

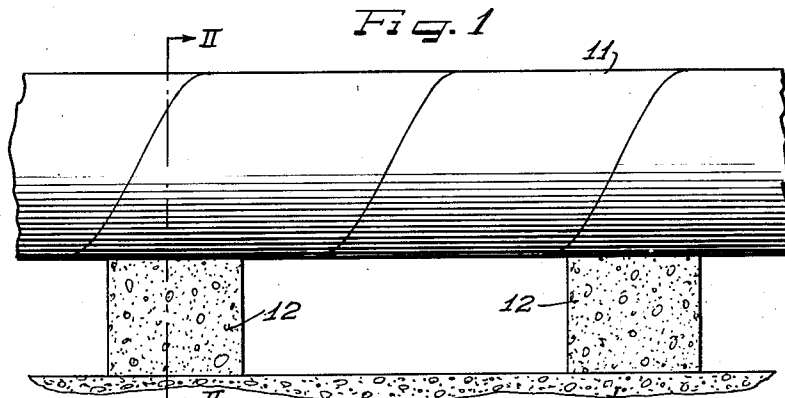
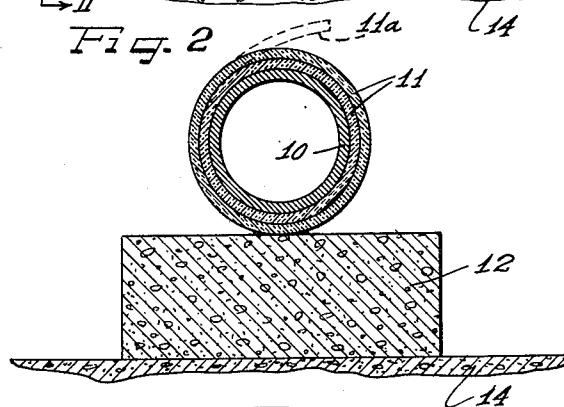
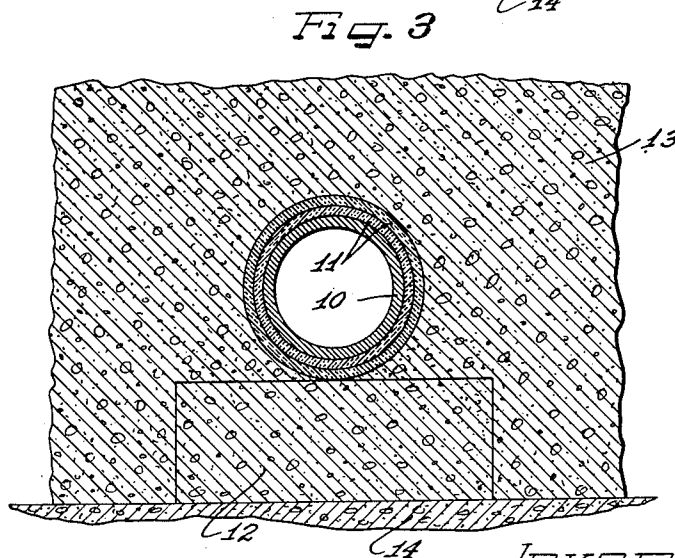
May 10, 1955

D. C. GOFF

2,707,984

METHOD OF INSULATING UNDERGROUND PIPE

Filed June 26, 1952



Inventor
DAVID C. GOFF

Hill, Sherman, Morris, Cass & Rinkman
Attys.

1

2,707,984

METHOD OF INSULATING UNDERGROUND PIPE

David C. Goff, La Grange, Ill., assignor to Zonolite Company, Chicago, Ill., a corporation of Montana

Application June 26, 1952, Serial No. 295,786

9 Claims. (Cl. 154—28)

The present invention is concerned with a method of insulating pipe carrying a heated fluid, such as steam, hot water, heated gases and other heated fluids.

One of the primary applications of the present invention is in the field of insulating steam pipes under conditions of extreme cold where the ground in which the steam pipes are to be imbedded is frozen, particularly in the so-called "perma-frost" regions.

In my previous Patent No. 2,355,966, issued August 15, 1944, I have described an underground insulated pipe system in which underground pipes are imbedded in a monolithic mass of a heat insulating concrete composition. In accordance with the processes of my prior patent, the pipes to be imbedded in underground systems are suspended over a base of structural concrete, and forms are provided about the suspended pipes to receive the concrete pour. In using this system in arctic areas, the aqueous concrete composition may freeze, with resulting formation of ice particles, thereby causing an improper setting of the concrete and a substantially complete loss of the strength which the set concrete composition is capable of attaining.

Another prime application of the invention other than in permanently frozen soils, is in installation where it is desired to keep steam or other heated fluids flowing continuously through the pipes or ducts during the time that the insulation is being applied.

The present invention provides a method for insulating pipes in underground installation without interruption of the flow of the heated fluid carried by the pipes, while at the same time preventing freezing or boiling of the water contained in the aqueous concrete composition that is poured about the pipes. In accordance with the present invention steam pipes, or other pipes or ducts carrying fluid at a predetermined elevated temperature are provided with a flexible covering of a heat insulating material prior to pouring of the heat insulating concrete composition about the pipes. One of the features of the present invention is the control of the amount of heat lost from the heated fluid in the pipes to the aqueous concrete composition being poured around the pipes, the heat loss being so adjusted that sufficient heat is transferred to the aqueous concrete composition to prevent freezing of the composition before its initial set, but insufficient to cause boiling of the water present in the concrete composition.

An object of the present invention is to provide a method for insulating underground pipes carrying steam or other heated fluids at predetermined temperatures.

Another object of the present invention is to provide a method for insulating steam pipes in underground installations without discontinuing the flow of the steam through the pipe during the application of the heat insulating concrete embedding material of the hydraulic setting type.

Another object of the present invention is to provide a method for controlling the amount of heat loss from

2

a steam carrying conduit to an aqueous, settable concrete composition poured about the conduit.

Still another object of the present invention is to provide an improved method for achieving a controlled heat loss from a steam pipe to an aqueous concrete composition poured therearound, thereby preventing freezing as well as boiling of the water contained in the aqueous concrete composition.

A further description of the present invention will be made in connection with the attached sheet of drawings in which:

Figure 1 is a fragmentary view with parts in elevation of an underground pipe system illustrating the support means and the heat insulating means employed;

Figure 2 is a cross-sectional view with parts in elevation taken substantially along the line II—II of Figure 1; and

Figure 3 is a view similar to Figure 2, but illustrating the structure when the heat insulating concrete material has been poured around the underground pipe insulation and has been set into an integral monolithic structure.

As shown on the drawings:

As shown in Figures 1 and 2, the process of the present invention involves providing a duct or pipe 10 through which steam or other heated fluid at a predetermined temperature is being passed. To provide for a controlled amount of heat loss from the steam flowing from the pipe 10, the pipe 10 is covered with a flexible, heat insulating material which may be a batt 11 of glass wool, or similar insulating material wrapped in one or more layers 11a around the periphery of the pipe 10 as illustrated in Figure 1. Any type of flexible or rigid type insulating covering for the pipe may be used for this heat loss control. For example, a rigid pre-formed cylinder or segmented cylinder of insulating material may provide a heat insulating jacket of the proper heat transmitting characteristics. Such a rigid insulator may, for example, be composed of foam glass sections or an asbestos board.

The particular amount of heat insulating material 11 to be used in any given insulation will depend primarily upon the diameter of the steam pipe 10 and the temperature of the pipe 10. Knowing the temperature, heat transfer characteristics of the insulating material and the quantity of heat insulating concrete to be poured about the steam pipe enables one to calculate the thickness of insulating material to be used in any given installation. As previously mentioned, other heat insulating materials besides glass wool may be employed, although the latter is preferred. Other insulating materials include paper, corrugated paper, and rock wool.

The supporting members for holding the pipe 10 in position in underground installation are a series of support blocks 12 on which the jacketed steam carrying pipe 10 rests. The blocks 12 are bottomed on a base 14 of structural concrete previously laid in the excavation. The support blocks 12, as well as the concrete composition used to insulate and imbed the steam line, are preferably composed of the compositions described in my aforementioned Patent No. 2,355,966. As described in this patent, a suitable mixture contains about one bag of Portland cement (weighing about 94), 8 cubic feet of expanded vermiculite of a particle size from minus 10 to plus 65 mesh, 7 quarts of a stabilized asphalt emulsion and 26 gallons of water. The asphalt emulsion may be prepared by mixing approximately 55 parts by weight of 50 to 60 penetration asphalt from California crude petroleum with about 43.35 parts of hot water containing about 0.15 part of caustic soda to produce a quick-breaking emulsion. For the purposes of the present invention, the asphalt emulsion is converted to the slow-breaking type by the addition of about 1.5 parts of a saponified

"Vinsol" resin, the latter being a black residue remaining after extracting crude wood rosin with petroleum solvents.

After the pipe 10 is wrapped with the heat insulating material and positioned along the spaced support blocks 12 the forms in which the pipes 10 are disposed may be filled with an aqueous concrete composition which is settable into a heat insulating, lightweight composition. I prefer to use for this purpose the aforementioned concrete composition containing substantial amounts of exfoliated vermiculite as this type of concrete composition has several unique advantages for this type of installation. Concrete compositions of this type have good elasticity, workability and plasticity and in addition, after the concrete has been properly set, it can be subjected to repeated cycles of freezing and thawing without breaking up, cracking or disintegrating the concrete structure. Further, a heat insulating concrete of this type is quite water repellent and has low capillarity. Further, the heat insulating concrete is lightweight, inert and non-corrosive, thereby eliminating any danger of deterioration, rotting, molding or disintegration. In addition, such concrete is fire-proof and will safely withstand temperatures up to 2000° F.

In addition to or in place of vermiculite other lightweight aggregates such as pearlite, pumice, slag and the like may be employed for the same purpose. As a further alternative insulating concrete containing no aggregate and produced by aerating neat cements may be employed for the purposes of the present invention.

As shown in Figure 3, after the aqueous heat insulating concrete composition is poured into the form about the pipe 10 on its supports 12, the concrete composition will set into a lightweight, monolithic mass 13 surrounding the pipe 10 and the support blocks 12. By the proper adjustment of the amount of heat insulating material 11 about the surface of the pipe 10, the concrete composition will undergo a more or less normal drying period without the formation of ice particles and without overheating of the water present in the concrete composition. Furthermore, drying of the concrete due to the flow of heat from the heated pipe 10 through the heat insulating wrap 11 can be so controlled as to require only a minimum drying out period, since the drying takes place from the inside of the mass outwardly. In case the pipe 10 is used as a steam pipe, steam is continuously passed through the pipe 10 from the start of the pouring operation until the concrete in the monolithic mass has completely set. As previously stated, the amount of heat loss from the pipe 10 through the insulating material 11 is regulated in accordance with the governing factors, including the outside temperature, so as to prevent the formation of ice crystals and yet not heat the water present in the concrete composition sufficiently to cause excessive vaporization of the water. Consequently, the concrete sets in a relatively short time into an integral, monolithic mass of substantial strength and good heat insulating properties.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. A method of insulating an underground pipe which comprises applying a first heat insulating material about the periphery of said pipe, passing a heated fluid through said pipe and pouring an aqueous composition of a second insulating concrete about said pipe, said first heat insulating material about said pipe being of such insulating value as to provide sufficient heat loss to said aqueous composition to permit setting of said concrete without freezing of the water contained in said composition while providing insufficient heat transfer from said heated fluid to said aqueous composition to cause excessive vaporization of the water in said aqueous composition.

2. A method of insulating an underground pipe which

comprises applying a flexible heat insulating material about the periphery of said pipe, passing a heated fluid through said pipe and pouring an aqueous composition of an insulating concrete about said pipe, the amount of said heat insulating material about said pipe being of such insulating value as to provide sufficient heat loss to said aqueous composition to permit setting of said concrete without freezing of the water contained in said composition while providing insufficient heat transfer from said heated fluid to said aqueous composition to cause excessive vaporization of the water in said aqueous composition.

3. A method of insulating an underground pipe which comprises applying a non-flexible heat insulating material about the periphery of said pipe, passing a heated fluid through said pipe and pouring an aqueous composition of an insulating concrete about said pipe, the amount of said heat insulating material about said pipe being of such insulating value as to provide sufficient heat loss to said aqueous composition to permit setting of said concrete without freezing of the water contained in said composition while providing insufficient heat transfer from said heated fluid to said aqueous composition to cause excessive vaporization of the water in said aqueous composition.

4. The method of insulating an underground pipe which comprises applying a heat insulating material about the periphery of said pipe, supporting said pipe along spaced support blocks composed of a heat insulating monolithic concrete material, passing a heated fluid through said pipe, and pouring an aqueous composition of insulating concrete about said pipe, said heat insulating material being present in sufficient quantity to provide sufficient heat loss to said aqueous composition to permit setting of said concrete without freezing of the water contained in said composition while providing insufficient heat transfer from said heated fluid to said aqueous composition to cause boiling of the water in said aqueous composition.

5. The method of insulating an underground pipe which comprises wrapping a layer of glass wool about the periphery of said pipe, passing a heated fluid through said pipe, and pouring an aqueous composition of insulating concrete about said pipe, the layer of said glass wool about said pipe being of such thickness as to provide sufficient heat loss to said aqueous composition to permit setting of said concrete without freezing the water contained in said composition, while providing insufficient heat transfer from said heated fluid to said aqueous composition to cause excessive vaporization of the water in said aqueous composition.

6. The method of insulating an underground pipe which comprises wrapping a layer of glass wool about the periphery of said pipe, passing a heated fluid through said pipe, pouring an aqueous composition of insulating concrete about said pipe, and setting said concrete into a monolithic structure, said glass wool being present in such thickness as to provide sufficient heat loss to said aqueous composition to permit setting of said concrete without freezing the water contained in said composition, while providing insufficient heat transfer from said steam to said aqueous composition to cause boiling of the water in said aqueous composition.

7. The method of insulating an underground pipe which comprises wrapping a layer of glass wool about the periphery of said pipe, supporting said pipe along spaced support blocks of a heat insulating monolithic concrete material, passing a heated fluid through said pipe and pouring an aqueous composition of insulating concrete about said fluid heated pipe.

8. The method of laying a pipe comprising the steps of wrapping the pipe with an insulating material, positioning said pipe on supports of a second insulating material, and passing a heated fluid through the pipe while pouring an aqueous composition of said second insulating

5

material about said first insulation to maintain said aqueous composition at a temperature above its freezing point and below its boiling point.

9. The method of laying an insulated pipe at or below freezing temperatures comprises the steps of positioning 5 said pipe on supports of an insulating material and passing a heated material through the pipe while pouring an aqueous composition of said insulating material about said pipe, thereby maintaining said aqueous composition at a temperature above its freezing point and below its 10

6

boiling point to facilitate drying of said insulating material without freezing.

References Cited in the file of this patent**UNITED STATES PATENTS**

1,690,467	Weaver	Nov. 6, 1928
1,704,156	Weaver	Mar. 5, 1929
1,797,443	Powell	Mar. 24, 1931
2,312,993	Stephens	Mar. 2, 1943