MORNING SESSION.

JANUARY 21, 1916.

The members manifested great interest in the exhibition of drain tile. Several firms had sent samples of their tile. Of special interest was the tile that Mr. Adam Channing brought from Whitewater. It was made by hand in 1859 and had been working for 55 years when it was dug up.

The convention was called to order by the president, who announced the following committees for the ensuing year:

Committee on Legislation: Chairman, B. M. Vaughan, Grand Rapids; P. J. Myers, Racine; J. L. English, Waterford; F. W. Lucas, Madison; G. T. Thorne, Oshkosh.

Committee on Standardization of Benefits: Chairman, H. H. Sherwood, Mauston; A. R. Whitson, Madison, A. E. Matheson, Janesville; T. H. Hanna, Stevens Point; R. S. Owen, Madison.

Committee on Railroad Rates: A. E. Holcombe and E. P. Arpin, Grand Rapids; and J. A. Reeves, Chicago.

Auditing Committee: Nye Jordan, Mauston; H. C. Webster, Milwaukee, and C. F. Leins, West Bend.

The first paper of the morning followed.

METHOD AND MACHINERY FOR INSTALLING DRAIN TILE.

J. H. HARNESS

With Wisconsin Drain Tile Co., Elkhorn, Wisconsin.

The outlet is the most important part of the tile drain. There should be a drop from the lateral into the open ditch or large tile into which the lateral empties. Without such a drop, the outlet will be submerged at the time when it is needed most. A submerged outlet causes sediment to settle in the tile. This is particularly true where the outlet is an open ditch which itself is filling up.
SOME TILE ARE LAID TOO DEEP.

A free outlet is more valuable than a particular depth. Some engineers with limited experience advise a particular depth regardless of whether or not the outlet will be submerged in obtaining that depth.

The majority of soils are benefited very little by lateral drains laid deeper than three feet. I have made a very thorough study of subsoils throughout Indiana and find the conditions in Wisconsin to be very similar as to subsoils.

My experience has taught me that in ninety per cent of the cases where I find a subsoil very close and hard the water makes its way on top of this strata of close or hard subsoil until it drops to the tile and is carried away. Therefore it is not only an extra expense to lay tile at an unnecessary depth but also a detriment.

I also find that the majority of deeply laid tile are more apt to be improperly laid as the work is much more difficult to perform properly. The majority of contractors take this extra depth too cheaply—a natural cause for poor work. I find that most engineers advise an expense that is unnecessary and detrimental.

However, the laying of a tile too shallow or too near the surface is a much worse mistake. When dealing with peat or similar soft soils we find that the soil settles and leaves the tile too near the surface to obtain the best crop results.

In determining the proper distance between laterals an engineer is needed who has had practical or field experience. There is a great difference in soil conditions. For this reason I find it impossible to give any fixed rule. I find some soils will drain much better with lateral tile laid one hundred feet apart than others when laid fifty or sixty feet apart.

Some soils require wide cracks left at the joints to let the water enter the tile freely. Others require tight joints. These differences often occur within short distances of each other, perhaps within the same line of tile. I have examined drains many times where the water would lie on top of the land long enough to damage the crop, and found the tile to be on a true grade and apparently in good shape except for the fact that the
tile were fitted too closely together for that particular kind of soil.

There should be a line of tile at the foot of every hill to cut off the seepage. This line is usually the most important line in the system. With such an intercepting drain you can afford to have your laterals farther apart, if that is necessary in order to keep down the expense.

As to main or outlet tile, I would advise them laid at a sufficient depth to allow the laterals to empty into the main as near the top as possible, taking care not to go to an unnecessary depth. This insures a more lasting drain for a number of reasons. The deeper the drain the less need there will be for repairs.

I have laid a great many main tile drains that could have been installed for a great deal less money and have been much more valuable if they had been planned by an engineer who had practical experience. With unnecessary depth you are apt to encounter soft beds or pockets of sand underlaid by some very hard substance making it difficult to maintain the tile on a true grade. A number of times I have taken up and repaired drains of this character.

Where the drain is laid deep and on solid bottom, the majority of workmen fail to make the bottom concave so as to fit the tile. Tile lying on a flat bottom have the weight concentrated upon one place and they break under the unnecessary weight where the tile are laid too deep.

Furthermore deep trenches invariably cave and here is where the inexperienced engineer is apt to fall down. He goes ahead and makes an estimate which he thinks is sufficient to perform the work, seldom getting it high enough to attract a competent contractor. When the work is under construction along comes the caving proposition or soft sand. The next step for the contractor is to do poor work or lose money or both. Such work and its results gives rise to the saying among farmers that the tile drain is a failure.

It is necessary in all cases where the adjacent land is much elevated, causing the water to flow quickly to the drain to construct an open or storm ditch over or near the main tile. There should be catch basins or inlets with perforated coverings placed
at intervals along the drain. I find this to be one of the most important parts of the drain. When the ground is frozen or heavy rains come, the water passes through the inlets with a pressure and almost invariably washes out any obstruction that may be lodged in the drain.

On the long narrow marshes with long sloping ridges of hard land on either side, the engineer without practical experience is very apt to make a mistake as to the size of the tile required. He takes into consideration only the marsh, and omits the flow from the high land. The resulting drain may have only about one-half the capacity it should have.

LABOR AND MACHINERY.

Machinery for installing tile drain is one of the greatest problems with which we have to contend. Machinery has been invented to do almost any kind of work and do it perfectly, but the tiling machine is a problem that is not yet entirely solved. To be sure, there are a few machines that do good work under favorable conditions, but it is a very difficult proposition. A
tiling machine must meet with such a variety of conditions that it has to be several machines combined in one. The most difficult thing is to make a machine that will be a paying investment for laying large tile mains.

We all know there are a number of tiling machines on the market but the contractors who are running these machines must leave out at least 20% of the land that is most in need of tiling and look for land firm enough for his machine. I find a great many marshes throughout this state, that are entirely too soft for any machine that is now built. This is why contractors are not interested in this class of work. They say "Do this work by hand." But I have had experience in that too, and am convinced that as a business it does not pay.

The greatest difficulty under present conditions in Wisconsin attends the installation of the main tile. It is necessary in a great many places first to cut an open ditch so as to carry away the water and allow the land to settle and harden in order to operate a tiling machine. I know of no cheaper method of cutting this ditch than with a large ditching plow and capstans. After tiling, this ditch may be retained to carry storm water.

I have operated a tiling machine that will follow these open ditches and cut them to a sufficient depth for tile. This makes the work of first and second cutting much easier than to try to do it all at once by any kind of machinery put on the soft marsh.

It also eliminates the caving proposition. I saw a machine that cost two thousand dollars trying to lay a main tile four and one-half feet deep through the soft marsh. This machine was making a total failure of the work and was not making operating expenses.

I have operated tiling machines on almost all kinds of soil and find that the only machine that really pays is the web or caterpillar traction type. But even with this the contractor must sort out the jobs to suit his machine.

I have operated a tow-line machine over open drains which had been dug long enough to allow the banks to settle and the sod to form, making an excavation from two to four feet deep in the bottom of this open drain. This makes the laying of the tile fairly profitable, where if I had tried to excavate a trench to the same depth over this land before the open ditch had
drawn the surface-water out of the soil, I would have made a failure with the same type of machine.

In conclusion I will say that this open ditch work must and will be accomplished before much outlet tile is laid. There has been very little tile laid in this state compared with the amount in Indiana and I see a great future for the business here.

*The President.* The next subject is closely related to this, so we will listen to Mr. Jones and then throw it open for discussion.

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**WHY TILE SOMETIMES FAIL**

*E. R. JONES*

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An Englishman landing at New York City met three men while he was walking on the pier. Two of these were negroes The Englishman immediately wrote to his people at home that two-thirds of the population of America were negroes. His conclusions are just as warranted as the conclusion that half of the tile drainage systems are a failure because one out of two that some man may have examined was not wholly successful. It is unfair to jump at conclusions without an examination of the premises.

Two kinds of men are apt to draw these conclusions—first, the man who has had an opportunity to see only one or two tile drainage systems; and second, the man who has seen a great many tile drainage systems but who has wanted to see only those that were apparent failures. In fairness to good tile drainage, we must teach the first man the error of his ways and spike the guns of the second. It is hard to teach a man who is prejudiced.

**COST AND BENEFITS.**

Wrong ideas prevail as to the cost of tile. A 4" tile laid 3 feet deep in a soil where the digging is reasonably easy costs 75¢ a rod for tile and labor; a 8" tile laid 4 feet deep costs about $2.00 a rod for tile and labor. If the laterals are 4 rods apart,