PATENT OFFICE

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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Underground Self-Drying Conduit

We, EARL CLARENCE PETERSEN and FREDERICK CARROLL MEYERS, both citizens of the United States of America, of 1300 Kelly Drive, Minneapolis, Minnesota, United States of America, and Box 638B, Route 5, Wayzata, Minnesota, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to underground pipe conduits for housing pipes, adapted to carry fluids at elevated temperatures, and more particularly, to a conduit structure which allows escapement of moisture vapours outwardly therethrough and prevents re-entry of moisture into the interior thereof.

Many types of prior art conduit structures for housing pipes, susceptible to thermal change, have been proposed, for example, in United States Patent Specification No. 2,906,294. Since the pipes housed within the conduit are often steam lines, it is not uncommon that small leaks in the pipe walls will develop which release steam vapours. If the pipes are maintained at a sufficiently high temperature, any water, which is allowed to accumulate in the conduit, will be readily evaporated so that it also will exist in the form of vapour.

When the conduits have concrete walls, there is a natural tendency for the moisture or vapours to migrate through the conduit wall from the warm side to the cold side, the cold side often being at a temperature near or below the dew point of the vapour. The moisture thereafter condenses and gives rise to free water. Under certain conditions, the temperature of portions of the wall may be below the dew point of the vapours migrating therethrough, and condensation will then occur inwardly of or within, the wall,

Existing conduit structures often utilise a vapour barrier, which is an impervious material that intimately covers either or both of the inside and outside surfaces of the conduit. Such a vapour barrier prevents moisture from migrating outwardly through the walls and ultimately causes condensing and redepositing of the moisture within the conduit, thus perpetuating a damp condition which can corrode metal pipes and construction material. With the moisture trapped within the conduit, any insulating packing surrounding the pipes will remain wet and thus will allow substantial heat transfer and loss from the pipes to the conduit walls.

More specifically, an object of this invention is to provide an underground concrete conduit structure for housing pipes carrying thermally elevated fluids, wherein an impervious vapour barrier is positioned in such a manner that moisture will be allowed to migrate in an outward direction only through the conduit walls.

Another object is to provide a conduit structure as set forth above which utilises, at the outer surface thereof, a means to permit and to aid the runoff of condensed water vapours after the migration thereof outwardly through the walls.

A further object is to provide a structure as set forth above which is simple in design and construction, yet highly effective in maintaining the inside of the conduit substantially free of water and water vapours, or in drying out water accidentally released in the conduit and into insulation material, without the necessity of rebuilding the affected portions of the conduit or of replacing wet with dry insulation.

These and other objections and advantages of the invention will more fully appear from the following description, made in connection with the accompanying drawing, wherein like

[*Price 4s. 6d.*]

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reference characters refer to the same or similar parts throughout the several views and in which:

Figure 1 is an end cross sectional view of a conduit, which employs the structural principles of this invention; and

Figure 2 is a reduced size cross sectional top view of Figure 1 taken on line 2—2.

The conduit, referred to generally as 10, employs a basic poured concrete enclosing wall construction which may be similar to that set forth in the above-referred-to patent on DUCT STRUCTURE FOR PIPES. Positioned within the side wall 11 and traversing the bottom wall 12, is a U-shaped support rod 13. Located adjacent the support rod is a vertically oriented side rod 14, which is also partially embedded in the bottom wall 12. Both of the rods 13 and 14 extend upwardly into the top wall 15 where they join with a roof support rod 16 and a beam rod 17, respectively. Longitudinal brace rods 18 are also shown secured to the joinder of the rods 13 and 16, as well as 14 and 17.

As seen in both Figures 1 and 2, a longitudinal shaft support rod 19 is positioned between rods 13 and 14. This rod adds structural support in addition to an initial supporting means for the roller 20 and roller shaft 21. Once the concrete walls 11 are solidified, however, the concrete itself will support the roller shaft, thereby giving the required support for a pipe line 22.

Referring to Figure 1, the inside of the duct is provided with screen material or metal lath 23, which gives added structural reinforcement to the inside surface of the conduit. The perforate nature of the metal lath and the natural vapour pervious character of the concrete walls allow moisture within the conduit to pass therethrough and to migrate toward the cooler outer surfaces 24 and 25, respectively, of the top wall 15 and side wall 11.

As more clearly seen in Figure 2, the outer surfaces 25 of the side walls are provided with a roughened or corrugated configuration. The roughened or corrugated configuration is one of the important aspects of this invention, since the protuberances thereof formed over and down the sides of the walls, provide drainage passageways for condensed water vapours that have migrated outwardly through the wall. This deliberate irregularity, which may quite easily be formed with a toothed trowel, for example, not only provides a means for running off the water but also prevents a sealed bond from forming between the wall surface 25 and a flexible web 26, which completely encloses the top wall 15 and side walls 11.

The flexible web 26 constitutes a moisture barrier, and may be made suitably of polyethylene material because of its chemical inertness, durability and flexibility. The web 26 is draped over the conduit prior to coverage thereof with earth. During use of the conduit, heat will be readily conducted through the web 26 and will tend to bring the temperature on the inside of the moisture barrier down to the condensation point or to the dew point of the steam or water vapour. Vapours migrating through the walls and reaching the corrugated surfaces will be there condensed, the condensate then being allowed to freely drain downwardly to the soil at 27 near the bottom of the conduit. In this area the web flares away from, and to a point below, the conduit so as to permit water to rain from the walls into the earth where it will be absorbed.

As seen in Figure 1, the bottom wall 12 is positioned on a double thickness of vapour barrier 28, and the top surface 29 is formed without the use of metal lath. An asphalt ~~master~~ barrier 30 is secured to the lower edges of each side 25 and extends downwardly thereof to isolate the saturated soil at 27 from the vapour barrier 28, thus preventing water from seeping back into the conduit through the bottom wall 12 or the lower portions of side walls 11.

It is noted that very often, conduits are completely sealed with asphalt mastic or similar substances. However, it has been found that this sealing prevents the free passage and drainage of the condensed water vapour which the irregular or corrugated surface of the present invention, in co-operation with the web 26, allows.

As indicated previously, the conduit is normally packed with a vapour pervious insulation material 31, such as glass fibre, that surrounds the pipes and fills the entire free space within the conduit.

It will, of course, be understood that various changes may be made in the form, details, arrangements, and proportions of the parts without departing from the scope of the invention as set forth in the appended claims.

WHAT WE CLAIM IS:—

1. A pipe conduit for housing pipe lines carrying fluids, the temperature of the fluids being substantially warmer than the temperature at the outer surface of said conduit, said conduit comprising a concrete enclosing wall adapted to house a pipe line, a non-porous web partially covering the outer surface of said enclosing wall, and means for maining said web at least partially in spaced relation to said outer surface of said enclosing wall, whereby the vapours present within the conduit, when allowed to migrate from the warmer inside of said wall outwardly to the cooler outside, will be allowed to condense there and freely drain downwardly to escape said pipe conduit.

2. The conduit of claim 1, wherein said

reference characters refer to the same or similar parts throughout the several views and in which:

Figure 1 is an end cross sectional view of a conduit, which employs the structural principles of this invention; and

Figure 2 is a reduced size cross sectional top view of Figure 1 taken on line 2—2.

The conduit, referred to generally as 10, employs a basic poured concrete enclosing wall construction which may be similar to that set forth in the above-referred-to patent on DUCT STRUCTURE FOR PIPES. Positioned within the side wall 11 and traversing the bottom wall 12, is a U-shaped support rod 13. Located adjacent the support rod is a vertically oriented side rod 14, which is also partially embedded in the bottom wall 12. Both of the rods 13 and 14 extend upwardly into the top wall 15 where they join with a roof support rod 16 and a beam rod 17, respectively. Longitudinal brace rods 18 are also shown secured to the joinder of the rods 13 and 16, as well as 14 and 17.

As seen in both Figures 1 and 2, a longitudinal shaft support rod 19 is positioned between rods 13 and 14. This rod adds structural support in addition to an initial supporting means for the roller 20 and roller shaft 21. Once the concrete walls 11 are solidified, however, the concrete itself will support the roller shaft, thereby giving the required support for a pipe line 22.

Referring to Figure 1, the inside of the duct is provided with screen material or metal lath 23, which gives added structural reinforcement to the inside surface of the conduit. The perforate nature of the metal lath and the natural vapour pervious character of the concrete walls allow moisture within the conduit to pass therethrough and to migrate toward the cooler outer surfaces 24 and 25, respectively, of the top wall 15 and side wall 11.

As more clearly seen in Figure 2, the outer surfaces 25 of the side walls are provided with a roughened or corrugated configuration. The roughened or corrugated configuration is one of the important aspects of this invention, since the protuberances thereof formed over and down the sides of the walls, provide drainage passageways for condensed water vapours that have migrated outwardly through the wall. This deliberate irregularity, which may quite easily be formed with a toothed trowel, for example, not only provides a means for running off the water but also prevents a sealed bond from forming between the wall surface 25 and a flexible web 26, which completely encloses the top wall 15 and side walls 11.

The flexible web 26 constitutes a moisture barrier, and may be made suitably of polyethylene material because of its chemical inertness, durability and flexibility. The web 26 is draped over the conduit prior to coverage thereof with earth. During use of the conduit, heat will be readily conducted through the web 26 and will tend to bring the temperature on the inside of the moisture barrier down to the condensation point or to the dew point of the steam or water vapour. Vapours migrating through the walls and reaching the corrugated surfaces will be there condensed, the condensate then being allowed to freely drain downwardly to the soil at 27 near the bottom of the conduit. In this area the web flares away from, and to a point below, the conduit so as to permit water to rain from the walls into the earth where it will be absorbed.

As seen in Figure 1, the bottom wall 12 is positioned on a double thickness of vapour barrier 28, and the top surface 29 is formed without the use of metal lath. An asphalt ~~master~~ barrier 30 is secured to the lower edges of each side 25 and extends downwardly thereof to isolate the saturated soil at 27 from the vapour barrier 28, thus preventing water from seeping back into the conduit through the bottom wall 12 or the lower portions of side walls 11.

It is noted that very often, conduits are completely sealed with asphalt mastic or similar substances. However, it has been found that this sealing prevents the free passage and drainage of the condensed water vapour which the irregular or corrugated surface of the present invention, in co-operation with the web 26, allows.

As indicated previously, the conduit is normally packed with a vapour pervious insulation material 31, such as glass fibre, that surrounds the pipes and fills the entire free space within the conduit.

It will, of course, be understood that various changes may be made in the form, details, arrangements, and proportions of the parts without departing from the scope of the invention as set forth in the appended claims.

WHAT WE CLAIM IS:—

1. A pipe conduit for housing pipe lines carrying fluids, the temperature of the fluids being substantially warmer than the temperature at the outer surface of said conduit, said conduit comprising a concrete enclosing wall adapted to house a pipe line, a non-porous web partially covering the outer surface of said enclosing wall, and means for maining said web at least partially in spaced relation to said outer surface of said enclosing wall, whereby the vapours present within the conduit, when allowed to migrate from the warmer inside of said wall outwardly to the cooler outside, will be allowed to condense there and freely drain downwardly to escape said pipe conduit.

2. The conduit of claim 1, wherein said

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means constitutes protuberances formed by roughening or corrugating the outer surface of said enclosing wall.

3. An underground pipe conduit for housing pipe lines carrying fluids, the temperature of the fluids being substantially warmer than the temperature at the outer surface of the conduit, said conduit comprising a relatively porous concrete enclosing wall adapted to house a pipe line, said enclosing wall having a metal lath reinforcing structure which will allow moisture vapours to escape therethrough, the outer surface of said enclosing wall being provided with a roughened surface for a substantial portion thereof, and a non-porous web lying in non-sealing engagement with said roughened surface and adapted to be held thereagainst by surrounding earth.

4. An underground pipe conduit for housing a pipe line carrying fluids, the temperature of the fluid being substantially warmer than the temperature externally of the conduit, said conduit comprising a concrete enclosing wall adapted to house a pipe line, said enclosing wall having integral top and side walls reinforced with porous metal lath, said top and side walls further being provided with small protuberances at their outer surfaces, said enclosing wall further having a bottom wall for supporting said top and side walls, a vapour pervious insulation material packed within said enclosing wall and adapted to surround a pipe line contained therein, a means adapted for supporting said pipe line within said conduit and in spaced relation to the walls thereof, and a non-pervious web covering said top wall and extending downwardly along the side walls to a point below said bottom wall, the lower portion of said non-porous web being flared away from said conduit, whereby said protuberances at the outer surfaces of said top and side walls will hold said web outwardly in spaced relation therefrom so as to permit free drainage of condensed moisture vapours collected between said protuberances.

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