July 23, 1935. H. W. PORTER ET AL 2,009,068

UNDERGROUND CONDUIT

Filed Oct. 3, 1934 2 Sheets-Sheet 1

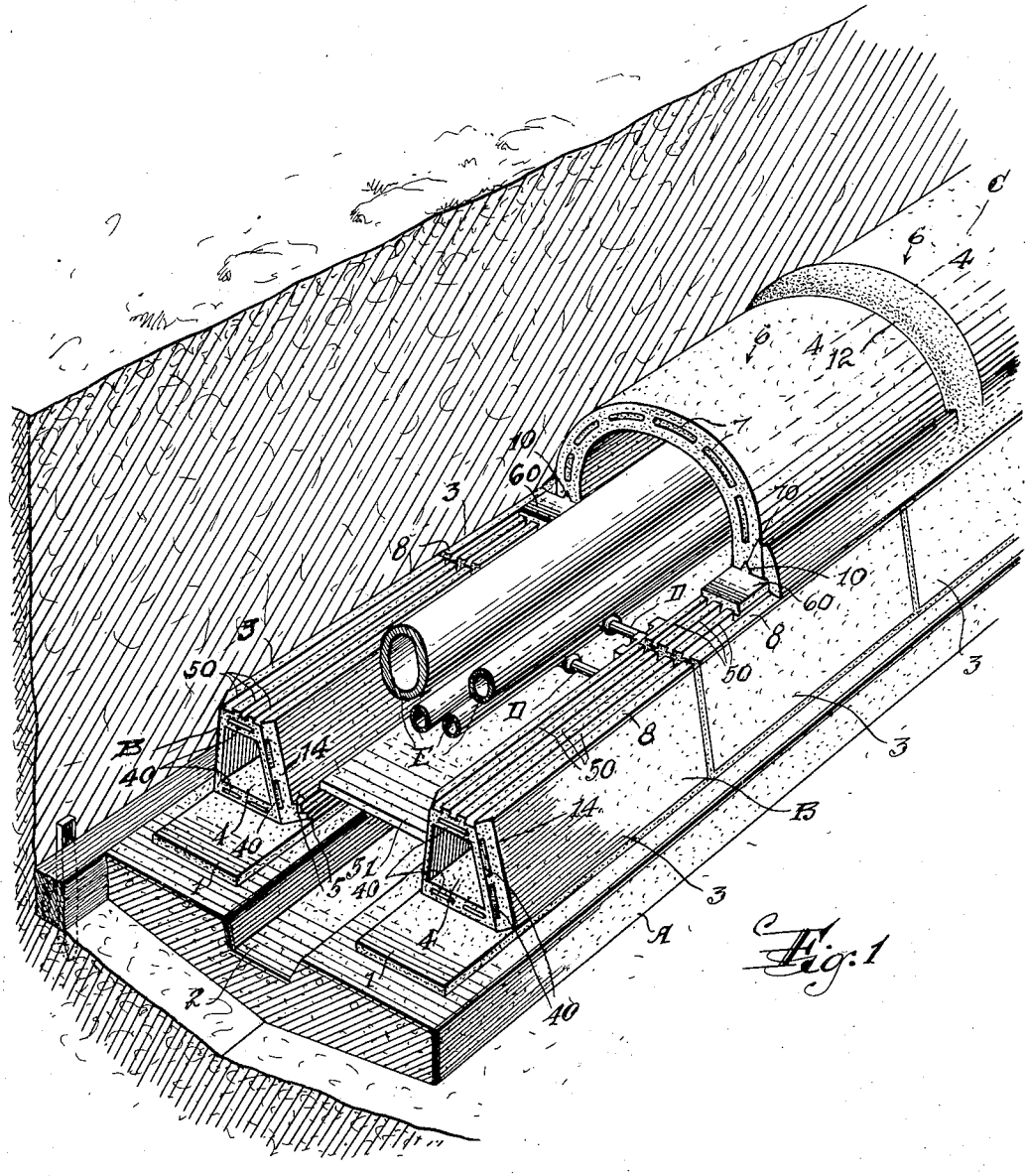


Fig. 1

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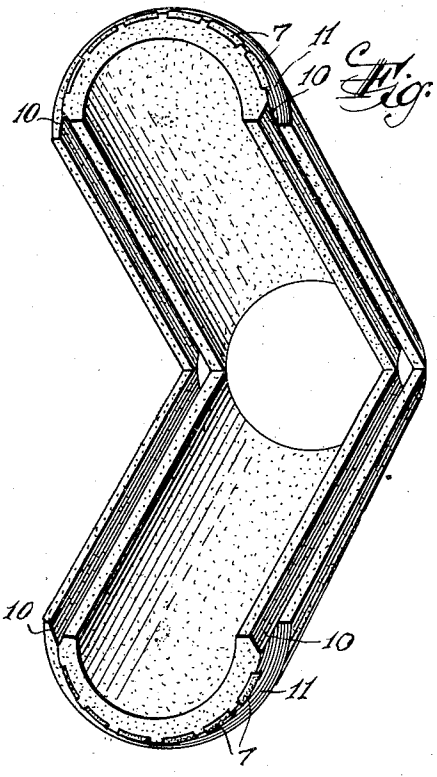


Fig. 3

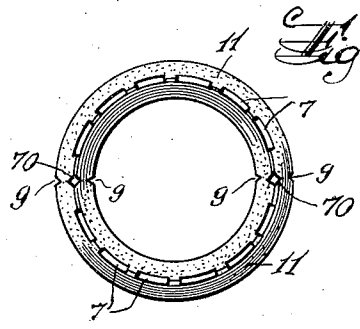


Fig. 2

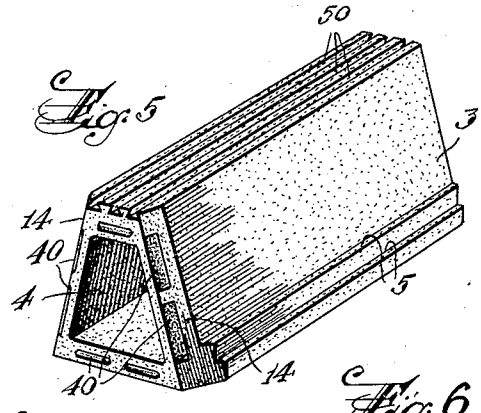


Fig. 5

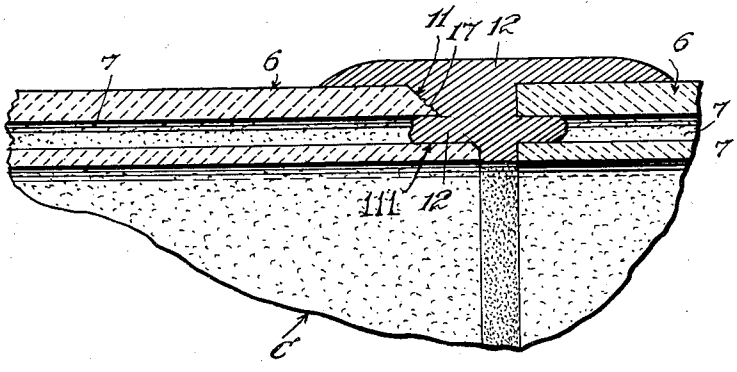


Fig. 4

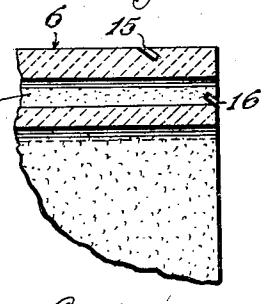


Fig. 6

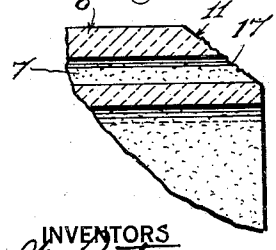


Fig. 7

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Patented July 23, 1935 2,009,068

UNITED STATES PATENT OFFICE

2,009,068

UNDERGROUND CONDUIT

Harry W. Porter, Maplewood, N. J., and William C. Boren, Jr., Greensboro, N. C.

Application October 3, 1934, Serial No. 746,634
In Canada June 8, 1934

10 Claims. (Cl. 285—112)

This application is a continuation in part of our copending application Serial No. 679,512 filed July 8, 1933, and the invention relates in general to conduits and particularly to underground conduits for housing, protecting and insulating pipes which are used for conducting steam from a central heating plant to different buildings to be heated. The conduit in general consists of an approximately flat monolithic or concrete base, pipe supports which can be set directly on said base, side walls formed of hollow tile-like blocks set end to end on said base and embracing portions of the pipe supports to hold them in position, and approximately semi-cylindrical top or ceiling tile set end to end upon said side walls in bridging relation thereto.

One object of the present invention is to provide top and side tile for such a conduit embodying novel and improved features of construction whereby each two adjacent tile shall be mechanically interlocked together at their ends to restrain relative lateral movement of the tile and retard infiltration of moisture through the joints.

Another object is to provide a novel and improved joint between the ends of two tile or building block wherein the tile shall have longitudinally extending recesses in their ends and the end of at least one of two endwise abutting tile shall be formed to permit easy insertion of mortar or cement into the space between the tile and into said longitudinal recesses to lock the tile together against relative lateral movement and to lock the mortar in the joint and provide a tortuous passage in the joint to restrain seepage of water therethrough.

A further object is to provide novel and improved top tile and side tile of the general character described which shall have longitudinal openings therethrough and at least one end provided with a beveled surface which intersects said longitudinal openings so as to permit the replacement of concrete or mortar between the ends of two adjacent tile and into said longitudinal openings for mechanically interlocking the tile together.

Other objects are to provide a novel and improved method of forming the beveled surfaces on the ends of the tile sections whereby the tile can be initially formed with end surfaces perpendicular to the axes of the tile, and portions of the end surfaces can be broken away after firing of the tile to provide such beveled surfaces; and to obtain other advantages and results as will be brought out by the following description.

Referring to the accompanying drawings in which corresponding and like parts are designated by the same reference characters throughout the several views,

Figure 1 is a perspective sectional view of an underground conduit including tile and tile joints embodying our invention.

Figure 2 is an end elevation of a tile pipe from which the tile sections of our conduit are formed.

Figure 3 is a perspective view of the tile pipe shown in Figure 2 split into two half sections, each of which comprise a top section for our conduit.

Figure 4 is an enlarged fragmentary horizontal sectional view through two abutting tile and the joint therebetween.

Figure 5 is a perspective view of one of the side tile sections.

Figure 6 is an enlarged fragmentary longitudinal section through the end of one of the tile sections showing the manner of forming the tile so that a portion may be broken away to provide a beveled surface on the end thereof and

Figure 7 is a similar view showing a portion of the end of the tile broken away to form a beveled surface.

Specifically describing the conduit in connection with which our invention may be utilized, the conduit includes a base A which is preferably monolithic and formed of cementitious material such as concrete so that the base can be formed at the situs of the conduit. The base preferably has a substantially flat top 1, and a longitudinal drain channel or gutter 2 along approximately the longitudinal median line of the base. Side walls B are set upon the top 1 of the base and support a top or roof C which is in arched relation to the side walls. Within the conduit are arranged supports D for supporting pipes or the like E.

The side walls B are formed of block sections which are preferably hollow tile 3, approximately trapezoidal in cross section and having longitudinal openings 4 therethrough, to form hollow side walls for the conduit. These tile sections 3 are set upon the top of the base 1 in end to end relation to each other with the wider of the parallel sides resting on the base and with the openings 4 disposed in alinement longitudinally of the conduit. Each tile section has at the side thereof which is disposed inwardly of the conduit a plurality of longitudinal ledges 5 parallel and adjacent to the wider of the two parallel sides of the section for cooperating with the corresponding ledges on the opposite tile sections to support a horizontal partition 51 which

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divides the conduit into a lower drainage chamber beneath the partition and an upper pipe containing chamber above the partition, the two ledges permitting the partition to be set at different elevations. Also, the tile is shown as formed with channels 40 in its walls.

The roof C is also formed of sections 6, each constituting a half section of a tile pipe, being approximately semi-circular in cross section; and each section preferably has closely spaced longitudinal channels between the inner and outer sides of the section, certain of which designated 7 are preferably approximately rectangular in cross section. These tile sections are set upon the tops 8 of the side wall sections 3 in end to end relation to each other with the channels 7 of adjacent sections, preferably although not necessarily, in alinement longitudinally of the conduit.

Sections of this character may be formed as illustrated in Figures 2 and 3 of the drawings by making a tile pipe with two diametrically opposite longitudinal channels 70, which are preferably diamond shaped in cross-section and have one axis disposed diametrically of the tile, and weakening the walls of the pipe in the diametral plane in which said channels 70 are disposed, as indicated by the longitudinal scorings 9 in Figure 2, and then splitting the pipe along said weakened portions as shown in Figure 3. It will be observed that the described arrangement of the channels 70 locate two opposite angles of each channel adjacent the inner and outer walls of the pipe, respectively, and these angles serve the same purpose as the scorings 9 to weaken the walls of the pipe. When the pipe is split into two sections as shown in Figure 3, each section has a longitudinal groove 10 in each edge thereof. With this construction, when the sections are set upon the side walls, the grooves 10 receive some of the mortar of the joint 60 between the top sections and side sections to provide a key between the sections and to retard seepage of moisture through the joint. Preferably, also, one end of each section 6 has an exterior beveled surface 11 intersecting said channels 7 and 70, so that when said end of the section is arranged in end to end and alined relation with one end of the other section as shown in Figure 4, a wide clearance for the application of mortar into the joint is provided and the mortar will easily flow into the ends of the longitudinal channels 7 and 70 so as to provide a mortar-key 12 between the sections as well as a tortuous passage for water through the joint. The mortar also closes the ends of the channels 7 and 70 so as to provide closed air spaces to enhance the heat insulating qualities of the tile. This structure eliminates the usual bell and spigot joint and provides a smooth outer surface for the top of the conduit so that if desired, whole conduit or only the mortar joints 12 may be protected against seepage of moisture therethrough by a suitable waterproof membrane or covering of waterproof material.

Each side tile B also preferably has at least one end formed with beveled surfaces 14 which intersect the channels 40, these beveled surfaces corresponding to the beveled surfaces 11 on the top tile and with this construction, when the end of one tile is arranged in end to end and alined relation with one end of another tile as shown in Figure 4, a wide clearance for the application of mortar or cement into the joint between the tile is provided and the mortar will easily flow into the ends of the longitudinal channels 40 to provide a mortar-like key or joint like the mortar key between the top sections 6. Of course, this joint may be covered with waterproof material just as is the joint 12 and it will be observed that the joints may be made substantially flat or smooth on the outer surfaces of the tile to facilitate the application of such waterproof coating.

The upwardly converging sides of the trapezoidal side tile 3 outside and inside the conduit tend to facilitate draining of exterior water from the conduit and conduct interior moisture rapidly downwardly to the draining chamber 2 respectively, and special filling of crushed rock, gravel and the like and extra outside drain pipes to facilitate drainage are not required. Moreover, the trapezoidal side tile provide stable supports for the top tile so as to facilitate erection of the conduit. Furthermore, the hollow structure of the side tiles with the longitudinal channels serve as secondary drain channels for carrying off any moisture which may seep through the joints between the side tile, and said tile also have high heat insulating qualities due to air in the chambers 4. The longitudinal channel 7 and 40 in the top and side sections respectively enhance the heat insulating qualities of the conduit sections due to the confinement of air within the channels.

The side tile are preferably provided with exterior grooves 50 in the joint surfaces for providing a bond between the tile and mortar.

Our invention also contemplates a method for forming the beveled surfaces 11 and 14 on the top and side tile respectively. These tile are usually formed by an extruding process and it is highly desirable to have the ends of the tile flat and in planes perpendicular to the axes of the tile so that the tile may be conveniently and stably set upon their ends. Accordingly the tile are initially extruded in the plastic form in their desired shapes with their end surfaces flat and wholly in planes perpendicular to the axes of the tile, and then are formed with slits or grooves 15 and 16 on the outer surfaces and end surfaces respectively, said grooves or slits 15 and 16 of each tile being in approximately the same plane which intersects the openings 7 or 40 and is inclined with respect to the ends and axis of the tile corresponding to the desired beveled surface to be formed. The tile can then be fired or baked in the usual manner, and have their end surfaces in planes perpendicular to their axes. Therefore the tile can be easily and stably set on their ends for handling and transportation without danger of their tipping over. When the tile reaches the situs of the conduit to be installed, the workmen may tap the portions of the tile outwardly of the slits 15 and 16 with a hammer or the like so as to break off the end portions of the tile outwardly of and between the slits as shown in Figure 7. This produces the beveled surfaces 11 and 14 respectively and it will be observed also that rough surfaces 17 are formed at the line of cleavage of the portions which are broken off. These rough portions enhance the bond between the mortar or cement and the tile sections. This is particularly advantageous where the tile are submitted to a glazing proces as is usual, because the rough surfaces 17 which are formed by breaking of the tile after the glazing operation, are unglazed and porous so as to provide for firm adhesion of the mortar or cement upon the surfaces.

It is highly important that the beveled sur-

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faces 11 and 14 intersect the longitudinal channels 7 and 40, so that the portions of the walls of the channels nearest the outer sides of the tile are cut away to provide for free entry of the mortar into the channels so the mortar is inserted between the tile. In other words, it is desirable that outer edge of at least one end of the block be cut away along its perimeter on a plane intersecting the recesses, and preferably the cut away portion or the surface formed thereby terminates short of the inner walls of the tile, i. e., the concave surface of the tile 6 and the walls of the longitudinal opening 4, respectively, so that the shoulder portions 111 of the block formed by the inner walls of the channels will guide the mortar into the recesses as the mortar is forced between the blocks.

The invention has been shown in connection with tiles or blocks for conduits but obviously the invention is equally susceptible to use in building blocks for other purposes.

While we have shown our invention as embodied in certain details of structure, it should be understood that this is primarily for the purpose of illustrating the principles of the invention and that many modifications and changes may be made in the structure of the tile and joint without departing from the spirit or scope of the invention.

Having thus described our invention, what we claim is:

1. In a tile conduit, two tile sections arranged end to end and each having longitudinal openings in its end between opposite faces of the tile section and the end of one tile having an exterior beveled surface intersecting the openings and forming a space for a mortar joint between the ends of the tile, and mortar in said joint extending into the ends of said openings to lock the mortar in the joint and the two tile sections together.

2. In a tile conduit, two tile sections arranged end to end each having longitudinal channels through its walls between opposite faces thereof, and the end of at least one tile having an exterior bevel surface intersecting the channels forming a space for a mortar joint between the ends of the tile, and mortar in said joint extending into the ends of said channels to lock the mortar in the joint and the two tile sections together.

3. A tile having longitudinal channels in its walls at its ends between opposite faces of the tile and at least one end formed with an exterior bevel surface intersecting said channels to provide a clearance for the insertion of mortar between said block and an endwise adjoining block and into said recesses of said blocks.

4. A unit for use in constructing conduits comprising a tile semi-circular in cross-section and having longitudinal channels through its walls between the convex and concave surfaces thereof and a continuous exterior beveled surface on at least one end extending along the convex side of the tile and intersecting said channels.

5. A unit for use in constructing conduits comprising a hollow tile trapezoidal in cross-section and having longitudinal channels through its walls between opposite faces thereof and a continuous exterior beveled surface on at least one end extending along one side of the block and intersecting said channels.

6. A tile having recesses in its ends between opposite faces of the tile and its outer edge on at least one end cut away on a plane intersecting said recesses to form a shoulder inwardly of said recesses.

7. A tile having longitudinal closely spaced openings in each end between opposite faces of the tile, and an exterior perimetral groove or score adjacent one end the plane of which intersects said openings so that the end edges of the tile can be broken off between said openings and said groove to form a rough porous surface and provide a clearance for the insertion of mortar between said tile and an endwise adjoining tile and into said openings in the tile.

8. The tile set forth in claim 3 wherein said bevel surface has a rough portion of the character of the surface of a cleavage produced by breaking of the tile.

9. The tile conduit set forth in claim 1 wherein said bevel surface has a rough portion of the character of the surface of a cleavage produced by breaking of the tile.

10. In a tile conduit, two tile sections arranged end to end and each having longitudinal openings in its ends between opposite faces of tile and the end of one tile having its outer edge cut away on a plane intersecting said recesses to form a shoulder inwardly of said recesses and provide space for a mortar joint between the adjoining ends of the two tile sections, and mortar extending into the ends of said openings to lock the mortar in the joint and the two tile sections together.

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