Oct. 5, 1943. C. GOTTWALD ET AL 2,330,966

FLUID DISTRIBUTION SYSTEM

Filed Sept. 18, 1939 3 Sheets-Sheet 1

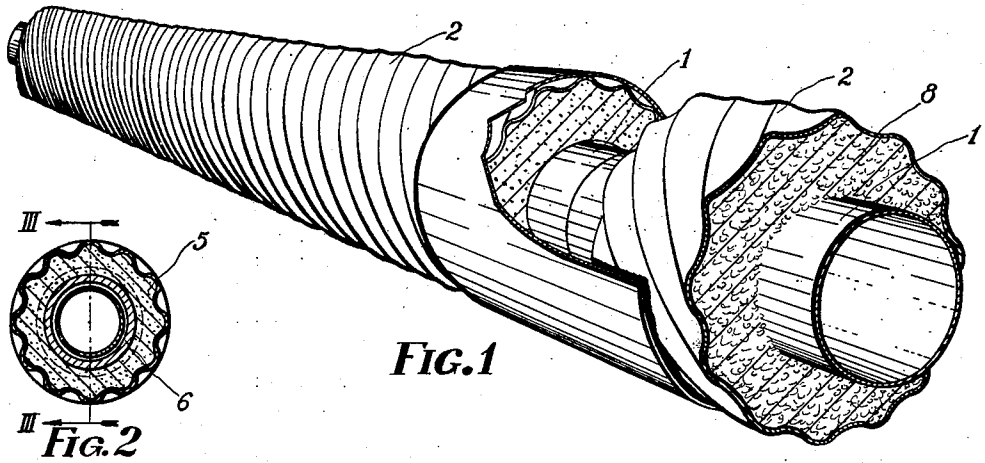


FIG. 1

FIG. 2

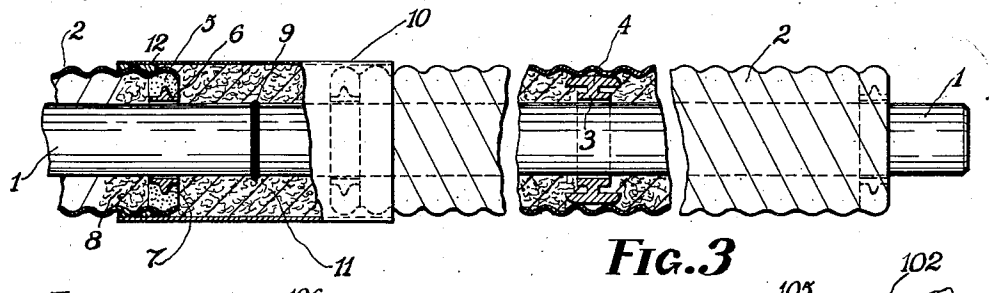


FIG. 3

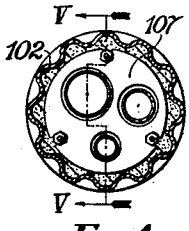


FIG. 4

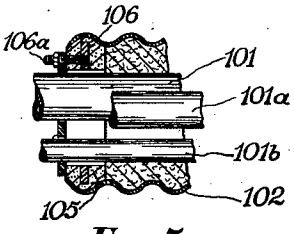


FIG. 5

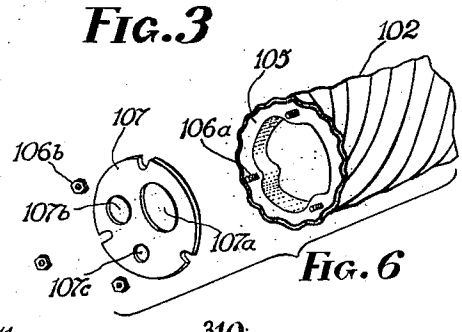


FIG. 6

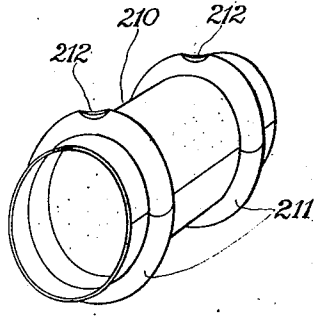


FIG. 7

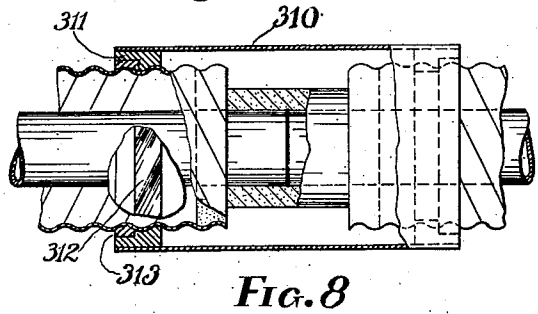


FIG. 8

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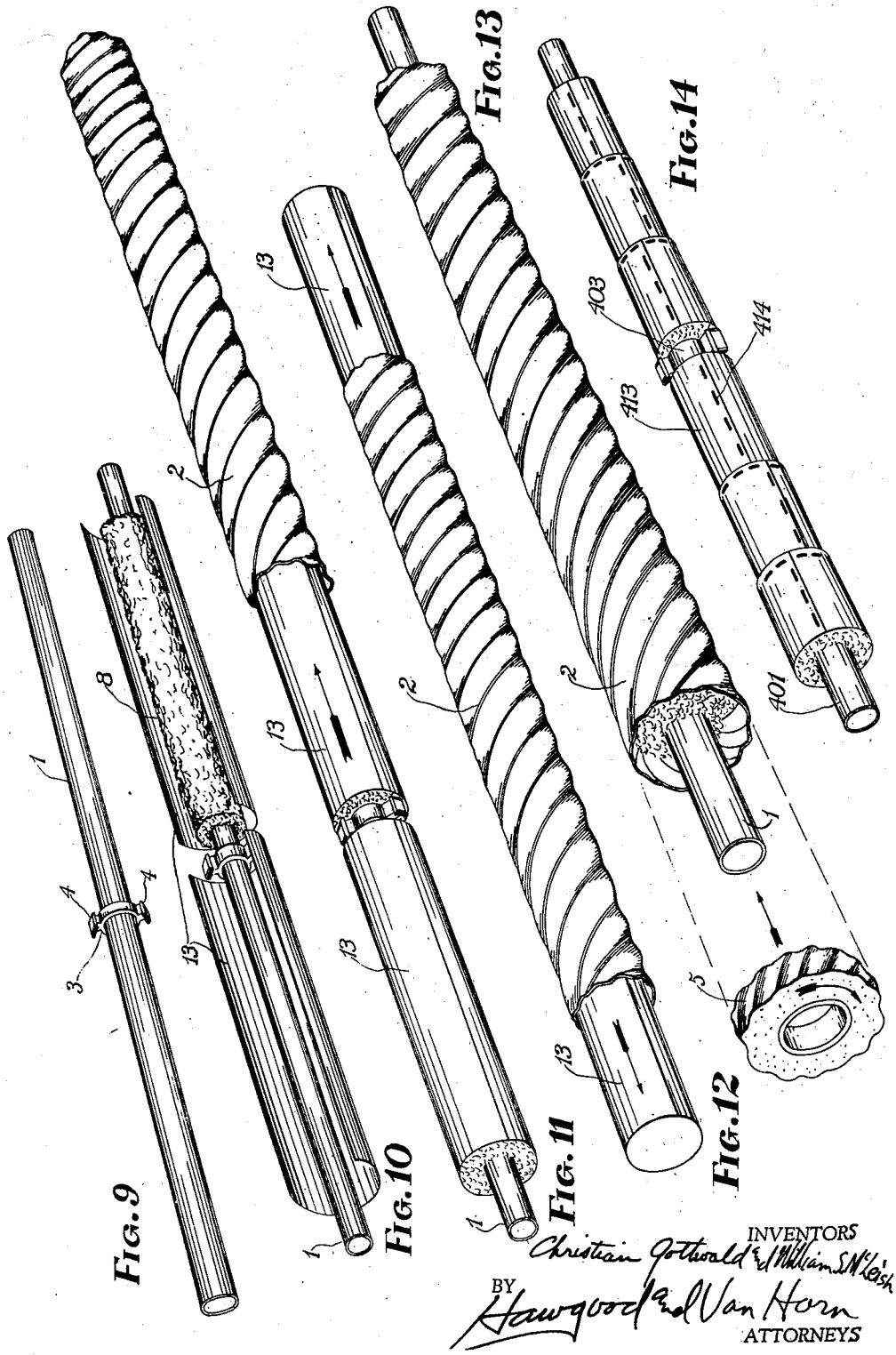
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Oct. 5, 1943. C. GOTTWALD ET AL 2,330,966

FLUID DISTRIBUTION SYSTEM

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FLUID DISTRIBUTION SYSTEM

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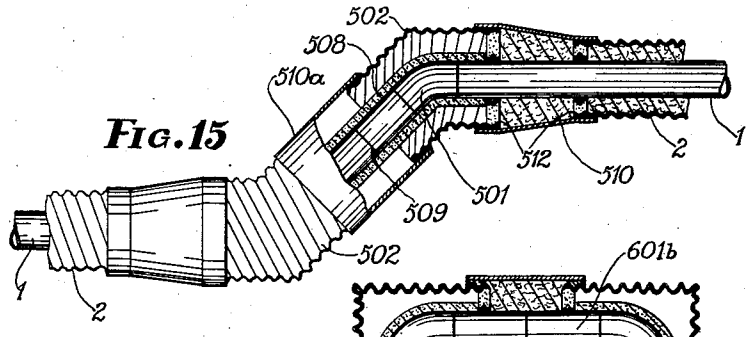


FIG. 15

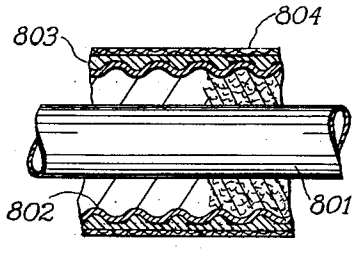


FIG. 18

FIG. 16

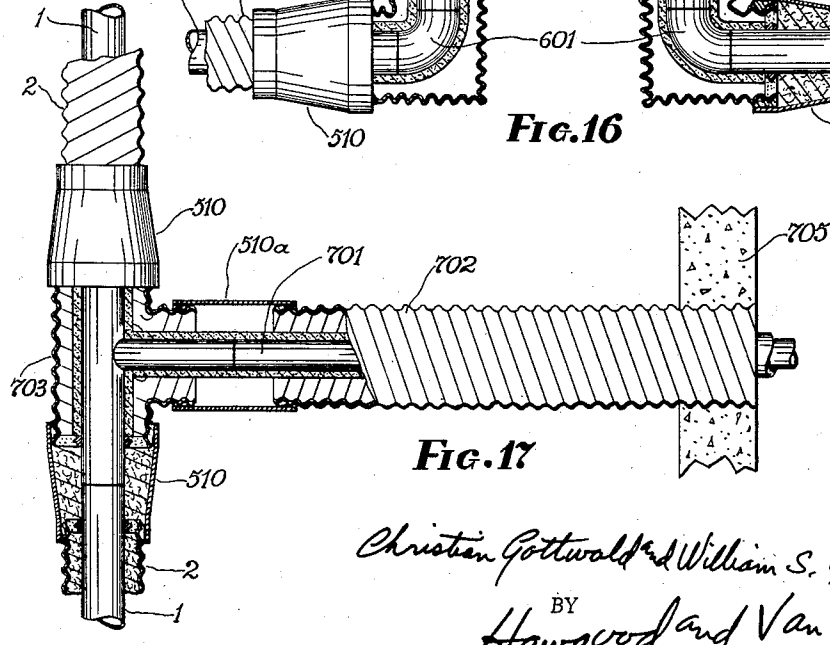


FIG. 17

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UNITED STATES PATENT OFFICE

2,330,966

FLUID DISTRIBUTION SYSTEM

Christian Gottwald, Cleveland Heights, and William S. McLeish, Barberton, Ohio, assignors to The Ric-wiL Company, a corporation of Ohio

Application September 18, 1939, Serial No. 295,390

6 Claims. (Cl. 138—64)

This invention relates to fluid distribution systems, and is particularly applicable to such systems which are used to distribute heated fluids such as steam, or cooled fluids such as required in refrigeration.

An object of our invention is to provide an improved apparatus for distributing fluids.

A further object is to provide an improved apparatus for distributing fluids which may be easily installed.

Another object is to provide an improved apparatus for distributing fluids which will occupy relatively little space.

Another object is to provide an improved apparatus for distributing fluids which will be composed of few and simple parts.

Another object is to provide an improved apparatus for distributing fluids in which the parts will be rugged and durable.

Another object is to provide an improved apparatus for distributing fluids which will effectively prevent the transfer of heat.

Another object is to provide an improved apparatus for distributing fluids which will effectively protect the internal parts from moisture.

Another object is to provide an improved apparatus for distributing fluids in which one or more tubes or pipes may be contained.

Another object is to provide an improved apparatus for distributing fluids in which a minimum of labor is required for assembly at the site of installation.

Another object is to provid an improved apparatus for distributing fluids which will be composed of units which are extremely light and easily handled.

Another object is to provide an improved apparatus for distributing fluids which will be extremely strong, both against internal pressure and external forces.

Another object is to provide an improved apparatus for distributing fluids which will have long life and high salvage value.

Another object is to provide an improved apparatus for distributing fluids which will be efficient and economical in operation.

Another object is to provide an improved apparatus for distributing fluids which may be easily and economically manufactured and installed.

Other objects will hereinafter appear.

The invention will be better understood from the description of several practical embodiments thereof, illustrated in the accompanying drawings, in which;

Figure 1 is a fragmentary perspective view of a fluid conducting conduit such as an underground steam line, parts being broken away and shown in section;

Figure 2 is a transverse sectional view of the conduit of Figure 1;

Figure 3 is a longitudinal partially elevational and partially sectional view taken on the line III—III of Figure 2;

Figure 4 is a view similar to Figure 2 of a modified form of construction containing three fluid conducting tubes or pipes;

Figure 5 is a fragmentary longitudinal sectional view taken on the line V—V of Figure 4;

Figure 6 is a perspective fragmentary view showing parts which appear in Figures 4 and 5 in unassembled relation;

Figure 7 is a perspective view of a modified form of outer coupling member;

Figure 8 is a partially elevational and partially sectional view of another modified form of coupling member;

Figures 9, 10, 11, 12, and 13 are perspective views showing successive steps in assembling a conduit such as illustrated in Figures 1, 2, and 3;

Figure 14 is a perspective view of parts of a modified type of assembly;

Figure 15 is a fragmentary plan view, partially in section, showing a portion of a completed conduit made of units, such as disclosed in the preceding figures, where it is desired to carry the conduit in an angular or somewhat off-set path;

Figure 16 is a similar fragmentary plan view, partially in section, showing an expansion bend composed of units such as illustrated in the foregoing figures;

Figure 17 shows the juncture of the main and a branch conduit; and

Figure 18 is a fragmentary sectional view of an embodiment of the invention showing an additional protective covering.

This invention is an improvement on, and a carrying forward of, ideas disclosed in the patent to Christian Gottwald, Patent Number 1,991,455 issued February 19, 1935, which first disclosed that fluid conduits such as those used in underground steam lines could effectively be formed with an outer metal shell, rather than the ceramic or masonry structures which, for many years, had been the only means available for underground distribution of fluids while providing them with thermal insulation.

In the embodiment of the present invention illustrated in Figures 1–3, the fluid distributing means is shown as consisting of an inner conduit formed of sections of pipe or tubing 1. For

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this purpose any desirable type of pipe or tubing may be used. In some instances it may be of steel, in others brass, cast iron, or other metals. It is found particularly convenient to use steel tubing having relatively thin walls, which may be seamless drawn tubing of the butt or lap welded type, or spiral welded tubing.

Each section of tubing 1 is shown as surrounded by a generally concentric cover 2 of substantially greater diameter than the piece of tubing, and terminating a slight distance, short of the ends of the tubing of the section. This casing or cover is held concentric with the tubing by means of spacers, of which two forms are illustrated in the first three figures of the drawings.

The casing or cover is of relatively thin walled material, such as metal strengthened by corrugating, and is shown as having the corrugations in helical arrangement.

About the central portion of tubing 1 is positioned a spacer consisting of a central ring 3, fairly closely fitting the exterior of the tubing and having three projecting skid-like arms or flanges 4 which are slightly smaller in diameter than the smallest interior diameter of the cover, so that they may readily slide therein. They extend axially a sufficient distance to bear upon at least two inwardly directed corrugations of the casing.

At each end of the casing is a ring shown as an outer portion of solid heat insulating material 5 and inner bearing ring of metal 6, fitting relatively closely upon the exterior of the tube 1, the ring 6 having an outwardly extending flange 7 keyed within the material 5. This solid material may conveniently be a mixture of asbestos, Portland cement, solid magnesia, or any other desired material having the requisite strength and heat insulating properties.

The exterior of the block is formed with corrugations corresponding to those of the interior of shell 2, so that the block may be positioned within the shell by threading the same therein and rotating it, as a short screw would be inserted in a long nut.

The helical corrugations upon the block and within the shell function as threads of relatively high lead to permit the easy insertion or removal of the block 5.

Surrounding the tube 1, and filling the shell 2 between the two end blocks 5 is a layer of heat insulating material 8, such as shredded asbestos, magnesia, mineral wool, or the like.

Each assembly consisting of a section of tube, its shell or casing, supports, and insulating material, constitutes a complete unit, which may be easily fabricated at a point remote from its installation, and may be easily handled and installed, as indicated in the above mentioned patent to Christian Gottwald.

A complete conduit is constructed by laying several units such as those above described in alignment, and uniting the ends of tubes 1 as by welding 9. Prior to this welding operation, a sleeve 10, shown as a plain piece of tubing, is slid over one of the shells adjacent the joint and upon the completion of the welding or otherwise joining tubes 1, the sleeve 10 is slid to the position indicated in Figure 3, whereby it overlies at least two convolutions at the ends of both shells or casings 2.

As the sleeve is being moved into position, the space within it and about the ends of the pipes 1 is filled with insulating material 11, similar to that indicated within the units. If desired, the projecting ends of the pipe sections may be surrounded by molded pipe covering or the like.

After the sleeve has been placed as indicated in Figure 3, sealing material, such as asphalt or cement is poured in a molten or plastic condition to fill the spaces between the ends of the sleeve 10 and the ends of the casing 2, which hardens as indicated at 12, firmly joining these parts together and tightly sealing them to each other.

While the central supporting member 3 is shown of metal, conveniently of cast iron, it will be apparent that rings of heat insulating material, similar to the rings 5, but having an external surface which will slide within the corrugations 2, may be provided and will effectively prevent the transfer of heat from the tube 1 to the casing 2 at these points.

Such a ring could be provided with a wear-resisting surface on either (or both) its interior and/or exterior, such as short pieces of tubing, rings bent of sheet metal, or the like.

When an all-metal spacer such as illustrated in Figure 3 is used, it will be noted that the arms carrying the bearing flanges 4 are of reduced cross section which greatly impedes the conduction of heat. It will also be noted that the areas of contact between the corrugations of casing 2 and the flanges 4 are very small, further impeding any transfer of heat.

In Figures 4, 5, and 6, a modification of the supporting block is shown, which is useful when a plurality of tubes are to be used instead of the single one of the first three figures.

Three tubes are indicated at 101, 101*a*, and 101*b*.

A block of heat insulating material 105 is seated within the end of the corrugated casing or cover 102. Within this is embedded a metal ring 106. Studs 106*a* are threaded into ring 106, and these are arranged to fit into notches in the periphery of the disc 107, provided with holes 107*a*, 107*b*, and 107*c*, arranged to fit the exterior of the tubes 101, 101*a*, and 101*b* respectively.

Nuts 106*b* serve to clamp the plate 107 to the ring 105. It will be apparent that the block 105 may be screwed into the corrugations of the casing 102, and that the plate 107 may then be slid over the ends of the tubes without having to twist these about within the casing and the plate 107 may then easily be clamped to block 105 by the nuts 106*b* and studs 106*a*.

In Figure 7 another form of sleeve is shown, this consisting of a cylindrical portion 210, which is formed adjacent each end with a generally annular corrugation 211. These corrugations are perforated as indicated at 212. This sleeve is applied in the same manner as sleeve 12 above described, excepting that after it has been moved to its final position the corrugations 212 overlie the ends of casing member 2.

The sleeve is arranged with perforations 212 extending upwardly and into these the sealing material, such as the molten asphalt, may be poured, this material flowing around the corrugations of the sleeve and forming two thick rings, sealing the sleeves to the casing ends.

Figure 8 shows a still further modification of the sleeve, this being indicated as a cylindrical member 310, in each end of which is placed a formed or cast ring 311, having its outer end provided with a cylindrical recess and being formed internally with a plurality of helically

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arranged corrugations 312 arranged to be threaded on the exterior of casings 2.

The space defined by the recesses is filled with melted asphalt or other cementitious material 313, which, while cooling or setting is prevented from flowing out of the recess by means of a flexible temporary form, commonly known in the art as a "snake."

Figures 9 to 13 show a method of assembling units such as illustrated in the first three figures of the drawing. From these it will be apparent that first the ring 3 is placed about the center of the tube 1. Next, two somewhat flexible pieces of material 13, such as thin sheet metal, are arranged to partially surround the tube, extending substantially to the ring 3.

In the trough-like spaces so formed is placed the heat insulating material 8, and the sheet metal members 13 then are closed to form two cylinders of slightly smaller diameter than the internal dimensions of the casing 2.

The tube, heat insulating material, and sheet metal holders 13 are slid axially into the casing 2, as indicated in Figure 11, until the longitudinal center tube and casing coincide, when the holders 13 are withdrawn as indicated in Figure 12, leaving the central supporting ring and heat insulating material inside the casing.

Next, the plugs 5 are slid over the ends of the tube 1 and threaded into the ends of the casing to hold the heat insulating material as well as the tube in place.

Of course, it will be apparent that the tube might be placed in the casing first, and the heat insulating material packed in from the ends. Also that the tube and casing might be placed vertically and the heat insulating material poured in from above. Similarly, the heat insulating material might be placed around the tube, held in place by the sheet metal holder members 13, and this assembly lowered end-wise into the casing.

In Figure 14 an embodiment of the invention is illustrated in which the sheet metal holder members have been replaced by strips of flexible sheet material, such, for instance, as felt roofing, roofing paper, or the like, these being shown as sections 413, each of which is bent into cylindrical form and held in this position as by staples 414.

Each section of roofing material may be filled as it is placed about the tube 401 and the successive strips may be stapled together.

Preferably, the ends of successive strips are telescoped—the smaller ends of each section heading in one direction, and the larger ones in the other—so that the assembly may be more easily slid into the casing.

With this embodiment of the invention, it is intended that the holder covering may remain permanently within the casing, and no provision for its withdrawal is therefore made.

While I have described above shredded asbestos or similar loosely associated heat insulating material, it will be apparent that solid or molded heat insulated material such as magnesia or the like might be used.

The sleeves shown for surrounding the joints in the first few figures are indicated as cylindrical. However, where it is desired to connect casing members of different diameters, as in connecting branch conduits to a main, or for use in conjunction with expansion joints, or the like, tapered or frustro conical (rather than cylindrical) sleeves may be used, the two ends of the sleeves being adapted to fit different sizes of casing section.

A few specimens of such arrangements are illustrated in Figures 15, 16, and 17.

In Figure 15, the main tubing sections 1 are surrounded by the casings 2, shown as axially offset. To the end of each tube section 1 a direction-changing fitting, such as a forty-five degree elbow 501, is united.

The central portions of each elbow is enclosed in an elbow-shaped casing 502, the elbow itself being covered with heat insulating material 503, shown as of molded type secured about the elbow in any desired manner.

A frusto-conical sleeve 510 is provided, having its smaller end arranged to slide over casing 2 and its larger end to slide over casing 502 which is of somewhat larger diameter than the casing 2. The ends of the casing are sealed to the sleeve by asphalt, cement or the like, as indicated at 512.

The two elbow sections are united by welding 509, and the junction between the casing sections 502 is closed by a cylindrical sleeve 510, similar in all respects to the sleeve 10 previously described.

In Figure 16 a generally U-shaped expansion bend is shown, this consisting of 90 degree elbows 601 welded to the ends of tube 1 and connected by perpendicularly extending tubes 601*a*, two more 90 degree elbows, and two shorter pieces of tubing 601*b* parallel the tube 1.

To permit the ready movement of the parts of the expansion bend in compensating for expansion and contraction, a larger casing 602 is provided about the tubes 601*a* than the casings sections 2.

Frusto-conical sleeves 510 are again used to join the smaller to the larger casing sections and a larger diameter cylindrical sleeve 510*a* joins the ends of the casings 602.

Figure 17 shows a T-like fitting connecting a branch 701 to the main conduit section 1. The branch is surrounded by a casing section 702 which is connected to a T-like casing section 703 by a sleeve 510*a*, the arms of the T-like casing being connected by sleeves 510 to casing sections 2. The end of casing section 702 is shown as anchored in a building or like wall 705.

While the casing sections are shown as of helically corrugated thin metal, it will be apparent that coatings for the protection of these may be conveniently provided, such, for instance as asphalt.

It has been found that if the casing be wound with building paper, felt, or some other fibrous sheet material, while asphalt is provided in sufficient quantities and a molten condition to fill the corrugations and penetrate the fibrous material, a very durable and smooth coating is obtained.

The casing section of Figure 18 illustrates this form of covering, which, it will be readily understood, may be applied to any of the casings illustrated in the other figures, and used with any of the types of connecting sleeves.

The tube with the casing is illustrated at 801, while the casing itself is shown at 802. The asphalt filling the corrugations is indicated at 803 and an asphalt impregnated layer of felt is shown at 804.

While we have described the illustrated embodiments of our invention in some particularly, obviously many others will readily occur to those skilled in this art, and we do not therefore limit ourselves to the precise details shown and described, but claim as our invention all embodi-

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ments, variations, and modifications thereof coming within the scope of the appended claims.

We claim:

1. A prefabricated conduit unit comprising an inner fluid conducting tube, a helically corrugated casing surrounding said tube and spaced therefrom, rings of heat insulating material having helically corrugated external surfaces arranged to be threaded within the corrugations of the casing at its ends, said rings being provided with supporting surfaces for maintaining said tube in spaced relation to the casing.

2. A conduit unit comprising a plurality of spaced parallel tubes, a tubular casing surrounding said tubes and spaced therefrom, rings of heat insulating material fitting within the ends of said casing, and bearing members detachably secured to said rings having guide means supporting said tubes in spaced relation to each other and to said casing.

3. A conduit unit comprising a plurality of spaced parallel tubes, a tubular casing surrounding said tubes and spaced therefrom, rings of heat insulating material fitting within the ends of said casing, and bearing members detachably secured to said rings having guide means supporting said tubes in spaced relation to each other and to said casing, and heat insulating material in the spaces between and about the tubes and within the casing.

4. A conduit unit comprising a plurality of spaced parallel tubes, a tubular casing surrounding said tubes and spaced therefrom, rings of heat insulating material fitting within the ends of said casing, and bearing members each comprising a plate having a plurality of apertures adapted to be slid over the ends of the tubes, and securing means detachably holding the plate to the ring.

5. A prefabricated conduit unit comprising an inner fluid conducting tube, an outer sheet metal casing of helically corrugated sheet material surrounding said tube and spaced therefrom, rings of heat insulating material having external helical corrugations threaded into the corrugations of the casing and bearings carried by said rings supporting said tube in spaced relation to the casing.

6. A conduit unit comprising an inner fluid conducting tube, an outer sheet metal casing of helically corrugated sheet material surrounding said tube and spaced therefrom, rings of heat insulating material having external helical corrugations threaded into the corrugations of the casing and bearings carried by said rings supporting said tube in spaced relation to the casing, said bearings comprising wear-resisting shoes permanently fixed to the rings.

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WILLIAM S. McLEISH.