be made on Sunday, and the railroad company to be given proper notice.

The electric road could not enter into an agreement because they had no funds from which to pay for their share of the required bridge. They were advised to make proper application for an increase in rates to cover the necessary costs, and as soon as their application was granted, they notified us that they were ready to draw up an agreement.

Our big job is done. Carrying out the agreements will be easier than making them. The contractor must select the time for crossing and notify the district engineer, who in turn must notify the railroad companies to open their tracks. Both tracks must be opened at the same time because there is not sufficient room between them to store the dredge. The high tension line, and the trolley line of the electric road will have to be raised or removed. The signal line and Western Union Telegraph lines on the right-of-way will have to be cut. The bridges are to be built before the contractor is ready to cross. At the time set for crossing, the bridges will merely be opened and put back into place in a short time. The commissioners, on the other hand, are to direct the cutting of a channel to cross the right-of-ways and a pit to store the dredging outfits, before the crossing is to be made in order to avoid unexpected delays that might be occasioned if the dredge is obliged to dig its own way through. If adequate preparations are made beforehand I feel confident that the problem of crossing railroads is not a serious one.

(Later: This plan was executed exactly as Engineer Donohue outlined it. Within 3 hours after the bridge was removed on the steam railroad, the house boats trailing the dredge had cleared both the steam railroad and the electric road. Temporary bridges were completed and traffic resumed on both railroads 5 hours after the first bridge was removed.—Editor’s note.)

HOW THE STATE DRAINAGE ASSOCIATION CAN HELP

Carl Foll, Deerfield, Wis.

I believe some of you know me; I am a farmer. If a farmer makes a success, he has not the time to study the making of
speeches. He has got to study his farming and work. If you only study and do not work, you fail.

Now, Gentlemen, I believe the Wisconsin Drainage Association is one of the important associations that we have in the state. (Applause.)

We have thousands and thousands of acres of marsh land in this state, productive today, but that a short time ago did not earn anything. True it is that we have hundreds of farms that have more or less wet land, that produces very little or next to nothing. Some of such farms have timbered wet lands which produce building materials, fence posts and fire wood. But even they have some wet marsh land that produces hardly anything.

Now, my friends, here is one thing for us and for the professors from the University to do: Go to such farms and help the farmers tile or drain the wet marsh land. I do not mean to help with shovel and spade. We can help them in another way.

I know the larger number of these farmers that own such marsh land do not know today how to go at it to make the improvements so as to have good soil. What this Drainage Association should do is to go and find out where such farms lie and hold meetings—four or five miles apart if necessary. Hold a meeting, for instance, in the schoolhouse; notify every farmer and have our professors come and explain to the farmers how to go on this land and make the wet lands good soil.

Hold these meetings often, and if in a radius of every four or five miles you can get one man who will go to work and make the improvements on his marsh land, when the rest of the farmers see the result of his work, they will start immediately on this work themselves.

I can tell you my own experience. Twenty years ago I started to improve my own marsh land and the farmers within seven or eight miles, after seeing the results of the improvements I had made, immediately began to come to me and talk about drainage. One man had a wet pasture—so wet that his cattle got mired in it. He said: “After seeing the results of your work I am going to tile my pasture.” He did this and had a very good result therefrom.

At another time, a friend of mine helped me thresh and saw the rye I raised in that poor marsh. He also saw the big crop
of hay growing there. In the fall he helped me fill silo and saw the enormous crop of corn I raised there. He went back and tiled his marsh and that man has good soil now; he has raised big crops of corn, hay, potatoes and sugar beets, and rutabagas by the wagon load. Of course, he was a good farmer; a lazy farmer could not have accomplished this.

Another man I remember had a forty-five acre marsh. He tiled it and put in a crop of potatoes and had good results. His brother also tiled his marsh and had good results.

A man eight miles away from me came to me one time in June, looked over my crops, and from then on came every month to watch the growing of the crops. He told me he had sixty-five acres that were hardly worth paying the taxes on. He said: "I am going to work and tile the sixty-five acres." I said to him: "My good friend, it will cost you a lot of money to tile sixty-five acres at one time." He told me he had had a contractor there that had made a plan for the tiling and the contractor had told him if he would do the hauling of the tile and cover the tile that he would tile his land for $26.00 an acre. This man said he had half of that money on hand and the other half he would borrow. He said: "I see your marsh here pays you more than seventy-five or eighty per cent. Why can't I pay five per cent to borrow the money?" He did so. He put the sixty-five acres in the easiest crop and had excellent results.

Other farmers in my locality laid single strings of tile in the low places of their marshes; other farmers made new ditches; and other farmers cleaned out their ditches. The result was that a good many acres of marsh land were improved in the northern part of the town of Deerfield and a good many hundred dollars have rolled into the farmers' pockets, all because old Carl Foll made a start.

The farmers who tiled their marshes have increased their herds by ten or fifteen head of cattle and more. They built additions to their barns; put up silos—some two; put up new corn cribs; built additions to their houses; and you can see what the result was.

I do not claim all this result came from the marshes, but if the farmers want to improve their marsh land and will work that marsh land together with their good land, the combination brings the result.
Now, gentlemen, I say again, if this Drainage Association would go out to these farmers that have wet land, and would get them together and hold meetings, explaining to them what they can do, you will see the result in the next fifteen or twenty years in this state. I believe honestly if I had not started twenty years ago to improve the marsh land in my locality, the northern part of the Town of Deerfield, that very little would be done today.

Gentlemen, so far as I know, we have in the state of Wisconsin a good many drainage districts; districts in which big ditches have been made and for which thousands and thousands of dollars have been spent by the farmers. Now, I would like to ask you: "Have the larger number of these farmers that spent their money in building these ditches, got good results? Has the average man got good results for the money he spent?"

(By a voice: NO!)

I must say that I know of two districts in which some of the farmers have got good results, but the larger number is not satisfied. Why are they not satisfied? I know in the better districts that every forty acres has an outlet, but the farmers do not know today that they must lay some tile in their marshes to keep the outlets busy. Without such tile the outlet is not much good.

Now I will say again: Here is work for our drainage association. Go to those districts where the farmers are not getting good results. Go there, give them a talk, hold meetings, try to organize a sub-district on from seventy-five to a hundred acres: tell these farmers to go and get a contractor and tile their land, and after they have tiled their land promise them another meeting. If the farmer wants to raise hay, tell him exactly what to do. Tell him what time he should plow his marsh, what time to put on the fertilizer and what kind of fertilizer to put on; what kind of seed to put in, and what time to seed it.

At such meetings we should have a farmer along who has actually tiled his farm. That farmer could talk to the other farmers and tell them what he has done with his own land and the results he has achieved. They might believe him when they wouldn't believe the professors.

I have never seen a failure of marsh land to produce a good crop of corn if you handle it right. I have had twenty years’
experience with it and have never had a failure with it except one year. That year the frost caught me awfully bad and that is the only failure I had.

Now, gentlemen, if the Drainage Association does its duty, each of us must become a missionary—a swamp angel. If we do this, we will help the farmers and we will help the whole community, as well.

SLOPES IN OPEN DITCHES

P. J. Hurtgen

Drainage Engineer, Kenosha, Wis.

The subject assigned to me is "Maintenance of Slopes in Ditches." I think that most of us will agree that if ditches could be constructed as most specifications provide that they shall be constructed, and if the cross-section of the ditches would remain unchanged after the work is completed, many of our troubles would be reduced to a minimum. This, however, is not the case. It is true, however, that the greater portion of our trouble is due to caving banks, and if this trouble could be overcome the cost of maintenance would be comparatively low.

As a rule the caving of banks is due to three causes:

Caves or breaks due to the inability of a layer of drift to hold the weight of the overhead bank. These breaks usually occur where a layer of sand or gravel or unstable clay lies some distance below the surface of the ground and as this layer crumbles a crack develops in the bank some distance from the edge of the ditch, and as the crack gradually widens the bank moves slowly into the channel. Where caves occur due to this cause, the only practical remedy is to flatten the slopes until sufficient weight has been removed to establish a state of equilibrium in the ditch banks. It is also necessary that the spoil bank be deposited far enough from the edge of the ditch to relieve the ditch banks from the excessive weight of the excavated material.

A second cause of caving banks is due to gravity slides, which result from the movement of the overhead bank upon a slippery layer of clay or other material due almost entirely to an excavated slope steeper than the angle of repose for the particular