Underground Insulation of Steam Pipes

Taking Up Methods of Insulating Underground Steam and Hot Water Pipes. Abstract of Paper Presented Before Ohio Society of Mechanical, Electrical and Steam Engineers, Nov. 21, 1908.

Why do we insulate underground steam and hot water pipes? In order that we many carry our steam or hot water the required distance with the least possible loss of heat or power. The insulation of such pipes can only be obtained by confining that pipe within a covering, which contains dead, dry air split up into small particles by the use of some non-conducting, indestructible materials, felted or massed together. Underground insulation of such pipes is difficult for two reasons: First, on account of dampness getting into the covering (water being a good conductor of heat), which cannot be readily driven off. the pipes being confined by the earth; and secondly, that the coverings themselves are liable to be attacked by destroying influences found in the earth itself. These combined with the heat of the pipe inside and dampness on the outside of the covering, means certain death sooner or later to anything of an organic nature. Consequently, the future insulation of these pipes must of necessity be confined to methods and materials, which will positively safeguard the pipes against such influences as above mentioned, and so far as present knowledge permits this seems to be either the tunnel or some form of conduit composed entirely of inorganic substances. We will consider these two types.

No one will dispute the statement that a tunnel is a pretty substantial proposition, but in a good many ways it has advantages which are worth consideration. The pipes are always accessible and if a leak occurs there is not much trouble in locating it so that repairs can be made without much difficulty. New pipes can be added from time to time as occasion requires, the tunnel being erected in a permanent manner and of size sufficient to accommodate additions. On the other hand the first cost is very high, the excavation being relatively much larger than would ordinarily be required for the number of pipes contained. The pipes must be separately insulated and as it is never thought necessary to cover the flanges under such conditions, the loss of heat from the pipes is sufficient at all times to comfortably heat a space, as a rule, approximating about the same number of cubic feet as are contained in one-quarter of the buildings which are to be heated. The argument is sometimes advanced that once this space is heated the loss is very slight, and to some extent this is true, but not by any means entirely so.

The other system is that using "Vitrified Sectional Conduit." All the materials are absolutely inorganic, the shell being composed of a carefully selected and thoroughly ground and mixed combination of stoneware clay. After the material passes from the moulds it is properly treated before being placed in the kiln to avoid warping of the sections, this being extremely important. The conduit is scored in process of manufacture so that it can be readily split, which is done before shipping, each half being so marked that it can be identified on arrival in order that the original tops and bottoms may come together. Before splitting, each conduit length must sustain a transverse test between hardwood supports which cover one-third of the entire circumference of the conduit.

The fitting or insulating material is composed of asbestos fibre and sponge, which is so intermixed that a maximum number of confined air-cells are obtained.

The pipes are carried on roll frames embedded in concrete, special tees being provided for this purpose, and whenever it is found necessary to anchor or turn a corner, brick pits are built. Almost any number of pipes may be placed in a single conduit and it is purposed that no pipe shall have less than three inches of the insulating material around it. The pipes are perfectly insulated and the entire conduit, with its contents, is self-contained. The loss in pressure is practically only that caused by the friction between the steam or hot water and the interior surface of the pipes.

This conduit can be laid within six inches of the top of the ground, snow not melting directly over it, as long as the atmosphere is below freezing point, according to actual observation.

The question of installation is a vital one with this, as with all other mechanical devices, especially so as it is of the greatest importance that no leakage of water shall occur. The lower half sections and the roll frames must be in perfect alignment, and it is absolutely necessary that the pipes shall be tested with a cold water test of at least 50% in excess of the steam pressure to be carried before the top half-sections are placed or any insulating material put on; neither should caulking or rusting of joints be allowed. The job of steam fitting must be perfect and experience teaches that by following this course it will remain perfect.

Observation tees are provided in case it is necessary at any time to look for a leak, but after a long term of years, during which time many thousands of feet of the conduit have been placed under ground throughout the Eastern States, it was proven that no observation is necessary and the reason is simple. In the first place the necessity for careful and proper installation has been duly recognized and taken care of; there is no chance of anything attacking the pipe from the outside, and with this danger eliminated the chances for necessity of renewal are very slight. In case, however, it does become necessary, after a long term of years, the defective pipe is easily located and the trouble and expense of renewal quite small. On the other hand the results to be obtained are almost marvelous. We have one case in mind, at Andover, Mass., where a line 600 feet long was tested and the gauge at both ends showed exactly the same pressure, and other cases could be mentioned where approximately the same results have been obtained; in fact no case was ever reported where, with proper installation, the efficiency test showed less than 90%.

Formerly wooden covering was used, but this would crack and allow the surface water to enter the crevices, so that the heat losses were sometimes equal to 30-40% of those of bare pipes. A new and good job would show an average loss of 20% of the loss of an uncovered pipe, or in other words, a saving of 80% of heat otherwise dissipated. Various substances have been tried out, but most of them deteriorate so easily, so that financially nothing was found to equal, as an efficient insulating material, water and heat proof substances which could be moulded into convenient shapes, and be made to entrap a lot of air; for, still and stagnant air is the very best kind of an insulator.

After many laboratory tests have been made on a large variety of substances, asbestos was found to fill the requirement best. It can be worked up easily into any shape, dense or loose in construction, and is not easily damaged by vibration of pipes, etc.

An idea as the amount of energy lost due to condensation of steam in pipes may be derived from the statement that 6 feet of 6-inch pipe uncovered, will cause a loss of energy each hour, equivalent to that generated by one pound of coal under average conditions. A good covering reduces this loss at least 80%.

THE CAUTIOUS DRUMMER.

The statement is made that the commercial traveller is considered by insurance companies a first-class risk. The reasons given are:

1. He is generally on the road and the railway train has been proven to be the safest place a person can be in.

2. He is a cautious person and generally selects a middle seat in a car about the centre of the train—no last cars or first cars for him. If there is a Pullman he selects that not for its greater luxury, although he is not adverse to that, but because of the better construction and greater strength of the Pullman.

AN OPPORTUNITY.

"You have had words with your chief?" "Yes. But I'll be even with him. The next time he makes a joke, I won't laugh."—Meggendorfer Blætter.