METHOD OF INSTALLING AN UNDERGROUND CONDUIT SYSTEM

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This invention relates to the installation of an underground or buried conduit system which consists of a plurality of adjacent trunk or main conduit lines and has for its primary object to provide a simple, economical, and efficient method for facilitating the installation of such a system and for ensuring a durable or permanent system, once installed. While the method employed in accordance with the present invention, which is hereinafter outlined, is applicable to conduits or pipes constructed of metal or any other suitable material and of any desired form, it is particularly adapted to be practiced in connection with the fibrous conduits or tubes which are in extensive use, as, for example, in electric wiring systems.

Such conduits or tubes may be formed by winding a web of cellulose pulp or a sheet of wet paper on a mandrel until a tube having a wall of the desired thickness has been formed, then removing the tube from the mandrel and thoroughly drying it. When used as a conduit or closure for electric wiring or as a pipe, the tube may be water-proofed and rendered electro-insulating by impregnating or saturating it with pitch or other suitable material. The ends of the conduits thus produced may be tapered, threaded either externally or internally, or otherwise suitably shaped and formed for coupling or direct connection with other or similar conduits.

Briefly stated, the novel method of installation consists in first digging and forming the usual trench in which the conduits are to be buried. After a suitable trench has been formed, conduit spacing supports having formed therein a plurality of separate grooves or furrows for receiving and supporting the conduits in position and accurately spacing or separating the same both vertically and horizontally, according to the number of conduits to be laid, while they are being buried, are located at suitable intervals along the trench, and the conduits to be buried are suitably connected with the conduits previously laid. The conduit supports are preferably then temporarily fastened to the ground by suitable removable fasteners or pins, to maintain them and the conduits supported thereon substantially stationary and in proper alignment while they are being buried. Removable partitions or temporary walls are then positioned at the ends of the supports, to direct, as well as to confine in the most desirable location a suitable mixture for encasing the conduits, so that the conduits may be permanently lodged and encased with a minimum amount of encasing material. The material employed for encasing the conduits is preferably a suitable concrete mix, and the space left outside the partitions, as well as the upper portion of the trench above the concrete mixture, is filled with earth. While the concrete is still soft or plastic, however, the pins or fastening rods for the supports, and the partitions for confining the concrete, may be removed, so that after one or more lengths of tubes or conduits are installed, other stages of tubes may be connected therewith and similarly installed.

With these and other features and objects in view, the invention consists in the method of installation of underground conduits and in the construction and arrangement of the parts hereinafter more fully described, in conjunction with the accompanying drawings, in which Figure 1 represents a section through a trench in which a conduit system may be installed in accordance with the present invention. Figure 2 represents a section similar to Figure 1, with the conduits placed on the spacing supports which have been fastened to the floor or bottom of the trench. Figure 3 represents the section after the partitions have been located and the space outside the partitions filled with earth. Figure 4 illustrates the section after the tubes have been encased in concrete or other suitable material and the installation has been completed. Figure 5 represents in isometric perspective a section of positioned or connected conduits immediately prior to the pouring of the concrete or the encasement thereof, with the front and a side portion of the trench broken away to show the layout within the trench. Figures 6, 7, and 8, respectively, illustrate...
in detailed perspective a spacing tube support, a removable partition, and a rod for fastening the supports employed in the present invention.

Referring to the drawings, which illustrate in sequence the steps of installation of the conduits, Figure 1 indicates a trench 1 of suitable dimensions, which is initially formed in the earth. The trench is preferably of substantially rectangular section, and has, so far as practicable, a substantially level floor or bottom 1*, especially at those positions where the supports 2 for sustaining and spacing the conduits while they are being installed, may rest. The spacing supports may be made of any suitable material, Portland cement concrete, mixed with ashes or other filler, being admirably suited, and may be of any suitable configuration to support the conduits while they are being installed. The supports in the present instance are made in the form of elongated blocks, each having formed therein at its upper portion a plurality of transverse grooves or furrows 3, 3, and at its lower portion a plurality of similar grooves or furrows 3*, 3*, for engaging and receiving the conduits and supporting the same. As shown, the grooves are arcuate in cross-section, and are of diameter substantially equal to the outside diameter of the conduits to be engaged and supported. Any other form of groove, however, as, for example, a rectangular or triangular groove, may be employed if desired. Moreover, each support may have any number of grooves, with sufficient spacing therebetween, depending upon the number of conduits which it is desired to lay in one tier.

The spacing supports are preferably moulded in the shop, and shipped for use in form or configuration as are the fibrous conduits are to be installed. In order to obtain a light block for shipment, which is of sufficient strength to support the conduits during installation, the concrete mix utilized in casting the same preferably contains as a bulk material such light material as cinders and ashes, and may be reinforced by metal bars or wires embedded therein. Accordingly, in casting the supporting blocks, one or a plurality of rods or wires 5, 5, preferably fastened at their ends to suitable plates or pieces of tin or of any other suitable sheet metal 6, 6, may be placed in the forms or moulds employed for casting the blocks, and the concrete or cement mixture employed in such casting may be poured thereonto, thereby causing the reinforcing wires to become embedded therein. The form may be provided with suitable pins or dowels so that after the pouring and setting of the blocks, holes 7, 7 may be produced therethrough on either end portion, to allow the insertion of a rod therethrough for pinning or fastening to the bottom of the trench. The holes may be produced by any other suitable method, as by suitably positioning a hardwood pin in the mould prior to the pouring of the concrete mix, and then knocking the pin out after the supporting block has set.

Assuming in the present instance that a plurality of tiers of conduits are to be installed, the spacing supports or blocks 2 in the lower tier are positioned at suitable intervals along the trench, and the lower tier of conduits 8, 8 to be installed are suitably connected as by couplings 9, 9 to the conduits 10, 10 of a section of conduits previously installed, and are thus supported and spaced on the lower supports. As shown on the drawings and previously indicated, the lower portion of each spacing support is provided with grooves similar to those at its upper portions. Thus, when a plurality of tiers of conduits need be laid in the same trench, as shown, the conduits 10, 10 of the lower tier serve as supports for the proper superposition and alinement of the upper supports 2*, 2* thereon. By such alinement of the upper and lower supports, they may be fastened to the ground by the common fastening means. Any suitable number of spacing supports may be employed in the installation of a single stage or section of conduits, but, as a matter of practice and economy, only two sets of supports are necessary for the installation of each tier of a section. The conduits 8*, 8* of the upper tier are similarly connected by couplings 9*, 9* to the conduits 10*, 10* of the upper tier of the previously installed section, and are supported and accurately spaced on the upper supports 2*, 2*.

After both tiers have been laid, rods or pins 13, 13, preferably provided with heads or enlargements 14 at their upper portions, are inserted through the holes 7, 7 of the superposed supports and driven into the ground. The lower or butt ends of the rods are preferably pointed so that they may be driven into the ground with relative ease. Thus the securement of the supports to the ground, and a secure holding of the pipes, is maintained while the concrete for encasing the pipes is being poured into the trench. Before passing, it may be stated that although only one grooved portion is necessary for the lower tier of conduits or where only one tier of conduits is to be laid, it is preferable to provide two as to have only a single standard spacing support for the job, the one standard being suitable for employment either for the installation of a plurality of tiers of conduits or for the installation of only a single tier. One could employ a single spacing support for both tiers, consisting of a block having a plurality of circular holes therethrough, through which the conduits to be supported may be inserted. Such a support, however, would not be economical for usage with a single tier of conduits. Moreover, it is again to be observed that the supports shown have arcuate grooves, so that, while they engage...
a sufficient portion of the periphery of the conduits to support or hold them in place, a material saving of concrete is effected over supports provided with semi-circular grooves or supports having circular apertures throughout. If desired, however, any other suitable blocks or combination of blocks may be employed.

To effect the installation of the conduits after their connection and placement with a minimum amount of encasing material, and to afford a distribution of such material immediately around the conduits where it is most effective and desirable, partitions 15, 15, extending from one end to the other end of the conduits, are positioned at the ends of the spacing supports. These partitions are made of sheet iron or any other suitable material, so as to confine the encasing mixture in the most desirable location, and are provided at their upper ends with any suitable means, such as a plurality of rings 16, to serve as handles by means of which they may be grasped by workmen, or lifted by hoisting mechanism, for insertion into a trench and removal therefrom. If desired, however, the plates may be provided with holes cut through at their upper portions, through which hooks, to which may be fastened ropes, may be inserted for hoisting the plates into position and for subsequently removing the partitions from the trench. The partitions rest against the ends of the spacing supports, leaving spaces between them and the sides 35 of the trench. These spaces are filled with earth, thus backing up or supporting the partitions so that concrete for encasing the conduits may now be poured into the trench.

While the conduits may be encased or buried in earth, if desired, in accordance with the present invention I preferably employ a suitable concrete mix, so as to form a permanent or durable casing for the conduits. Such concrete, after setting, in great measure prevents access of moisture to and into the fibrous conduits, thus aiding in their preservation. For this purpose, the usual concrete mix, but comprising relatively fine stones preferably not averaging over 3/4 of an inch in diameter (that is, stones which will pass through a 3/4-inch ring) are employed, so that a dense structure for encasing or burying the conduits may be had. The concrete is mixed sufficiently wet, to form a mixture that will readily flow down between the conduits and will fill up the spaces between the supports, in a manner to completely envelop or surround the conduits. Only sufficient concrete is necessary as will properly bond the conduits together. Directly after the pouring and while the concrete is still soft and plastic, the rods 13, 18 are withdrawn from place and when the concrete is sufficiently firm the partitions are likewise withdrawn. The concrete may then be allowed to set, after which the trench may be completely filled with earth, but, obviously, since concrete will harden or "set" underground just as well as if it were entirely open or exposed to the atmosphere, the trench may be filled before the concrete has set. Of course, the rods and partitions may be permitted to remain during the initial setting of the concrete, provided they are withdrawn before they are permanently anchored unless it is desired to leave them in position permanently. It is evident that a plurality of sections of pipes may be laid and connected, preparatory to their encasement, and the conduit line may thus be first built up of indefinite length, after which a suitable concrete mixing and pouring machine may pass down the line of trench, and the concrete poured thereinto. Thus, by the simple and practical method described, any number of conduits and tiers of such conduits may be efficaciously, and economically laid. The installation is efficient and accurate, since the spacing supports determine and ensure separation between the conduits, and their proper alignment. Moreover, during the pouring, the conduits are adequately supported, so that there is practically no tendency for the conduits to be thrown out of alignment.

It is to be understood that the pins which are employed for fastening the supports and the partitions may be made of wood and left behind in the ground after the pouring of the concrete; but removable instrumentalties such as described are more economical and are preferably employed. It may also be stated that the various materials, as well as the form and construction of the instrumentalties employed, may be changed or modified according to circumstances, without departing from the spirit or scope of the invention. Hence I do not wish to limit myself to the particular processes, nor the arrangement, construction and usage of the parts described.

What I claim is:
1. A method of installing underground conduit systems, which comprises forming a trench, locating conduit spacing supports of concrete at intervals along said trench, fastening said supports to the bottom of said trench by rods inserted through holes in said supports and driven into the ground, connecting the conduits to be installed with other conduits previously laid and resting the conduits on said supports, positioning removable partitions against the ends of such supports, filling the space outside the partitions with loose filling material, and covering the conduits in said space between the partitions and supports with concrete, removing the fixing rods and partitions, and filling the remainder of the trench with loose filling material.
2. A method of installing underground conduit systems, which comprises forming a trench, locating conduit spacing supports at intervals along said trench, connecting the conduits to be installed with other conduits previously laid and resting the conduits on said supports, positioning removable partitions against the ends of such supports, filling the space outside the partitions with earth, encasing the conduits in said space between the partitions and supports with concrete, and removing the removable partitions.

3. A method of installing underground conduit systems, which comprises connecting a plurality of conduits arranged in tiers with other conduits previously laid, supporting the conduits on supports adapted to engage the conduits and maintain them in spaced relationship, temporarily fastening said supports to the bottom of said trench by removable fasteners, positioning removable partitions against the ends of such supports, filling the space outside said partitions with loose material, encasing the conduits in said space between the partitions and supports with concrete, removing the fasteners and removable partitions, and filling the trench.

4. The method of installing underground conduit systems which comprises forming a trench, locating conduit supporting blocks at intervals along said trench, placing conduits on said supports, placing another tier of supports upon the laid conduits, fastening all said supports and the conduits engaged thereto to the bottom of the trench, positioning partitions against the end of said supports, filling the space outside of the partitions with earth to back up said partitions, encasing the conduits between said partitions in concrete, and filling the remainder of the trench with earth.

5. A method of installing underground concrete systems, which comprises forming a trench, laying a tier of transverse concrete spacer members at intervals on the bottom of the trench, laying lines of conduit longitudinally in the trench upon said spacers, laying a second tier of concrete spacers upon said conduits so that the second tier is spaced from the first tier, laying more conduits on the second tier, pinning the tiers of spacers to the ground, and pouring concrete around and between all said conduits and around and between all said spacers.

In testimony whereof I have affixed my signature.

EDMUND BURKE.