W. C. FLANNERY.

SEWER, AQUEDUCT, OR LIKE CONDUIT.

APPLICATION FILED SEPT. 3, 1913.

1,120,706.

Patented Dec. 15, 1914.

2 SHEETS—SHEET 1.

Fig. 1.

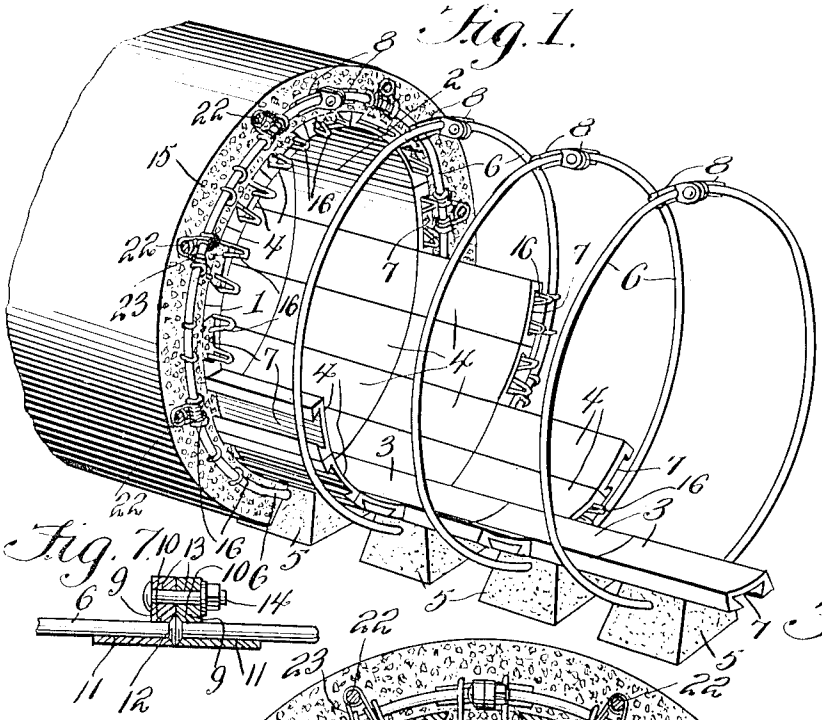


Fig. 7.

Fig. 8.

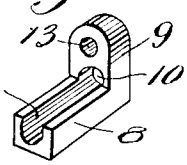


Fig. 2.

WITNESSES

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2 SHEETS—SHEET 2.

Fig. 3.

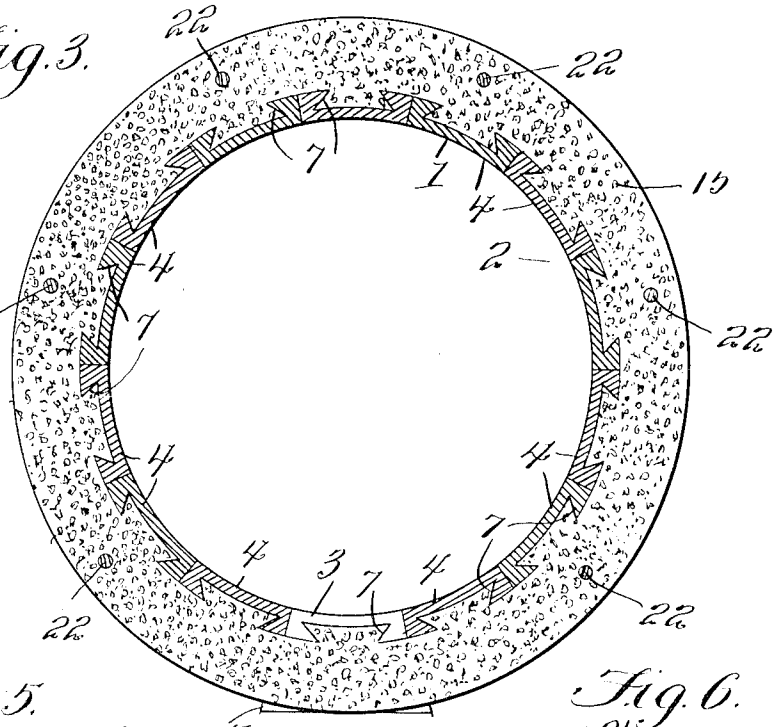


Fig. 5.

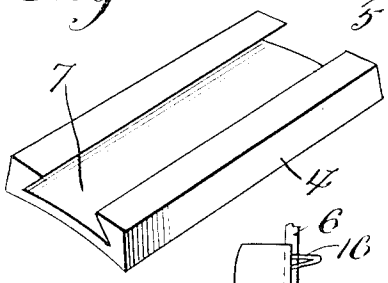


Fig. 6.

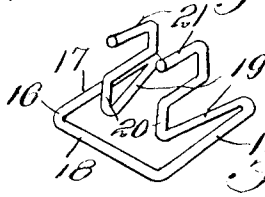


Fig. 9.

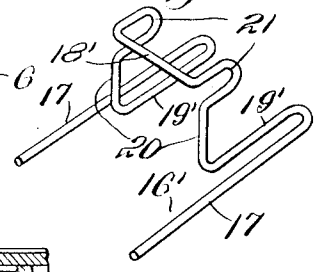


Fig. 4.

WITNESSES

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UNITED STATES PATENT OFFICE.

WILLIAM C. FLANNERY, OF WASHINGTON, DISTRICT OF COLUMBIA.

SEWER, AQUEDUCT, OR LIKE CONDUIT.

1,120,706. Specification of Letters Patent. **Patented Dec. 15, 1914.**

Application filed September 3, 1913. Serial No. 788,016.

To all whom it may concern:

Be it known that I, WILLIAM C. FLANNERY, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Sewers, Aqueducts, or like Conduits, of which the following is a specification.

My invention relates to improvements in the construction of sewers, aqueducts and like conduits of the general type disclosed in my prior applications, No. 639,454, filed July 19, 1911 and No. 683,317, filed March 12, 1912, wherein the sewer or other conduit is formed of a built-up inner wall, lining or shell of tiles, an outer wall of concrete, and a supporting means for, among other functions, holding the said inner wall, lining or shell in spaced relation to the bed of the trench, to sustain the shell during the process of erection and allow the concrete to be filled in on all sides about the same, whereby such supporting means is embedded or invested with the shell in the concrete and forms a part of the completed conduit, thus obviating the necessity of employing forms or false work and securing the attendant advantages set forth in said prior applications.

The object of the present invention is to provide a novel construction of skeleton framework including rings or bands for supporting and holding the tiles assembled, and novel means for coupling the tiles and firmly fastening the same to the rings or bands, all of which elements are embedded in and monolithically bound together by the outer concrete wall.

A further object of the invention is to provide novel frame units, each including a ring or band, a bottom or starting tile and a concrete pedestal in which the said ring or band and bottom tile are fastened, whereby units of the character described may be easily and quickly assembled to form a frame structure to receive the remaining tiles, the pedestals carrying the rings or bands serving to support the structure in position *ab initio* from and above the bed of the trench, so that the concrete may be readily filled in to envelop and bind all the component parts together, whereby the use of forms and other falsework may be avoided.

A still further object of the invention is to provide a novel construction of grooved interlocking tiles and fasteners, whereby the tiles may be easily and quickly set up, coupled together and fastened to the supporting rings and said tiles held spaced from the rings, allowing the concrete to fill all interstices and firmly bind and interlock all parts together to provide a conduit formed of a minimum amount of material and yet having great strength and durability.

With these and other objects in view, which will appear as the nature of the invention is better understood, the invention consists in the features of construction, combination and arrangement of parts hereinafter fully described and claimed, reference being had to the accompanying drawings, in which:—

Figure 1 is a fragmentary perspective view of a sewer or like conduit embodying my invention, showing a portion of the conduit completed and the remainder in process of erection. Fig. 2 is a vertical transverse section through the conduit in the plane of one of the rings or bands. Fig. 3 is a similar view taken on a plane between adjacent rings or bands. Fig. 4 is a vertical longitudinal section through that portion of the conduit which is in process of erection. Fig. 5 is a perspective view of one of the tiles. Fig. 6 is a similar view of one of the fasteners. Fig. 7 is a cross section through connected coupling members and the ends of a supporting ring or band held thereby. Fig. 8 is a perspective view of one of the coupling members. Fig. 9 is a perspective view of a modified form of fastener.

In the construction of a sewer or like conduit embodying the principles of the present invention, I provide an inner wall, lining or shell 1, built up into the desired cross sectional shape or contour to bound and inclose the sewer passage or channel 2, the said wall, lining or shell 1 being formed of united segmental tiles 3 and 4, all of which are of similar construction. These tiles may or may not be arranged to break-joint throughout the length of the sewer and may be and preferably are of an acid-proof or acid-resisting character. In practice, ordinary salt-glazed tiles may be used with advantage, which tiles are made in different sizes to suit the diameter of the conduit to be constructed. The tiles may be shaped to produce an inner wall, lining or shell which may be of circular form in cross section, as shown, or of any other desired cross sectional contour.

The body of tiles forming the inner wall, lining or shell 1 are sustained and supported at all times by concrete blocks or pedestals 5, and vertical transverse frame rings or bands 6. The said concrete blocks or pedestals 5 are preferably of frusto-pyramidal form and rest upon the bed or base of the sewer trench. The rings or bands 6, which may be of the split type, as shown, extend through and are embedded at their bottom portions in the pedestals 5 and are arranged in spaced relation to each other, so as to form with the pedestals a skeleton framework to hold the tiles assembled and supported above the bed of the trench.

The blocks or pedestals may be molded exteriorly of the trench and placed in position therein, or molded or otherwise formed within the trench, a mold of suitable character being employed whereby the rings or bands 6 and the tiles 3 may be permanently embedded and fastened in the pedestals in the process of producing the latter. All of the tiles 3 and 4 are provided in their rear faces with longitudinally extending dove-tailed grooves 7, and, as shown, the bottom tiles 3 rest directly and centrally upon the pedestals 5, each tile 3 extending to like degrees in opposite directions longitudinally beyond its supporting pedestal. The rings or bands 6 may be constructed of bar iron, hoop iron or any other suitable type of iron or steel, bent into the required shape, and the ends thereof are united by grooved or channeled coupling members 8 having abutment lugs 9 provided with openings 10 communicating with the grooves or channels 11 for the reception and passage of the ends of the ring or band which are suitably upset or headed as at 12 to hold them in position. Openings 13 are also formed in the lugs for the passage of bolts 14 or the like, whereby the coupling members are held united.

For convenience of description, the tiles 3 may be termed "starting tiles" and the tiles 4 "forming tiles." In the process of erecting a sewer or like structure, units of the character described, each including a pedestal, frame ring and starting tile are arranged at proper intervals apart along the base or bed of the sewer trench, with the rings 6 vertically disposed and arranged at right angles to the line of the trench and the ends of the starting tiles 3 in abutting relation. The ends of the tiles 3 are then fastened together and the tiles 4 filled in and fastened to each other and to the frame rings to form the inner wall or lining 1, after which the rigid, self-sustaining shell thus produced is embedded or invested in an outer surrounding wall 15 of concrete. As will be obvious, the pedestals 5 form supports for the built up inner wall or shell which hold the same above the base or bed of the sewer trench, allowing the concrete to be filled in at all points to invest the pedestals and shell and form a monolithic structure of great strength and durability, the pedestals or supporting means accordingly becoming a component part of the sewer, whereby the use of forms and other falsework may be dispensed with.

For the purpose of initially holding the parts assembled, and strengthening and reinforcing the structure as a whole, I provide fasteners 16, each formed of stout spring wire and comprising a U-shaped body portion including parallel resilient arms 17 connected at one end by a transverse portion 18. From the free ends of the arms 17, the wire is extended inwardly on converging lines toward the cross piece 18 to provide inner arms 19, the arms 17 themselves forming engaging or gripping members and the arms 19 coöperating therewith to also form gripping or engaging members. The wire extends from the free ends of the arms, which terminate about midway of the length of the body portion in right angular offsets or projections 20 which terminate at their free ends in engaging hooks 21.

The body portions of the fasteners are adapted to engage and interlock with the dove-tailed grooves 7 of the respective tiles. A fastener of the character described is employed for initially connecting each starting tile 3 with the frame ring or band 6 used in conjunction therewith to produce the structural unit. The body portion of this fastener is engaged with the dove-tailed groove of the tile midway of the length of the tile, while the hooks 21 of the fastener are engaged with the adjacent portion of the ring or band, thus holding the tile fastened upon the ring or band but in spaced relation thereto, so that the parts named may be embedded in the concrete forming the pedestal 5, which will also interlock with the dove-tailed groove in the tile and bind the elements firmly together. Fasteners of the type described are also employed to fasten the abutting ends of the starting tiles 3 together, the body portions of the fasteners being arranged so as to engage the grooves at the ends of adjoining tiles to couple the same together. In like manner fasteners of the character described are also employed to couple the ends of the tiles 4, while the hooks 21 of the fasteners engage the rings or bands 6 to hold the tiles 4 in position thereon. After the structural units have been assembled in the manner described, the forming tiles are placed in position on opposite sides thereof so as to close the spaces between adjoining rings or bands and form the self-sustaining shell, all the tiles being thereby firmly supported in position to produce the wall or lining 1 and a sustaining framework therefor, and as soon as the tiles 4 are assembled upwardly from the tiles 3 to

the desired elevation the work of filling in the concrete at the base of the sewer commences, and the operation of assembling the forming tiles and filling the concrete continues until the structure is completed.

It will be observed from the foregoing description that by means of fasteners of the character described the elements of the body structure of the sewer or conduit may be easily, conveniently and rigidly assembled, and that when the parts are assembled the fasteners hold the tiles in spaced relation to the rings or bands allowing the concrete composing the walls 15 to fill the dove-tailed grooves in the tiles, which accordingly become firmly embedded with the fasteners and the frame rings or bands in the concrete wall. The fasteners, in addition to performing the functions described, further serve as invested reinforcing elements, but if desired longitudinally extending reinforcing rods 22 may also be employed and united to the frame rings by wires or other tiles 23, so as to be embedded in the concrete when the latter is filled in. It will therefore be evident that the invention provides a type of sewer or analogous structure which may be easily, rapidly and cheaply produced and which, by the use of salt-glazed or equivalent titles, may be made of an acid-proof character, the tiles constituting at one and the same time the inner wall of the passageway and the protecting lining bounding the sewer passage.

The fasteners employed may be modified to a considerable extent within the scope of the invention. In Fig. 9 I have shown one form of modification which may be employed, the fastener 16′ in this instance being also made of a single piece of wire and of the same general construction as the fastener 16, except that the arms 17 are formed by the ends of the wire, while the cross piece 18′ connects the hooks 21 and the arms 19′ extend parallel with the arms 17.

Having thus described my invention, what I claim is:—

1. A sewer, aqueduct, or like conduit, comprising spaced concrete pedestals, metallic frame rings embedded at their bases in the pedestals, an inner wall or shell formed of assembled tiles sustained by the frame rings and pedestals and including starting tiles embedded in the pedestals, and an outer wall of concrete investing the aforesaid elements and extending at the base of the conduit through the space between the pedestals.

2. A sewer, aqueduct, or like conduit, comprising spaced concrete pedestals, metallic rings or bands embedded in and supported by said pedestals, an inner wall or shell of tiles supported by the pedestals and frame rings, and an outer wall of concrete in which the aforesaid elements are invested.

3. A sewer, aqueduct or like conduit comprising concrete pedestals arranged at intervals along the bed of the sewer trench, frame rings or bands carried by said pedestals, an inner wall or lining of assembled tiles, fasteners engaging the frame rings and tiles and supporting the tiles in spaced relation to the frame rings, and an outer wall of concrete in which the aforesaid parts are invested.

4. A sewer, aqueduct or like conduit comprising spaced supporting pedestals, frame rings or bands carried by said pedestals, tiles mounted upon the frame rings or bands and forming an inner wall or lining, said tiles being provided with dove-tailed grooves in the backs thereof, fasteners engaging the grooves in the tiles and connecting the tiles with each other and with the said frame rings and an outer wall of concrete in which the elements named are invested.

5. A sewer, aqueduct or like conduit comprising spaced concrete pedestals, frame rings or bands embedded in and supported by said pedestals, an inner wall or shell of assembled tiles, fasteners connecting the tiles with each other and with the frame rings, the bottom tiles and fasteners connecting the same with the frame rings being embedded in the concrete pedestals, and an outer wall of concrete in which the aforesaid parts are invested.

6. A sewer, aqueduct or like conduit, comprising spaced pedestals, frame rings embedded in and sustained by the pedestals, bottom or starting tiles embedded in the pedestals, other tiles assembled with said starting tiles and forming a wall or shell sustained by the pedestals and frame rings, and an outer wall of concrete in which the aforesaid parts are invested.

7. A sewer, aqueduct or like conduit, comprising concrete pedestals, frame rings embedded at their bases in the concrete pedestals, tiles supported by the pedestals and frame rings, said tiles having dove-tailed grooves in the backs thereof centrally disposed upon the pedestals, fasteners engaging the dove-tailed grooves at the centers of the starting tiles and engaging the coacting rings or bands and embedded in the pedestals, forming tiles similarly provided in their backs with dove-tailed grooves, fasteners engaging the grooves in all the tiles and connecting the ends of adjacent tiles together and fastening the forming tiles to the frame rings, and an outer wall of concrete in which the aforesaid parts are invested.

8. A sewer, aqueduct or like structure comprising pedestals, frame rings supported by the pedestals, an inner wall or lining formed of tiles supported by the pedestals and frame rings, said tiles having dove-

tailed grooves therein, fasteners connecting the tiles with each other and also fastening the same to the frame rings, said fasteners being arranged to space the tiles from the frame rings and an outer wall of concrete in which the aforesaid parts are invested.

9. A sewer, aqueduct or like conduit comprising spaced concrete pedestals, frame rings or bands embedded in and supported by said pedestals, an inner wall or shell of assembled tiles, fasteners connecting the tiles with each other and with the frame rings, and an outer wall of concrete in which the aforesaid parts are invested.

10. A sewer, aqueduct or like conduit comprising spaced concrete pedestals, frame elements formed independently of and embedded in and supported by the pedestals, tiles supported by the pedestals and frame elements and forming an inner wall or shell, and an outer wall of concrete in which the aforesaid elements are invested.

11. A sewer, aqueduct or like conduit comprising spaced concrete pedestals, frame elements formed independently of and embedded in and supported by the pedestals, an inner wall or shell of assembled tiles provided with grooves, fasteners engaging the frame elements and grooves in the tiles and supporting the tiles from the pedestals and frame elements, and an outer wall of concrete in which the aforesaid parts are invested.

12. A sewer, aqueduct or like conduit, comprising an outer wall of concrete, an inner wall of tiles, a series of spaced concrete pedestals, frame elements formed independently of and embedded at their bases in the pedestals, and fasteners connecting the tiles with the frame elements, said frame elements and fasteners being embedded with the pedestals and tiles in the concrete wall and said pedestals and frame elements forming a base support for the tiles supplementary to the concrete wall.

13. A sewer, aqueduct or like conduit, comprising spaced concrete pedestals, frame rings formed independently of and embedded in the pedestals, grooved starting tiles embedded in the pedestals, other grooved tiles assembled with the starting tiles and forming an inner wall or shell, fasteners engaging the grooves in the tiles and connecting the same with the frame rings, and an outer wall of concrete investing the aforesaid parts.

14. In a structure of the character described, a structural unit comprising as an article of manufacture a concrete pedestal, a vertical transverse metallic frame ring having its base portion embedded in and extending through said concrete pedestal, and a starting tile embedded in the top of the pedestal above the embedded portion of the frame ring, said tile extending longitudinally at right angles to the frame ring and having its ends projecting beyond the pedestal.

15. In a structure of the character described, a structural unit comprising as an article of manufacture a concrete pedestal, a vertical transverse metallic frame ring embedded at its base in the pedestal, a starting tile embedded in the top of the pedestal, and a fastening element embedded in the pedestal and connecting said tile with the embedded portion of the frame ring.

16. In a structure of the character described, a structural unit comprising a concrete pedestal, a frame ring embedded in and supported by the pedestal, and a starting tile also embedded in the pedestal and fastened to the embedded portion of the frame ring.

17. In a structure of the character described, a structural unit comprising a concrete pedestal, a frame ring embedded in and supported by the pedestal, a starting tile resting on the pedestal and provided with a dovetailed groove receiving a portion of the concrete of the pedestal, and a fastener interlocking with said groove and engaging the embedded portion of the frame ring.

18. A sewer, aqueduct or like conduit comprising a series of spaced concrete pedestals, an outer wall of concrete, frame rings embedded at their bases in the pedestals and a shell of tiles carried by the pedestals and frame rings and invested therewith in the concrete, said pedestals forming a support independently of the concrete to sustain the frame rings and body of tiles from and in spaced relation to the foundation.

19. A sewer, aqueduct, or like conduit, comprising a longitudinal series of spaced pedestals, vertical transverse frame rings rising from and embedded at their bases in the pedestals, starting tiles embedded in the pedestals centrally of their length above the frame rings, other tiles secured to the frame rings, starting tiles and each other, and arranged with the frame rings to form a shell, and an outer wall of concrete enveloping the rings and tiles and in which the bases are embedded, said concrete wall extending through the spaces between the pedestals beneath the adjacent portions of the shell.

20. A sewer, aqueduct or like conduit comprising spaced concrete pedestals, rings or bands embedded in and supported by said pedestals, a shell of tiles, fasteners connecting the tiles with the frame rings and holding the tiles in spaced relation thereto, and an outer wall of concrete investing the aforesaid parts.

21. In a structure of the character described, a structural unit comprising as an article of manufacture a frusto-pyramidal

concrete pedestal, a vertical transverse metallic frame ring embedded at its base in the pedestal and extending therethrough beyond two diametrically disposed sides thereof, and a starting tile embedded in the top of the pedestal and extending longitudinally at right angles to said frame ring, and having its end portions projecting beyond the other diametrically disposed sides of said pedestal.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM C. FLANNERY.

Witnesses:

M. MARKHAM FLANNERY,

MARY P. FLANNERY.