Construction of Tile Drains—No. 5.

BY PROF. MANLY MILES.

In my last article, page 202, the types make me say that "it is necessary to provide for the entrance of water at the top of the tiles," &c. This paragraph should read: "It is *not* necessary to provide for the entrance of water at the top of the tiles *where* silt is liable to be washed in with it."

As the efficiency of a drain will depend largely upon the free discharge of water at the outlet, it will be best to provide some permanent protection of this part of the system to prevent any displacement of the tiles by the action of frost or the treading of cattle.

A stone wall laid up dry, if of flat or quarry stones, or with water-lime mortar, if of cobble stones, will be found the most economical and satisfactory protection. The foundation of the wall should be laid in a trench at least three feet deep, so as to be below the reach of frost, and the top of the wall should reach at least three feet above the tiles, to support the embankment that will be required to protect them from all disturbing causes. The tiles that pass through the stone and form the outlet of the drain may be one or two sizes larger than the tiles immediately above them, so that an iron grating may be placed over the outlet to prevent vermin from entering the drain, without retarding the discharge of water when the tiles are running full. In making the moderate expenditure required for this permanent protection of the outlet one of the most frequent causes of failure in the working of drains will be avoided.

When drains are well laid on a uniform slope and with close joints, and the outlet is well protected, there are but two causes of obstruction that are worthy of especial notice.

Where bog-iron ore is found in the vicinity of springs that are discharged into the drain, a deposit of the oxide of iron is liable to form in the tiles and may completely fill them. The only remedy for this is to take up the tiles and remove the obstruction. It is well, however, to notice the ocalities where such springs occur as a possible source of future annoyance.

The roots of trees under certain conditions penetrate the joints of the tiles and form a fibrous, spongy mass that in the end forms a complete obstruction. In all cases in which I have observed this form of obstruction there has been running water in the tiles during the dryest seasons, and it seems that a perennial spring and a season of drought are the conditions required to produce it. It is often difficult to determine the tree or trees that are the source of obstruction, as those in the immediate vicinity of the drain are not always troublesome, while others at a considerable distance may prove very annoying.

I do not know of any remedy for this difficulty but the sacrifice of the trees that produce it. Care must, however, be taken to determine the real cause before resorting to this heroic remedy in localities where it is desirable to preserve the trees for shade or ornamental purposes. Willows and elms are more likely to be troublesome than other varieties, and the protection of the joints by cement which has been recommended by theorists has not proved an efficient remedy in practice. Where it is desirable to preserve the trees in the vicinity of a drain, a larger tile than would otherwise be necessary may be used, and when obstructions occur the drain must be taken up and the roots removed.

The place of obstruction may be detected by observing where the water rises to the surface, or is not removed rapidly after a heavy rain, which will be at or just above the seat of difficulty on moderate slopes, or where the descent is rapid, it may be just below it. In places where such obstructions are liable to occur it will be best to have a small well from the drain to the surface, so that any partial stoppage of the tiles may be detected from the diminished flow of the water in a wet time, that the removal of the roots may be made at a convenient time before complete obstruction occurs.

Draining Springy or Swampy Land.

A Kentucky subscriber of the *Tribune* submits a case for advice. It comes under the above general subject, and as there is much land like his in the country, almost useless unless drained, and as the drainage is somewhat difficult, the case seems to deserve a somewhat extended notice. It would have received it long ago if the gentleman had signed his name to his letter, so that more full inquires could have been made. He says:—

"I send you a diagram of some wet land (which gives me a good deal of trouble and no yield), which I hope you will have time to examine and suggest a remedy. The swampy places hold water very tenaciously, the soil being black muck, with a very hard and compact sub-soil, composed principally of fine black gravel intermlxed with some clay."

From the diagram it appears that the field is an oblong rectangle, shaped and proportioned like the flat surface of a brick; that it contains twenty acres; that there is a fine fall from both sides towards a curved line running nearly through the middle, lengthwise; that this line has a rapid descent towards one end, but runs nearly its entire length through a strip of marshy ground from twenty-five to seventy-five feet wide; and there are several springs in the field, and that open ditches from these springs and through the marshes have already been cut. The subscriber says further:—

"When it rains the water will stand for weeks on this land and will not filter through into the ditch, though there is a fine fall toward every one of them. There is high land all around this swamp, and it has occurred to me that the swamp might be caused by the water settling down from the hills and forcing itself to the surface."

The remedy I should suggest would be to tile-drain the entire field systematically and thoroughly. If it is useless now, as its owner says, and the soil is naturally fertile except for surplus water, it would certainly pay, unless neighboring land (good without tiling) is exceedingly low in price, and labor and tile exceedingly high. The field lies admirably for tiling. A large main drain should be laid three feet deep, in a curved course through the field, following the line of the lowest level, and laterals at the same depth should branch out and receive the water from each of the springs. They should be so arranged at the upper end as to receive the entire water of the springs immediately, without wash or sediment. They should also be root-proof through their entire length (as crop roots will seek the running water inside), and yet admit the water from the marshy ground along their course. The size of these main drains must be governed by the amount of water furnished by the springs, the marsh and the surface water caused by rainfall on the entire field. Probably the large main should be at least six inches, and the main branches three or four inches in diameter. Then laterals should be run straight down the slope, parallel with each other, to the nearest main. These should be of two-inch tile, and sunk at least 30 inches deep, and from 25 to 30 feet distant from each other.

I think there can be no doubt that such a system of draining would make the entire field arable. True, the water stands in the muck, and does not filter through into the open ditches; but these are probably sunk only to the gravel, and if the muck is nearly impervious to water, the water would stand in it as described. But if the tiles were sunk into the gravel a foot or two the hydrostatic pressure would force the water through the porous gravel into the tiles. Laying tile is like knocking the bottom out of a pail, the watar is sure to find its way out. I have never yet seen the soil which a thorough system of tile-draining would not free of its surplus moisture. It would probably cost not far from $25 per acre to drain the field thoroughly, making laterals thirty-three feet apart all over the field.—*W. I. Chamberlain, in N. Y. Tribune.*

Contributors' Notes and Queries.

To cover stubble land with some growing crop is a benefit which experience in Western New York and elsewhere has fully demonstrated. It protects the land from the effects of the hot sun, adds fertility, and improves the mechanical condition of the soil. The expense is only the seed and harrowing it in, or, if necessary, the use of the cultivator also. But, even if the plough has to be employed, it is found a paying operation, as it mellows the soil (particularly at this time of the year), and turns over what plant refuse remains. The ploughing should be light. Any thrifty grain may be sown. Millet is excellent on a good soil, which it requires. On indifferent soil oats will do, and on quite poor land, peas, always followed by plaster, which easily doubles the growth. Peas also, more than any other growth, shade and mellow the soil, unless we except buckwheat. Where the field is intended for some late spring crop, like corn, rye is the plant, as it grows till late in the fall, and starts early in the spring, making, at late ploughing, a large growth. It is one of the richest of plants, yet so great is the increased yield of the crop that follows, particularly corn, that there must be some other effect besides the plant food which it contains. This is also the experience with young clover, which, with a summer's growth, gets a root two or three inches in length in deey soil, and doubtless other plants are similar in effect.—*Montgomery.*

Storing Show Potatoes.

How Mr. Peter McKinlay stores potatoes (who cultivates 600 varieties in Peckenham, England) an English exchange says:

When a row of any sort is lifted, the best samples are selected with care, and carried into a large airy outbuilding, which is lined with tiers of small wooden bins ranged one above the other, but open at the top, each one holding about half a bushel of potatoes. Into these the selected samples are carefully laid, and are covered up with dry sawdust, where they remain clean and fresh until required for the show table—whilst the remaining tubers of the sort, having been exposed to the air and fully dried for a few hours, are then buried in a small pit at the end of the row, where they remain until the show tubers having been removed from the bins to win prizes at exhibitions, the heaps are opened, the selected seed tubers are taken to the bins to remain for the winter, whilst the remainder go to the store for domestic consumption. As in front of each bin the name of the potato occupant is placed, each sort is easily found when required. There is no better material in which to keep tubers fresh and bright than clean, dry sawdust.

Vegetable Mould Prevents Leaching.

A correspondent of the *American Agriculturist* throws out a useful hint to farmers who have light, sandy soils, when he says:

Almost all thin soils are peculiarly subject to leaching—that is, to having their goodness washed through them. The remedy is to make a soil full of fine mould. To this end the land must have a crop upon it all the time A growing crop fills the soil with roots. The roots decompose and form mould. Red clover is pre-eminent as a mould-making and soil-making plant. Buckwheat is useful chiefly when it is plowed under. Corn sowed as for fodder, being scattered in every third furrow when plowing, may be plowed under, or it may be cut and fed or cured; in either case it is beneficial. The roots and stubs make a great mass of mould in the soil, and where it is all made use of as a green manure the result is most satisfactory. Turnips cover the land quickly, and if plowed under are of marked benefit. In any event they prevent the growth of weeds, and as summer fallowing is always detrimental to such land, quick-growing green manure crops are our only resource, for by their use we work the soil, we kill the weeds and we improve the land, all at the same time and with little labor.

The Weevil.

The presence of these insects may be detected by the weight of the grains. On throwing a handful into a bucket of water the diseased grains will float. After the female has, by means of her rostrum or beak, deposited an egg in the grain, she covers it up with a sort of glue of the same color as the husk, hence the difficulty of detecting the presence of this depredator in the granary during the time when it is in the larva state.