Dec. 5, 1950 T. F. M. WILLIAMSON 2,532,587

THERMAL INSULATED PIPE

Filed March 4, 1946

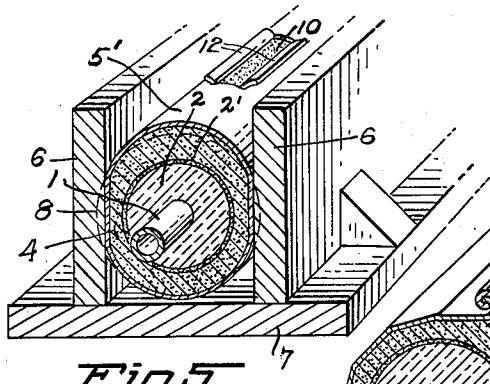


Fig. 5.

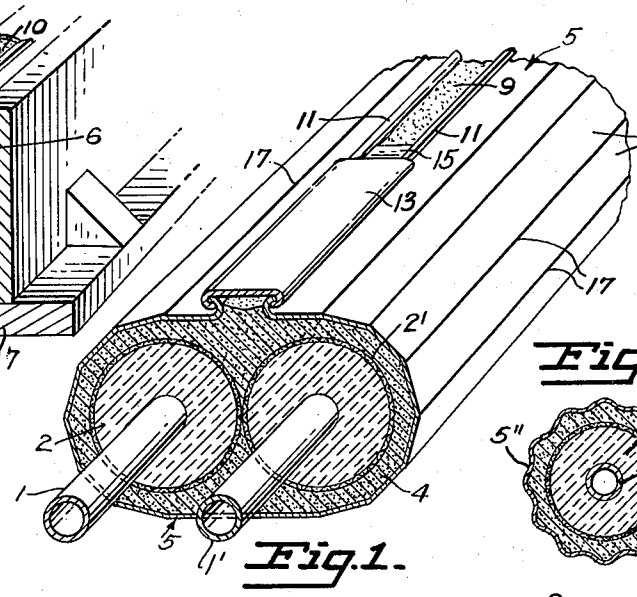


Fig. 1.

Fig. 7.

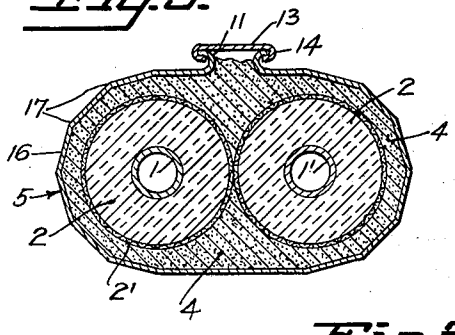


Fig. 3.

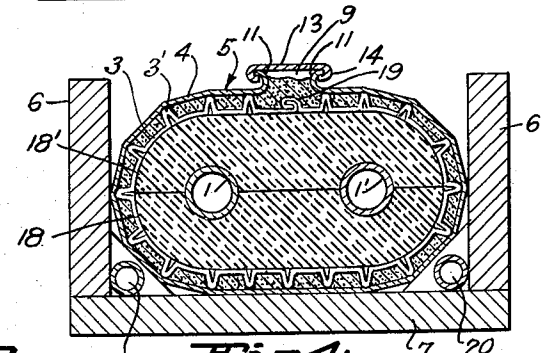


Fig. 4.

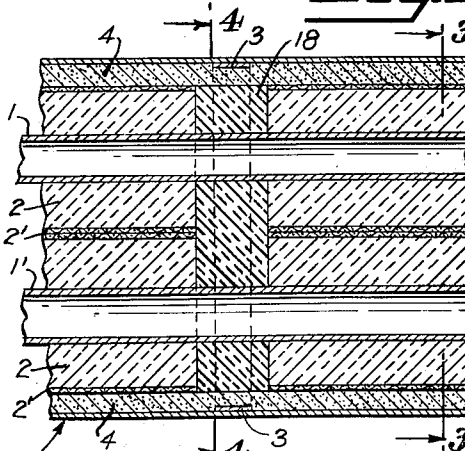


Fig. 2.

Fig. 6.

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THERMAL INSULATED PIPE

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5 Claims. (Cl. 154—44)

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This invention relates to pipe which is both thermally insulated as well as insulated or sealed against water gaining access to the thermal insulation, and the principal object of the invention is to provide improvements in the construction of such pipe as well as improved steps in its making so that the resulting finished product will be more durable and effective for the purposes above set out.

Particular features and advantages of the invention are set out in the following description and in the following drawings.

In the drawings Fig. 1 is a perspective view of a pair of metal pipes enclosed in their heat and moisture insulating jackets and outer sheet metal casing made in accordance with my invention.

Fig. 2 is a plan view of Fig. 1 shown partly in section.

Fig. 3 is a cross section of Fig. 2 taken along the line 3—3 thereof.

Fig. 4 is a cross section of Fig. 2 taken along the line 4—4 thereof and showing the pipe assemblage supported within an aligning trough.

Fig. 5 is a perspective view of a single pipe assemblage with its tubular casing supported in an aligning trough distorting its casing out of round.

Fig. 6 is a fragmentary plan view showing a couple of the pouring or casting slot closing plates in place, and with a modified joint sealing strip.

Fig. 7 is an end view of a single pipe assemblage having an expansible casing.

Briefly described the finished product comprises one or more pipes enclosed in thermal covering such as asbestos or magnesia composition steam pipe covering, spacedly supported within an outer casing (preferably of bendable non-rigid sheet metal), and with the space between the casing and the thermal steam pipe covering filled with pourable moisture impervious pitch, tar, asphaltum, or mixture of these generally classed as bitumens, introduced in a heated or molten condition and permitted to harden in the casing when it cools. Such a product broadly is old in the art as my invention relates to improvements which go far in meeting industrial requirements heretofore not satisfactorily met.

In the drawings the pipe is designated 1, the thermal covering 2, the spacing means 3, the moisture impervious material such as asphaltum 4, and outer casing 5, the latter being non-rigid sheet material to provide a mold for the bitumen.

Heretofore the outer casings have always been round in cross section and the molten pitch has either been poured in at one end of the assemblage with the assembly tilted, or poured through side

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openings or slots in the casing with the assembly in horizontal position. In such assemblages the solid asphalt pitch layer is generally about an inch thick and it expands and contracts with heat and cold, and to such an extent that it has been customary to leave the pouring slots open to take care of the expansion to prevent fracture of the outer casing, and one of the objects of the present invention is to take care of any such expansion or contraction without requiring any openings in the casing, and which is effected by having the sheet metal casing other than of simple round cross section, say of oval, or round and flattened on one or more places, for example, and of deformable sheet metal, as distinguished from heavy load-bearing pipe, so that in expanding the pitch will force the casing walls outward toward a true round cross section and hence toward a larger internal capacity to take care of the increased volume, and upon shrinkage with lowering temperature the casing will contract again toward its original cross section. With the above explanation of one of the features of my invention kept in mind, the description of the drawings will be more easily understood.

In Figs. 1, 3 and 4 the outer sheet metal casing 5 is shown as of generally elliptical cross section, while in Fig. 5 the casing 5′ is shown as slightly compressed on opposite sides by the rigid walls 6 of an aligning trough 7, to distort it from its original round cross section (denoted by the dotted circular line 8), and in Fig. 7 the casing 5″ is shown as slightly corrugated to permit of expansion from inward pressure, and corresponding contraction when the pitch shrinks.

In Figs. 1, 3, 4 and 5, the casing is provided with a slot 9 or openings 10 on top through which to pour the molten pitch. In Figs. 1, 3 and 4 the casing 5 is shown formed of sheet metal bent to substantially oval form and with its two edges spaced to form the slot 9 and with the edges bent outwardly to form hooks 11 running the length of the casing, while in Fig. 5 the opening may be one or several slotted openings spaced along the casing, and each slot formed with outwardly hooked edges 12.

The spaced outwardly hooked edges 12 of Fig. 5 and 11 of Figs. 1, 3 and 4 are adapted to receive cover plates 13 which are formed with confronting or inwardly turned hooked edges 14 to engage over the hooked edges of the slot 9 or pitch pouring openings 10, as indicated in Figs. 1, 3 and 4. These cover plates may also be of sheet metal and preferably each is provided with an extending lip 15 at one end only which may be forced under a

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preceding plate 13 when several plates are used to cover a slot, and in which case the plates may be slid along from one or both ends of the casing to the position shown in Fig. 2 (right hand portion) where the lip 15 is shown tucked below the adjacent or preceding plate, and the lip being preferably tapering as indicated in Fig. 2 so as to make a sealed joint when all are driven up tightly together, and after which the engaged edges of the plates and casing may all be flattened down substantially into the plane of the casing wall by striking them with a hammer, mallet, or flat heavy bar. It is to be understood that the asphalt or pitch layer 4 had first been permitted to become firmly set. Instead of providing a lip 15, a separate piece of sheet metal may be positioned under each joint as at 15' in Fig. 6.

The casing is preferably formed of sheet metal and deformed from regular arc in transverse section, by making a succession of definite longitudinal or axial bends as with a sheet metal worker's "brake" to form a series of successively adjoining longitudinally parallel flat surfaces 16 or narrow panels disposed arcuately and defined by angles or corners 17 which are obtusely angular and the vertex of which is radially outward relative to the axis of the enclosed pipes; or otherwise slightly "fluted" for the length of the casings as this insures the casings remaining straight or true and eliminates the tendency of the casings to warp and twist as they do if merely bent on a smooth curve.

As heretofore stated, since an arc or circle encloses greater area than other geometric form, the providing of angles 17 of Fig. 1, or corresponding corrugations 5'' of Fig. 7, decreases the area filled by the pitch which, when the thermal expansion takes place, tends to restore the arc of a circle, and when the pitch again contracts upon cooling, the metal, due to having been bent beyond its limit of elasticity, seeks to return to its former shape, as so bent or angled. The bends or angles 17 as shown in Fig. 3 and the peaks of the corrugations as shown in Fig. 7 are of greater radial distance from the center of the casing and obviously have greater resistance to radial deformation than the areas therebetween, for the same reason that an angle iron has greater resistance to bending than a flat strip. Therefore, it is the areas between the angles or ridges which expand and contract.

In making up the assemblage, the pipe or pipes 1 are first covered with the heat insulation material 2, and which is preferably lengths of the conventional magnesia steam pipe covering put over the pipe in split block sections and held in place as by a canvas wrapping 2' glued or cemented in place, the adjacent ends of the lengths of insulation material being relatively spaced, while at intervals along the pipes bare spaces are preferably provided in which are placed preformed firmer insulating blocks 18 as of asbestos-cement composition around which are spacing band devices 3 which space the interior of the outer casing about an inch from the outer surface of the heat insulation 2 to receive the molten pitch filling 4.

The blocks 18 may be solid and slipped over the ends of the pipe to the required position and the insulation 2 applied to the pipe between the spaced blocks, but I prefer to make the blocks 18 in sections parted along the horizontal line 18' so that they may be applied after the pipe (or both pipes of Figs. 1 to 4) have been insulated at all other places, and the spacing band device 3 may be wrapped about the two block sections to firmly tie them and the pipes into a handling unit which is then placed into the casing 5 either by slipping the unit in endwise, or springing the casing open (if of the type shown in Figs. 1–4) and inserting it from above.

The spacer band 3 is preferably of metal, although it may be of plastic or other lower heat conducting material, and it may be formed in any numerous ways to provide a band portion 3 having circumferentially spaced outwardly projecting spacing lugs 3' so that the band may be tightly wrapped about the block sections 18 and the ends crimped in place as at 19. As best shown in Fig. 4, the spacing lugs space the outer casing from the insulation body around pipe 1, the lugs being circumferentially spaced so that the pitch may flow therebetween longitudinally within the outer casing.

Before pouring in the molten asphalt, the assemblage is preferably placed level within a trough 6–7 to align the casing and force the slot edges to parallelism so that a few of the cover plates 13 may more easily be applied while leaving sufficient of the slot open for pouring the molten asphalt or other waterproof filler to fill the space between the casing and the thermal insulation.

It is also desirable that the aligning trough be continuous for the full length of the assemblage and be provided with naked steam pipes 20 through which hot steam can be circulated from any suitable source, not shown, so as to keep the entire assemblage hot until the molten pitch is all poured.

Before pouring the pitch, the extreme ends of the casing space are closed either by suitable insulating filler blocks, although preferably by a "putty" of asbestos fiber and/or magnesia cement composition as has been common practice in the art.

In pouring the molten pitch, particularly if of a normally solid grade of asphalt great trouble has been experienced in obtaining a complete filling of the space, and I have discovered that if the molten mass is poured in several stages, generally three will do, and a few minutes time is given between pourings to permit the previous one to gradually settle into all the interstices and the enmeshed air bells to break and pockets of air to escape, a completely solid fill may be produced, and as has heretofore been almost impossible to obtain.

After the casing is full and no more settling takes place, the stem heat is turned off, and cooling water may be passed through pipes 20 if desired as well as sprayed over the top from a hose or special spray pipe, to entirely set the asphalt, and after which the entire slot may be closed with the interlocking cover plates and all hammered down in tightly interlocked condition with the casing edges.

Such an oval form of casing as shown in Figs. 1, 3 and 4 may be tightly sealed yet is able at all times to expand and contract to accommodate the requirements of the asphalt as explained previously in this description.

If a corrugated casing as shown at 5'' in Fig. 7 is used the corrugated shell will of course be able to expand or contract as the filler may require. It is of course apparent that such a casing may contain but one or any number of the insulated pipes 1, and also that the spacer blocks as at 18 in Fig. 4 and spacer band 3 would be shaped to suit. However, the preferred form of casing is

the bending in longitudinal ridges and flat areas therebetween as shown in Figs. 1 to 4, as such form permits expandability and contraction at lower pressures and also is better adapted to use of the spacer member 3.

If it is desired to use a simple casing of plain round cross section and still gain the expansion and contraction advantages above described, it may be done as shown in Fig. 5 and wherein the dotted circle 8 indicates the original round cross section of the casing, but which was compressed or squeezed inward slightly at opposite sides by being crowded into a rigid walled trough 7 of slightly less width inside than the original casing, so as to make the cross section of the casing slightly oval in a vertical direction as shown in the drawing. Such a confined casing will have a lesser inner area than the original round casing, and the molten asphalt may be poured in the space from the ends by tilting the trough and casing at a convenient angle, or poured through any number of openings on top such as the slots 10, or as is evident the slot may extend the full length as described for the casing of Fig. 1.

While I describe or imply the outer casings of the various modifications shown in the drawings to be of sheet metal, they may in some cases be of other sheet materials such as plastic, fiber, etc. when such materials are available with the characteristics required.

Also, since the waterproof filling may be of solid asphaltum, tar, pitch, or a mixture of these or other meltable water resisting compounds, my use of the word "pitch" in the claims is intended to embrace any of such materials or mixtures thereof.

Such insulated pipes as above described may be joined at their end to make any lengths desired as is well understood in the art, and they may be used for conveying either hot or cold liquids or gases for any purpose where ingress or egress of heat to or from the pipes is required to be overcome.

Having thus described my improvements in thermal insulated pipe, and the manner of its making what I claim is:

1. An insulated pipe comprising a conveyor pipe enclosed in thermal insulation and spacedly supported within an outer deformable tubular casing shell having an arcuate wall portion and a pourable filling of moisture impervious material in the space, said casing shell having in its arcuate wall portion a plurality of successively connected relatively angularly disposed flat areas arranged arcuately, said flat areas being non-rigid and axially longitudinal of and integral with the wall of the casing shell to provide for radial expansion of the filling, the angle vertex between said flat areas being radially outward relative to the longitudinal axis of the enclosed pipe.

2. An insulated pipe of the class described having the elements of claim 1 and in which the casing has a longitudinal pouring opening provided with longitudinal free edges which are spaced apart and outwardly hooked to receive a complementally hooked cover plate, and a sheet cover plate for closing said pouring opening, said cover plate having complementally hooked edges for engaging the hooked edges of the casing at the pouring opening, said cover plate comprising a plurality of sections in which one of the sections is provided with a tongue extending from a free end thereof and adapted to overlap the adjacent end of an adjacent section of cover plate.

3. An insulated pipe comprising a conveyor pipe member enclosed in thermal insulation and spacedly supported within an outer non-rigid deformable tubular casing shell having an arcuate circumferential wall portion, said shell being provided with an opening for receiving a pourable filling, a bitumen filling of moisture impervious filling in said space between insulation and shell, said casing shell having in its arcuate wall portion a plurality of integral successively connected relatively angularly disposed flat areas arranged arcuately, said flat areas being axially longitudinal of the wall of the casing shell, the angle vertex between said flat areas being radially outward relative to the longitudinal axis of the enclosed pipe.

4. An insulated pipe of the class described having the elements of claim 3 and in which spacer means are interposed between the thermal insulation and the outer casing shell, said spacer means comprising bands snugly circumferential of the thermal insulation and relatively spaced longitudinally thereof and said bands having thereon circumferentially spaced lugs extending radially outwardly from the band to the outer casing shell, the circumferential spacing of the lugs permitting fluid bitumen to flow longitudinally past the spacer means between the thermal insulation and the outer casing.

5. An insulated pipe of the class described having the elements of claim 3 and in which the adjoining longitudinal flat areas of the casing are relatively connected at longitudinal edges by obtuse angles.

THOMAS F. M. WILLIAMSON.

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