocks, but this is unobjectionable since the bulging is so limited by the fabric as to prevent waste of the bonding material, while the slight bulge serves to securely lock the blocks together after the cement has hardened. After laying the first row of the blocks, as described, bonding material is distributed along the lower side-portions 13 of said blocks in sufficient quantities to fill the joint-spaces between the same and the succeeding rows of blocks, which are then laid and their end-joints bonded as before. Preferably the successive rows of blocks are placed so as to "break joints;" that is, so that the ends of the blocks of one row are opposite the centers of the blocks of the adjoining rows.

After the assembling of the lower portion of the structure, as described, a suitable form or centering arch is arranged in position to support the upper half or arch of the conduit while the same is being assembled. In the construction of said arch or upper portion of the structure any number of the blocks may be laid together in proper position, and the bonding material subsequently placed in the joint-spaces between the upper edge-portions thereof, it being apparent that the open edges of said joint-spaces are exposed and accessible, and that the plastic bonding material may be flowed thereinto so as to perfectly fill and seal the joints. Referring to Fig. 3 it will be seen that the fabric strips 20 may be laid into the end joint-spaces, the edges of the strips turned out over the upper surfaces of the blocks, and the material 19 poured into the pocket formed by the fabric, the latter preventing the plastic material flowing into the longitudinal openings of the blocks more than to form a slight bulge at each side. After having filled the joint-spaces and allowed a sufficient time for the cement to set, the centering or supporting falsework is removed as usual.

In the modified form of the structure shown in Figs. 5 to 8, inclusive, the upper half or arch thereof is constructed in the same manner as that first described, the blocks being of identical form and arrangement. The blocks of the lower portion of the structure are of such form, however, that the open joint-spaces are at the inner or upper sides thereof instead of being at the outer or lower sides thereof as in the first instance. Thus the flat side-portions 130 are adjacent to the inner wall 90, the concave and convex seat-portions 140 and 150, and the secondary seat-portions 160 and 170 are adjacent to the outer curved wall 100, and the end joint-spaces are formed by shortening the inner wall 90 and the adjacent radial portions extending out to the intermediate wall 110. At the sides or flanks of the conduit there are rows of blocks C of which the upper sides are formed to correspond with the blocks of the arch, while the lower sides are formed to correspond with the blocks of the trough or bottom-portion of the structure. It will be seen that the plastic bonding material 180 and 190 may be placed in the joint-spaces after the blocks have been laid in place, in substantially the same manner as for the upper portion or arch of the conduit.

In the construction of sewers from tile-blocks of the forms heretofore used, it has been attempted to provide a layer of bonding material extending throughout between the contiguous sides of the blocks. This can be effected only with considerable difficulty, particularly when laying blocks at the top of the arch, where it becomes necessary to plaster the cement onto the sides of the blocks already laid, and then push the last block of the arch longitudinally into place

between them, during which a part of the cement is scraped off, resulting in loose and imperfectly bonded joints at the top of the arch which is the most vital portion of the structure. It is found in practice that the inner or lower edges of the joints are particularly liable to be defective, and that any attempt to plaster or "point up" the joints from the lower side of the arch is not only expensive but is usually ineffective, since the material plastered into the joints soon falls out. Even where the plastered material is well united with the other bonding material, acid fumes and the like developed from the sewage soon cause the material to become loose so that it will crumble and fall out of the joint.

In the structure provided by my invention it will be seen that these difficulties and disadvantages are avoided. The contiguous sides of the blocks all have a direct bearing upon each other, the bonding material is not exposed to the action of the sewage, and said bonding material cannot possibly be displaced from the joint-spaces after the structure is completed and covered over with earth. As the joint-spaces of the arch, or of the entire structure in the modified form thereof, are filled with the bonding material subsequent to the laying of the blocks, the spaces being such that the material may be readily placed therein, there is no probability of the joints being inefficiently bonded, and the strength and permanence of the structure are assured.

Now, having described my invention, what I claim and desire to secure by Letters Patent is:

1. In a structure of the class described, a wall comprising a plurality of blocks each having its edge portions adjacent to one face of the wall seated directly against the corresponding edge portions of the adjacent blocks and provided with coacting interlocking portions adapted to permit the blocks to be assembled in a structure prior to the application of the bonding material, the lateral extent of the directly seated edge portions being substantially one-half the thickness of the wall and forming a hinge joint located at one side of the center of the edges of the blocks, the remaining portions of the blocks being spaced apart to provide a joint-space for receiving bonding material, said joint-space extending to the face of the wall opposite that adjoining the directly seated edge portions of the blocks, and the width of said joint-space at said face of the wall being not less than its width in any plane parallel with said face.

2. In a structure of the class described, a wall comprising a plurality of adjoining longitudinal rows of blocks, the end and side portions of each block adjacent to one face of the wall directly and continuously engaging the contiguous blocks, said directly engaged portions of the blocks having a lateral extent of substantially one-half the thickness of the wall and having interlocking and engaging portions forming a hinge joint at one side of the center of the edges of the blocks and adapted to hold the remaining side portions of the blocks in definitely spaced relation to each other whereby to form spaces for the reception of bonding material and said spaces extending to that face of the wall opposite the directly engaged portions of the blocks and being not less in width at the face of the wall than at any other part thereof.

3. In a structure of the class described, a wall comprising a plurality of blocks disposed edge to edge, said edges directly and continuously contacting with each other from one face of the wall to a plane intermediate of the wall faces, said directly contacting edges of the blocks having interlocking engaging and holding portions forming hinge joints at one side of the center of the edges of the blocks and holding in definitely spaced relation to each other, the edge portions from said intermediate plane to the face of the wall opposite that first mentioned, the space between said spaced edge portions having a slight taper inward and bonding material filling only the spaces between the last mentioned edge portions of the blocks, the coacting interlocking portions permitting the assembling of the blocks in a structure prior to the application of the bonding material.

4. A sewer block comprising spaced, concentric cylindro-curvilinear walls and radially extending connecting side portions, said connecting side portions having concave and convex longitudinally extending bearing or seat portions adjoining one of said walls, said bearing or seat portions having identical contoured surfaces whereby to directly and continuously engage the side portions of like blocks and permit the blocks to be assembled in a sewer construction prior to the application of bonding material, said bearing or seat portions forming a hinge joint at one side of the center of the edges of the blocks, and the remaining parts of said side portions being plane surfaces and maintained at substanially uniform spaces from the corresponding parts of like blocks engaged by said side portions.

5. A block for use in arch-portions of sewer walls comprising inner and outer cylindro-curvilinear walls, concaved and convexed longitudinally extending interlocking bearing or seat portions at the sides of the blocks adjoining the lateral edges of the inner walls, said seat portions having identical contoured surfaces adapting the same to directly and continuously engage the seat

portions of like blocks, said seat portions extending from the inner wall outwardly to a plane intermediate the same and the outer wall and forming hinge joints at one side of the center of the edges of the blocks and, side portions substantially radial to the axis of curvature of the walls and extending from the outer edges of the seat portions to the outer wall, said side portions being maintained at a substantially uniform spacing from the side portions of like blocks when the seat portions of the blocks are in contact.

H. J. CATHROE.