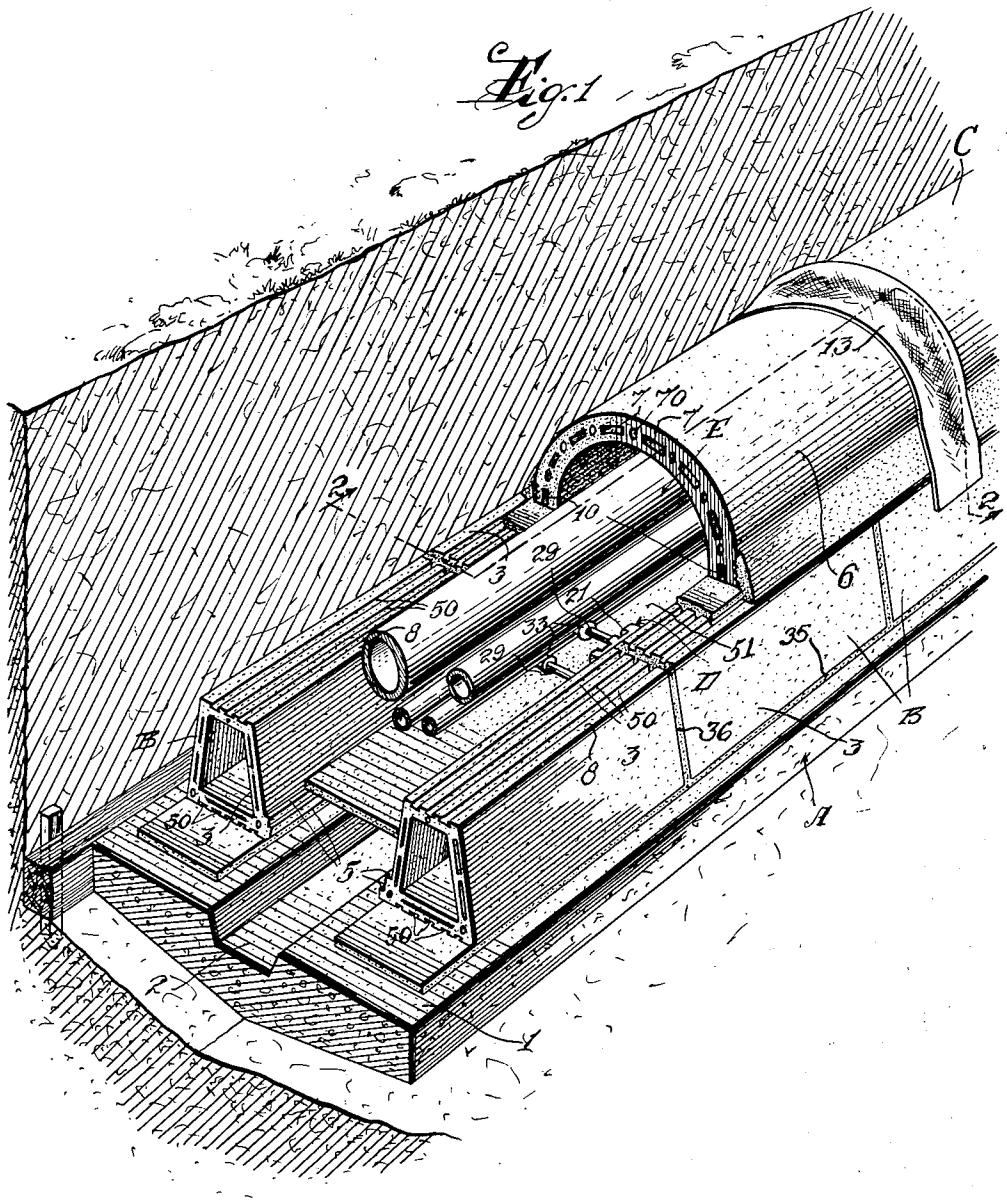
Jan. 8, 1935. H. W. PORTER ET AL 1,987,517

UNDERGROUND CONDUIT

Filed July 8, 1933 4 Sheets-Sheet 1



INVENTORS
Harry W. Porter
& William C. Boren Jr.

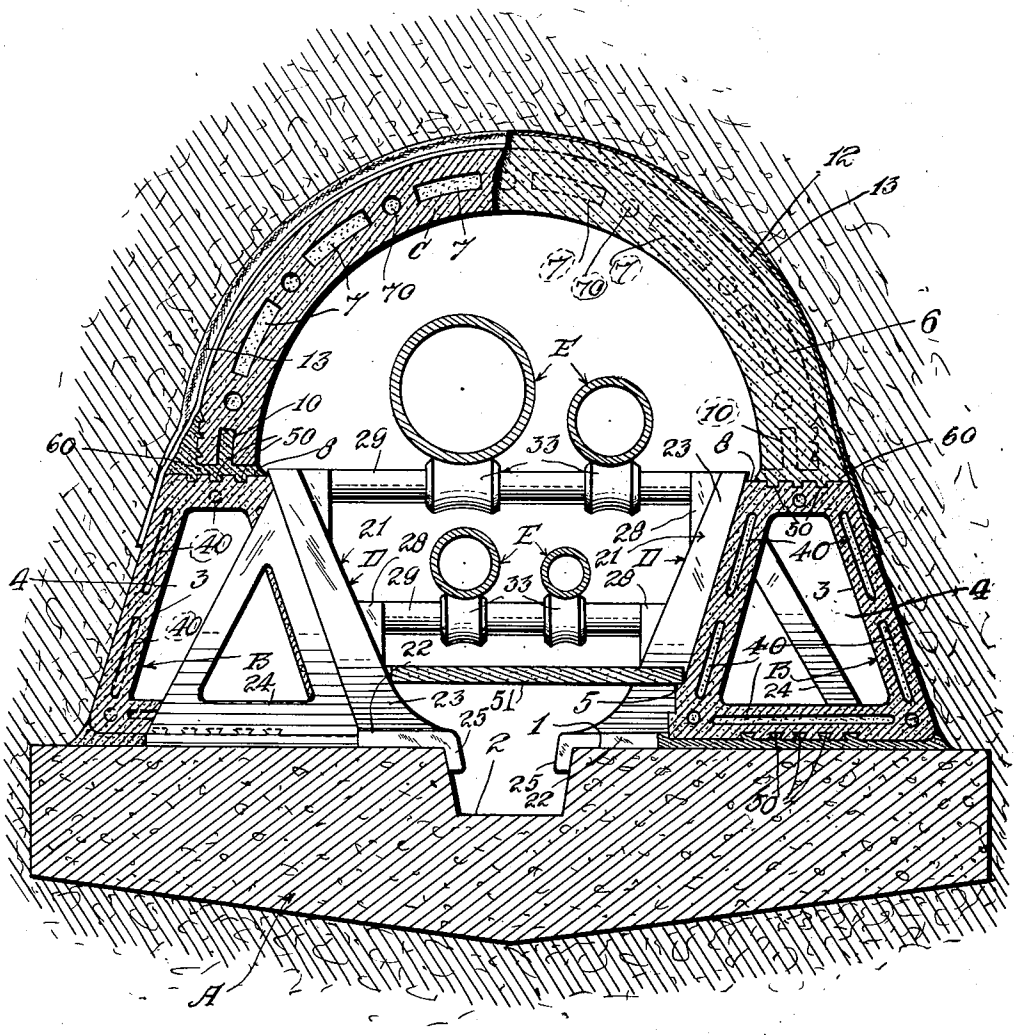
By. Harry R. Cook,
ATTORNEY

Jan. 8, 1935. H. W. PORTER ET AL 1,987,517

UNDERGROUND CONDUIT

Filed July 8, 1933 4 Sheets-Sheet 2

Fig. 2



INVENTORS
Harry W. Porter
& William C. Boren Jr.

By Harry B. Cook,
ATTORNEY

Jan. 8, 1935. H. W. PORTER ET AL 1,987,517

UNDERGROUND CONDUIT

Filed July 8, 1933 4 Sheets-Sheet 3

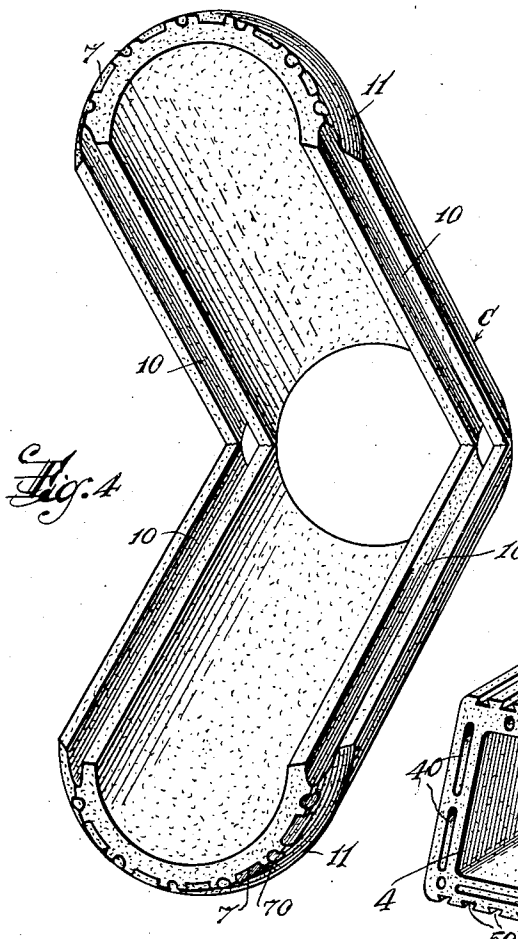


Fig. 4

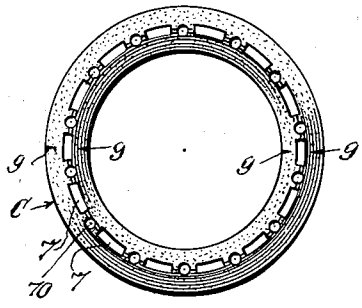


Fig. 3

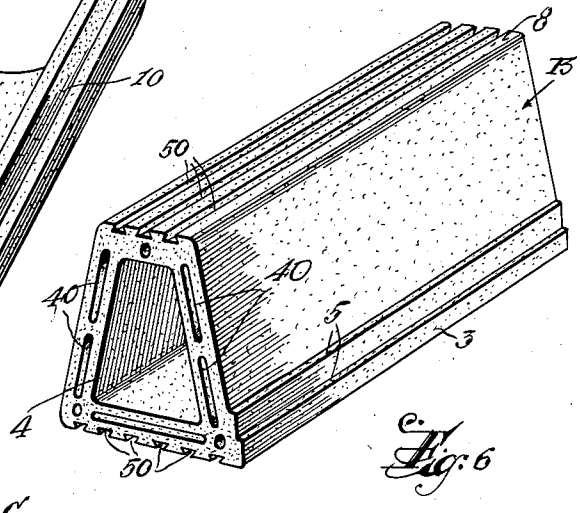


Fig. 6

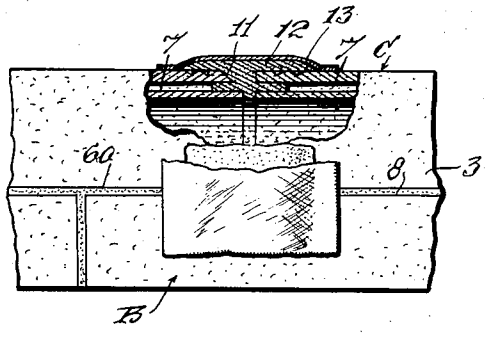


Fig. 5

INVENTORS
Harry W. Porter
& William C. Boren Jr.

By Harry D. Cook
ATTORNEY

Jan. 8, 1935. H. W. PORTER ET AL 1,987,517

UNDERGROUND CONDUIT

Filed July 8, 1933 4 Sheets-Sheet 4

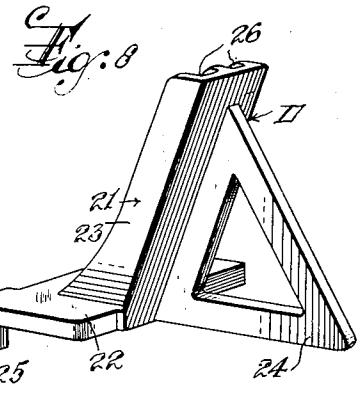


Fig: 8

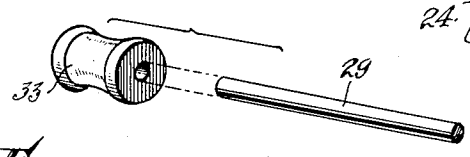


Fig: 10

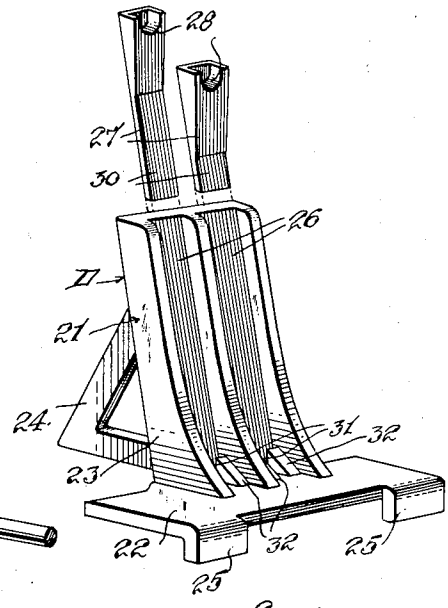


Fig: 9

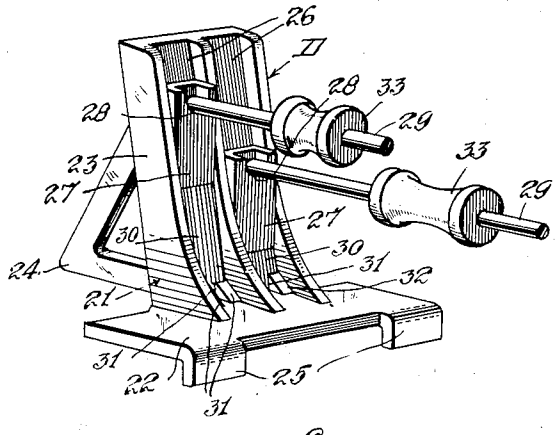


Fig: 7

INVENTORS
Harry W. Porter
& William C. Boren Jr.

By Harry D. Cook,
ATTORNEY

Patented Jan. 8, 1935 1,987,517

UNITED STATES PATENT OFFICE

1,987,517

UNDERGROUND CONDUIT

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

Application July 8, 1933, Serial No. 679,512

13 Claims. (Cl. 137—75)

This invention relates in general to conduits and more particularly to underground conduits for housing, protecting and insulating pipes which are used for example, for conducting steam from a central heating plant to different buildings to be heated.

Important objects of the invention are to provide a conduit of the character described comprising a plurality of different types of parts constructed and related so that during assembly of the parts no interference shall occur between mechanics installing different parts of the work, and one group of mechanics may complete installation of one type of parts before another group of mechanics begin their work installing other parts, and for accomplishing these results to provide a conduit comprising 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 on said base and embracing portions of said pipe supports to hold them in position, and approximately semi-cylindrical top or ceiling tile set upon said side walls in bridging relation thereto, whereby said base can be set or poured at one time, said pipe supports then can be set on the flat top thereof after which the pipes can be laid on said supports, said side wall blocks thereafter can be set on said base with said pipe supports between them, and said top tile can be then set on said side walls to complete the conduit.

Another object of the invention is to provide such a conduit embodying a novel and improved construction and combination of parts including a plurality of sections of different types which can be easily made in different sizes with the sizes of one type complemental to corresponding sizes of the other types, whereby underground conduits of many different sizes or capacities can be easily and quickly installed by proper combinations of said sections and the sections can be kept in stock ready for use. In other words, one important object of our invention is to provide a conduit having a base with a substantially flat top, separate side walls formed of a plurality of identical sections which may be set end to end on said flat top of the base so that the side walls may be independently erected on the base and spaced apart to make conduits of different widths as may be desired, and a top formed of tile sections set end to end upon the tops of the side walls in arched relation thereto, whereby by making the base, side wall sections and top sections of different sizes, conduits of different capacities can be quickly installed.

Further objects are to provide novel and improved means for supporting pipes which can be set directly upon and in simple abutting relation to the monolithic base and which have portions to be embedded in the mortar joints between the side tile to hold the pipe supports rigidly against movement whereby the pipe supports can be easily and quickly set and the weight of the pipes and supports shall be directly and wholly assumed by the monolithic base to relieve the side and top tile from such weight; to provide such pipe supports having novel and improved features of construction including seats for pipe supporting shafts which are vertically adjustable to accommodate different sizes and relations of pipes in the conduit, and to provide a novel and improved construction and combination of such a base and pipe supports wherein said base and pipe supports have cooperating parts by which the pipe supports can be easily and quickly set and alined with each other on the base without the necessity for special measurements or alining operations.

Another object is to provide an underground conduit of the character described embodying novel and improved features of construction whereby ground water shall be quickly drained away from the top and side walls of the conduit, seepage of water into the conduit shall be kept to the minimum without the necessity for extra drains, crush rock or gravel fills, etc., around the conduit, and any water within the conduit shall be quickly drained away at the botom of the conduit.

Other objects are to provide novel and improved trapezoidal hollow side wall tile to provide stable supports for the top tile and for draining off seepage water at the sides of the conduit; to provide novel and improved top tile which are semi-circular tile pipe sections and have air channels of novel form therethrough, so that the tile shall be light in weight, strong, and shall have good inherent heat insulating qualities; to provide top tile whereby novel and improved joints shall be possible between adjacent top tile and between the top tile and side tile to mechanically interlock said tile together and retard infiltration of moisture through the joints; to provide a novel and improved construction and combination of side tile and interior partition plates whereby the partition plates can be easily, quickly, separably, and adjustably mounted on the side tile between the monolithic base and the pipes to divide the conduit into a lower drain chamber and an upper pipe containing an insulating chamber and

to facilitate drainage of moisture from the upper chamber to the lower chamber; 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 sectional perspective view of an underground conduit embodying our invention.

Figure 2 is an enlarged vertical transverse sectional view through the conduit.

Figure 3 is an end elevation of a tile pipe from which the top sections of our conduit are formed.

Figure 4 is a perspective view of the tile pipe shown in Figure 3 split into two half sections each of which comprises a top section for our conduit.

Figure 5 is a fragmentary side elevation partially in section of the conduit on approximately the scale shown in Figure 1, illustrating a form of joint between the top tile sections.

Figure 6 is a perspective view of one of the side tile sections.

Figure 7 is a perspective view of one of the pipe supporting standards, viewing the same from the front thereof.

Figure 8 is a similar view of the rear of the standard.

Figure 9 is a view similar to Figure 7 with the shaft supporting brackets removed from the standard, and

Figure 10 is a composite perspective view of one of the shafts and pipe supporting roller which cooperates therewith.

Specifically describing the invention, our 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 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 longitudinal channels 7 between the inner and outer sides of the section and preferably approximately rectangular in cross section as clearly shown in Figure 2 of the drawings. Also, preferably, longitudinal openings 70 are provided in the walls of the sections between adjacent channels 7 for a purpose hereinafter described. 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 and openings 70 of adjacent sections in alinement longitudinally of the conduit.

Sections of this character may be formed as illustrated in Figures 3 and 4 of the drawings by making a tile pipe with the longitudinal channels 7 and weakening the walls of the pipe in a diametral plane as indicated by the longitudinal scorings 9 in Figure 3, and then splitting the pipe along said weakened portions as shown in Figure 4. Preferably the scorings 9 are arranged transversely of two of the channels 7 so that when the pipe is split into two sections as shown in Figure 4, 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. Also, preferably, one end of each section 6 has an exterior beveled surface 11 intersecting said channels and openings 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 5, 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 openings 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 openings 70 so as to provide closed air spaces to enhance the heat insulating qualities of the tile. The openings 70 also compensate for expansion and contraction of the material between the channels 7 to reduce possibility of fracture of the section and without unduly weakening the walls of the sections. 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, the mortar joint 12 may be protected against seepage of moisture therethrough by a suitable covering 13 of waterproof material as shown in Figure 5. Obviously, the sections 6 need not be provided with the exterior bevel 11 and the ends of the sections may be square.

Another important feature of our invention is the means for supporting pipes or the like within the conduit. This means is shown in detail in Figures 7 to 10 inclusive and includes a standard 21 to be disposed at each side of the conduit in opposed relation to another similar standard. Each standard has a foot 22 to rest on the base 1 of the conduit, an upstanding arm 23 and a wing or web 24 which projects from the rear side of the arm 23. This wing or web 24 is of such dimensions as to be received in the joint between the ends of adjacent tile sections 3 and the standards 23 preferably slightly incline with respect to the feet 22 so as to nicely abuttingly engage the inner sides of the respective side walls. Each foot 22 has depending lugs 25 to abuttingly engage the upper portions of the side walls or the upper edges of the drain channel 2 in the base A. Each upstanding arm 21 has longitudinal channels 26 to face the channels in the opposite standard, and shaft supporting brackets

27 are slidably mounted in said channels. Each bracket 27 has at one end a seat 28 to receive one end of a shaft 29, and at the other end has a leg 30 which rests in a seat 31 formed by bosses 32 projecting upwardly from the foot 22 in spaced relation to the bases of the channels 26. The brackets 27 can be easily slid into and out of the channels 26 and the elevation of the seats 28 may be varied by cutting off portions of the legs 30 so that the brackets can be made of standard size and later cut according to specifications of the particular conduit. Each shaft 22 has a roller 33 rotatably mounted thereon to support a pipe or the like E.

In constructing a conduit in accordance with our invention the base A is first poured in the bottom of the ditch in which the conduit is to be laid, the drain channel being molded into the top of the base. After the concrete has hardened the pipe supports are set upon the top 1 of the base in the desired spaced relation. The feet 22 are simply set upon the top of the base with the lugs 25 overhanging the edges of the drain channel and in abutting relation to the sides thereof. In this way the standards are easily and quickly alined with each other along the edges of the drain channel. The brackets 27 are then adjusted to the proper elevations, after which the shafts 29 are mounted in the brackets and the pipes E may there be laid on the rollers 33. The side wall tiles 3 are then set by joints 35 on the top 1 of the base at opposite sides of the drain channel 2 in end to end relation to each other with the horizontal openings 4 in alinement longitudinally of the conduit. If necessary, the standards 23 of the pipe supports may be adjusted to locate them between the ends of adjacent side tile 3, and the webs 24 of the standards are embedded in the joints 36 between the side tile; and, of course, the side tile are preferably set in contacting relation with the standards 23.

Then the top tiles 6 are set upon the tops of the side tile 3 with the mortar joints 60 between the edges of the top sections 6, and the joints 12 between the ends of the top sections.

With this construction, it will be observed that the various sections of the conduit may be separately and independently erected or installed, and that the pipe supports and pipes may be set and laid directly on the flat top of the base without any interference from upstanding projections such as are encountered in conduits formed of two half sections of tile pipe with the pipe supports laid in the lower section. Therefore, there need be no interference between the various groups of workmen performing the different operations necessary in constructing the conduit, and one portion of the job can be completed before the next portion is started.

It will also be observed that the side tile, top tile and pipe supports can be made in various complemental sizes and that the base A may be made of any desired size so that conduits of widely different sizes or capacity can be easily and quickly installed by various combinations of the sections. For example, the height of the conduit can be varied by using taller side sections, while the width of the conduit can be varied by using wider top sections on a wider base, and both the width and height of the conduit can be increased by utilizing taller side sections, wider top sections and wider bases. Sections of the various sizes can thus be kept in stock and combined for different jobs as desired.

Obviously the partitions 51 will be laid after the side tiles 3 are set, and the pipe containing chamber above the partitions may be filled with suitable heat insulating material when desired.

The upwardly converging sides of trapezoidal side tile 3 outside and inside of the conduit tend to facilitate draining of exterior water away from the conduit and conduct interior moisture rapidly downwardly to the draining channel 2, respectively, and special fillings of crushed-rock, gravel, etc. and extra outside drain pipes to facilitate drainage are not required. All moisture within the conduit is quickly conducted to the drain gutter 2 at the bottom of the conduit, and this drain gutter can be interrupted at intervals by manholes and run off drains for carrying the water to some suitable outlet. 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 tiles also have high heat insulating qualities due to air in the chambers 4. The partition 51 fully protects the insulating material above it from moisture in the bottom of the conduit and prevents the drain channel from becoming clogged with the insulating material. The longitudinal channels in the top and side sections enhance the heat insulating qualities of the conduit sections due to the confinement of air within the channels.

The pipe supports rest directly upon the base A so that no strains from the weight of the pipe supports or pipes are imposed upon the side walls or top of the conduit, and various sizes of the pipe supports may be utilized as required, while the elevations of the pipe supporting shafts may be varied as required by cutting off the legs 30 of the brackets.

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

While we have shown our invention as embodied in certain details of construction 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 conduit without departing from the spirit or scope of the invention.

Having thus described our invention, what we claim is:

1. An underground conduit comprising a monolithic base having an approximately flat top, spaced and separate side walls formed of identical tile sections having substantially flat bottom surfaces and set end to end on said flat top of said base so that the side walls may be independently erected on said base and spaced apart as desired, and a top formed of identical tile sections set end to end upon the tops of said side walls in arched relation thereto.

2. The underground conduit set forth in claim 1 wherein said tile of the side walls are trapezoidal in cross-section and have the wider of their parallel sides set on the top of the said base.

3. An underground conduit comprising a monolithic base having an approximately flat top, spaced and separate side walls formed of identical tile sections having substantially flat bottom surfaces and set end to end on said flat top of said base so that the side walls may be independently erected on said base and spaced apart as desired, said tile sections having longitudinal openings therethrough alined with each other lon-

gitudinally of said side walls to provide drainage and heat insulating channels, and a top formed of identical tile sections semi-circular in cross-section having longitudinal openings therethrough and set end to end upon the tops of said side walls in arched relation thereto with said longitudinal openings of one section in alinement with said openings of adjacent sections longitudinally of the conduit.

4. The underground conduit set forth in claim 1 wherein said top tile sections have longitudinal channels opening through the ends thereof and one end of one of two adjacent top tile sections has an exterior bevel surface intersecting said channels to provide a space for mortar to enter between said sections and into said channels, and with the addition of mortar in the joint between said adjacent tile sections extending into the ends of said longitudinal channels for interlocking the sections and locking the mortar in the joint.

5. An underground conduit comprising a base having an approximately flat top, side walls formed of block sections set end to end on said top of the base, pipe supports including bracket standards set on said top of the base in abutting relation to said side walls and having portions embedded in the joints between said block sections, and shafts having their ends journaled in the oppositely disposed bracket standards, and a top formed of sections set end to end on said side walls.

6. An underground conduit comprising a base having an approximately flat top, side walls formed of block sections set end to end on said top of the base, pipe supports set on said base and having portions embedded in the joints between the ends of said side wall block sections, and a top formed of sections set end to end on said side walls, said base having portions in predetermined alined arrangement, and said pipe supports having parts to abuttingly engage said portions of said base for alining said supports as they are set on the base.

7. An underground conduit comprising a base having an approximately flat top, side walls formed of block sections set end to end on said top of the base, pipe supports set on said base and having portions embedded in the joints between the ends of said side wall block sections, and a top formed of sections set end to end on said side walls, said base having a drain channel in its top, the edges of which are parallel with said side walls, and said pipe supports having parts to engage and overlie said edges of said channel whereby said supports can be alined with each other along said edges of the channel.

8. The conduit set forth in claim 5 wherein said base has a drain channel in its top, the edges of which are substantantially parallel to each other, and said bracket standards have foot portions to rest on said base and formed with flanges to overlie the edges of said drain channel whereby said supports can be alined with each other along said edge of the channel.

9. The underground conduit set forth in claim 1 with the addition of pipe supports set directly on said base in abutting relation to said side walls at joints between said tile of the side walls and having portions embedded in said joints.

10. The underground conduit set forth in claim 1 wherein said base has a longitudinal drain channel in its top and said side tile have longitudinal ledges on their inner sides, and with the addition of a horizontal partition separably mounted on said ledges above said drain channel to divide the conduit into an upper pipe receiving and insulating compartment and a lower drainage compartment.

11. A pipe support for conduits comprising a pair of bearing standards having corresponding vertically disposed channels facing each other with seats at their lower ends, a bracket vertically slidable in each channel having a seat at its upper end to receive a shaft and a straight leg at its other end which fits said channel seat, whereby said bracket can be adjusted to vary the elevation of said seat by cutting off a portion of said leg, and a pipe supporting shaft mounted in said seats.

12. A pipe supporting unit for conduits, comprising a foot to rest upon a support, a standard projecting upwardly from said foot and having a vertical channel in its face formed with a seat at its lower end, a bracket vertically slidable in said channel and having a seat at its upper end to receive a shaft and a straight leg at its other end to fit said channel seat, and a wing projecting from the rear of said standard to enter a joint between wall blocks.

13. An underground conduit comprising a monolithic base having an approximately flat top, spaced and separate side walls formed of identical tile sections having substantially flat bottom surfaces and set end to end on said flat top of said base so that the side walls may be independently erected on said base and spaced apart as desired, said tile sections having longitudinal openings therethrough alined with each other longitudinally of said side walls to provide drainage and heat insulating channels, and a top formed of identical tile sections set end to end upon the tops of said side walls in arched relation thereto.

HARRY W. PORTER.
WILLIAM C. BOREN, JR.