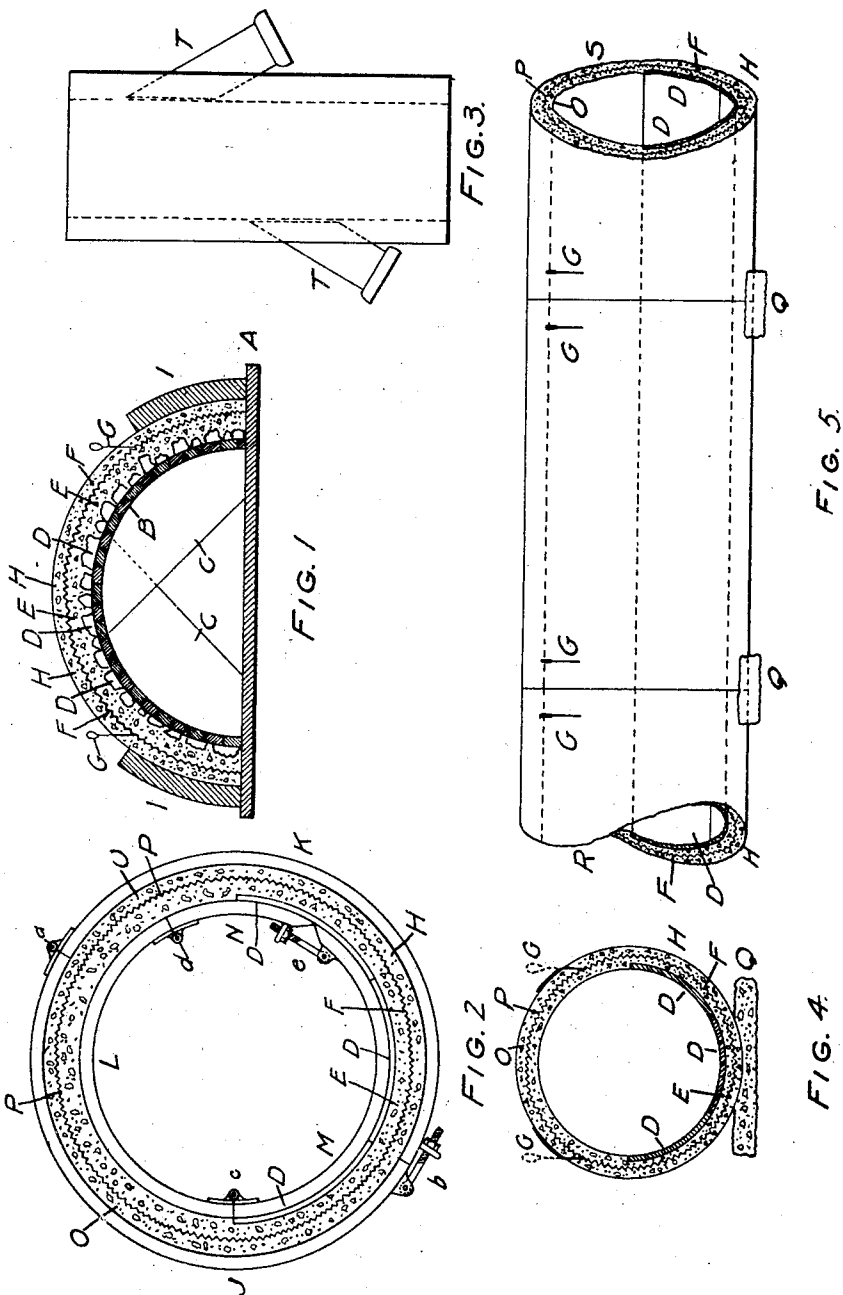


No. 823,141.

PATENTED JUNE 12, 1906.

F. E. SHAW.
SEWER PIPE.

APPLICATION FILED MAR. 23, 1904. RENEWED MAY 5, 1906.



WITNESSES

John P. Johnson
Howard A. Lamprey

INVENTOR

Fredrick E. Shaw
BY Warren R. Perce
ATTY.

UNITED STATES PATENT OFFICE.

FREDERICK E. SHAW, OF PROVIDENCE, RHODE ISLAND.

SEWER-PIPE.

No. 823,141.

Specification of Letters Patent.

Patented June 12, 1906.

Application filed March 23, 1904. Renewed May 5, 1906. Serial No. 315,306.

To all whom it may concern:

Be it known that I, FREDERICK E. SHAW, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Sewer-Pipes, of which the following is a specification, reference being had therein to the accompanying drawings.

Like letters indicate like parts.

Figure 1 is a view in cross-section of a mold and of the armored invert formed therein. Fig. 2 is a top plan view of a mold and my improved sewer-pipe formed therein. Fig. 3 is a plan view of my improved sewer-pipe provided with branch pipes. Fig. 4 is a view in cross-section of said sewer-pipe and the foundation on which it rests. Fig. 5 is a side elevation of said sewer-pipe and foundations.

My invention relates to an improved sewer-pipe made in portable sections and having an armored invert and an arch united thereto and forming therewith a continuous tubular pipe, the same being formed of concrete in one integral mass, but the lower longitudinal half of which, constituting the invert, being provided with a stone-facing or vitrified or other hard substance on its inner side, as hereinafter particularly described. This improved sewer-pipe is made in sections of any convenient length and of any desirable diameter.

The most satisfactory kind of sewer-pipe hitherto used is that which is made of clay baked in a kiln and having a hard, glazed, or vitrified surface. Such baked-clay pipes are easily portable and are made in sections of a suitable length and diameter, so that they can be conveniently transported and laid in position. Each section is usually provided with an enlarged concentric collar at one end, into which the plain end of the adjacent section is inserted, and the two are there cemented together in the place they are to occupy in the trench. These pipes, having a very hard and smooth surface, wear well because they do not present any obstacle or projections to the current of water flowing through them, nor to the stones, gravel, or other solid substances which are carried through them by the force of the water-currents. For this reason also such pipes can be laid with a less pitch of inclination than drains which are made of bricks, laid in courses, or of pieces of stones cemented to-

gether, as is common in the usual sewer constructions; but there are practical disadvantages and limitations in the use of these baked-clay pipes which prevent their general use. They are necessarily fragile and liable to crack and break during transportation and in handling, especially those of a comparatively large diameter, which are bulky and difficult to handle, and as they are comparatively thin, in order that they may be portable, they offer but little resistance and are liable to break when subjected to improper force. This breakage results in their absolute uselessness and the consequent loss of the entire cost of their manufacture and transportation. For these reasons such pipes are not commonly used except in the small sizes and sections suitable for mere drainage purposes or for connection of buildings with a city sewer system and not at all for street-sewers, except those of a very limited capacity.

It is the purpose of my invention to make a sewer-pipe which has all the advantages of these baked-clay pipes as to durability and portability, but in lengths and diameters such as adapt them to street-sewer purposes in general, as well as to the more limited uses for house-drains and the like; and with this end in view my invention consists of the novel construction and combination of the several parts as hereinafter described, and specifically set forth in the claims.

The armored invert which constitutes the principal feature of my invention is shown in Fig. 1, together with the method of its manufacture. A represents a horizontal plank or base, and B a form or center of strips of suitable material, preferably wood, fastened together in some convenient and efficient manner. The ends of this form B are supported on the base A and at proper intervals braces or ribs C C are provided to sustain it in position, together with the load which is to be placed thereon. Pieces of any suitable stone D D, (preferably of such stone as has a naturally smooth cleavage,) are then placed upon the outer surface of the form B with their smooth sides in contact therewith to form, as nearly as may be, a continuous smooth surface against the outside of said form. Upon these pieces of stone, on the upper or back side thereof, (which are usually more or less rough or irregular in surface) is spread concrete E in a moist plastic condition, which backs said pieces D of stone and fills the in-

terstices between them. When a considerable layer E has been thus spread, a wire netting or mesh F is placed on said concrete layer E, and near the ends of the section pieces of wires G, having at one end open loops, are fastened at their opposite ends to said wire-netting. Then another layer H of concrete is spread upon the wire-netting and through the meshes of said netting unites with the concrete layer E into one homogeneous mass therewith, thus embedding the wire-netting F. The outer surface of the concrete layer H is formed in contact with the inner surfaces of the outer segments I I of the mold. This invert so constructed is then dried in the mold and forms one solid semitubular sewer-section. When removed, it is found to consist of a semitubular mass of concrete, having an intermediate or embedded layer of wire-netting F and provided with a smooth practically continuous surface of stone on its inner or concave side, which stone surface constitutes what may be termed an "armor." This semitubular armored invert is then placed in another mold, (illustrated in Fig. 2,) consisting, preferably, of two semitubular portions J K, hinged together, as shown at *a*, and provided with a locking device *b*. This locking device comprises a screw-threaded tongue pivotally mounted in earpieces and extending through an eye or staple. By means of a nut on said tongue the two parts J K of the mold can be drawn together into perfect abutment and locked in that position. This mold also has an inner tubular wall of less diameter than the combined portions J K, preferably consisting of the three longitudinal segments L M N, hinged together, as shown at *c* and *d*, and having a locking device *e*, similar to the locking device *b* just described. These mold-sections J K and L M N are arranged concentrically to each other and preferably mounted upon a common base. The distance between the inner surface of the sections J K and the outer surface of the sections L M N is just equal to the thickness of the composite armored invert D E F H. This mold J K L M N receives the said armored invert and is set up on end. Then a mass of concrete O is put into the matrix of said mold between the outer sections J K and the inner sections L M N and tamped down, the wire netting or mesh P being embedded in the concrete O in a circle continuous with that of the wire-netting F. Wire loops G', having at one end open loops, are fastened at their opposite ends to the wire-netting P. The concrete O unites with the concrete layers E and H and forms with it one mass. The curvature of the inner or concave surface of that portion of the sewer-pipe which is composed of the concrete O is continuous with the curvature of the exposed surface of the armor D, so that there are formed two diametrically op-

posite longitudinal shoulders, against which the longitudinal edges, respectively, of the armor D abut, as seen in Figs. 4 and 5.

The wires G' are bent down, as shown in solid lines in Fig. 4, to fit against the inner surface of the outer portion of the mold. (Shown in Fig. 2.) In like manner the wires G (shown in Fig. 1) should be temporarily bent down in order to fit the mold wherein the invert is formed. The wire loops G are useful to receive derrick-hooks or other appliances to enable the ready handling of the invert section (shown in Fig. 1) after the same has been dried and removed from the mold, and the wire loops G' are useful to receive the derrick-hooks or other appliances to enable the ready handling of the completed sewer-pipe section when it is transported and in lowering the same into position in the trench. When this composite tubular sewer-section has dried in the mold, (shown in Fig. 2,) it is separated therefrom by unlocking the devices *b* and *e* and opening the mold-sections.

The sewer-section is now ready to be laid in the trench. The wires G' are bent up from the position shown in solid lines in Fig. 4 to the position shown in dotted lines in said figure.

Foundations Q, of concrete, are laid at intervals in the bottom of the trench in such position that the ends of the sewer-section may rest thereon. The hooks of the chains of the derricks are inserted in the four eyes of the wires G, and the sewer-section is lowered into the trench, with its ends resting on the foundation Q, as seen in Fig. 4. Other similar sewer-sections R and S are laid with one end of each of them in abutment with the respective ends of the first-named sewer-section, as illustrated in Fig. 4, and said adjacent ends are cemented together, thus making said three sewer-sections one continuous pipe.

Branch pipes T, having their inner ends properly beveled, may be inserted in said composite sewer-section in holes made therefor at suitable angles, as indicated in Fig. 3.

The wire-netting which is embedded in the concrete, as described, gives added strength to the structure and is especially useful in protecting the pipe from breakage. It also has the function of giving firm support to the wires G, by which the pipe is handled.

Instead of using pieces of stone for the armor, as shown at D, sections of curved baked-clay plates can be used, if desired, or any other suitable material adapted to furnish a durable wearing-surface.

It is obvious that instead of making the arch of one mass of concrete, as shown at H, a complete composite tubular sewer-section can be made by the use of a proper form or mold adapted for the purpose, thus constituting a fully lined or armored tubular sewer-

pipe; but for general usage I prefer to furnish an armor for the invert only.

The particular forms of the molds shown in Figs. 1 and 2 are not essential, but other forms of molds capable of producing the same or similar results may be used, if desired.

I claim as a novel and useful invention and desire to secure by Letters Patent—

1. The improved portable armored invert for sewers herein described, consisting of a semitubular molded body of concrete faced on its inner or concave side by a layer of a different and more durable material, substantially as specified.

2. The improved portable armored invert for sewers herein described, consisting of a semitubular molded body of concrete, a wire-netting embedded in said concrete, and a facing or lining on the inner or concave side of said invert composed of pieces of stone held by said concrete and having their exposed surface approximately smooth and continuous, substantially as specified.

3. The improved portable sewer-pipe herein described, consisting of a tubular body of concrete having two diametrically opposite longitudinal shoulders, and a semitubular armor on the lower portion or bottom of said

sewer-pipe composed of pieces of stone held by said concrete and having their exposed surface approximately smooth, said armor abutting said shoulders and having its said surface continuous with the inner concave surface of the unarmored upper portion of said sewer-pipe, substantially as specified.

4. The improved portable sewer-pipe herein described, consisting of a tubular body of concrete having two diametrically opposite longitudinal shoulders, a tubular piece of wire-netting embedded in said concrete, and a semitubular armor on the lower portion or bottom of said sewer-pipe composed of pieces of stone held by said concrete and having their exposed surface approximately smooth, said armor abutting said shoulders and having its said surface continuous with the inner curved surface of the unarmored upper portion of said sewer-pipe, substantially as specified.

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

FREDERICK E. SHAW.

Witnesses:

HENRY N. FRANCIS,
WARREN R. PERCE.