

surface the road, and the cost of maintenance is greatly reduced.

There is no hard-and-fast rule for the location of tile underdrains on the road. It is important, however, that they be given depth below the road surface, in order to tap and receive the greatest amount of subsoil water—just as a pail can be kept less full of water by a hole in its side near the bottom, rather than one near the top. For this reason, a tile underdrain below the open drain at the side of the road, in level land, is preferable to one laid in the center of the road, particularly if the road has been previously macadamized or given a heavy coating of gravel. To cut up this old roadbed is objectionable, and more expensive than to lay a drain at the side. Except in heavy clay, one underdrain at the side will usually do all for a road that two underdrains, one at each side, will accomplish. This, however, depends on the porosity of the soil and the distance to which the underdrain will draw on each side. On hills, or where the open drain is subject to erosion, it is better to lay the underdrain below the shoulders of the road, tapping wet and soft spots with a blind drain running diagonally into the heart of the spring or spot where the water comes to the surface. If the soil is stiff clay, or is of a character that does not drain readily, it is often advisable, and is frequently necessary, to surround the tile drain with gravel, sawdust, clean, sharp sand, crushed stone or other porous material. That, in some cases, tile drains have not been effective in drying hills, is due to the fact that the soil was a heavy clay, and that no provision had been made for increasing the attractive power of the tile by placing porous material over it. In clay soil, to fill the trench with gravel, sand, etc., is the ideal method.

Tile drains must be given free outlets. They must have a constant fall and not be irregularly laid; otherwise, the depressions will fill with silt and be blocked. In quicksand they should be surrounded with sod or sawdust. If the tile are likely to settle in the sand and become irregular, a board should be placed under them to keep them in true alignment. The size of tile used should ordinarily be four or five inches in diameter, and they should be placed at a minimum depth of two feet below the ground. An average of 2½ feet is usually sufficient. The minimum fall should be three inches in 100 feet. At or near the upper end there should be an opening to permit a free circulation of air through the drain.

RESULTS FROM EXPERIENCE.

Inquiry has been made by the Ontario Highways Department, of the clerks in a number of townships, as to their use of tile underdrains. The following extracts from their replies will be of interest:

A. G. Smillie, Clerk of Tuckersmith Township.—For the past eight or ten years we have grasped every opportunity to tile drain the side-ditches, where necessary and practicable. We, of course, have not reached all necessary places yet, but still a great deal has been done, and we find a great saving in maintaining. All our tile, so far, are in the center of road. For the past three years we have drained a number of springy hills, using 3-inch for short hills, and 4-inch if over 40 rods long. Might specially mention four drains on one of our busiest roads, which drain springy hills, and which have been a very valuable object lesson to many doubtful ratepayers. Tile are laid about 24 to 30 inches deep, covered level, and about 12 inches of crushed stone in coarse and fine layers put on. The results have been all anyone could wish for. We no longer hear ratepayers growling about the expense, which averages about 75 cents per rod. All soil was a very heavy clay loam. Before laying the tile, the roads cut axle-deep, and were almost impassable, although much material had been dumped on them. They had not been neglected for want of material in the past. The object of the tile was to dry the foundation, and thus make it solid. Cost of maintenance will be very much less than formerly; in fact, we are beginning to think it would pay to drain, not only the hills, but the whole road. Our roads are fast becoming noted for their excellence, thanks to the crusher and underdrains. We think one drain in the center of a road cut axle-deep is as good as one in each shoulder, and costs a little less.

James Anderson, Clerk of East Zorra Township.—I suppose there are some five or six miles of tile drains in this township. Of this, more than half belong to drains constructed under the Municipal Drainage Act, and some under the D. & W. Act. Nearly all are on the side of the road. Sizes range from 3-inch to 18-inch, but are mostly 6, 8 and 10 inches. A number of them were laid to replace open ditches on the roadsides, which required constant repair to keep open. They are principally in swampy lands, and have secured a good permanent bed, where it was almost impossible to keep a road in repair before laying them. Some were also laid where the subsoil was inclined to be quicksand, and these have also resulted in making a good firm road-

bed. A few hills have been tiled along the center, but with rather poor results. The side of the road is the place for tile in almost any location, with short offshoots in the hills, if necessary. In this locality the roads now require drainage more than anything else, and all our experience so far goes to conclusively prove it.

J. D. Drummond, Clerk of McGillivray Township.—Tile underdrains have been used only to a limited extent, as yet, but, where used, are giving very good satisfaction. They have been laid on springy hills, almost invariably in center of road, and on level roads at sides at bottom of grade. We consider, on springy hills, the tile should be at least three times the capacity of the water necessary to be drained, the length of drains in hills varying from 50 to 200 feet. In one case the soil was almost the nature of quicksand, the others in blue clay, with quicksand bottom. The road on hills was almost impassable before tile was laid, and the object was to remove the water from the surface of road. The benefit derived is good if it is possible to tap the spring and carry it away, but in heavy clay soils we have not found so much benefit, as the surface becomes so puddled as to prevent the water getting to the tile. In such soil, of which we have considerable in our township, we consider an open ditch at the side of the roadway preferable.

J. H. Cannon, Clerk of Brant Township.—A short tile underdrain was laid about three years ago in the center of the road (probably 18 rods). The soil was black, and inclined to be springy. The roadbed would heave with the frost in the spring, and become boggy. The road, since laying the tile, is quite satisfactory, both spring and fall.

J. B. Barry, Clerk of Elizabethtown Township.—We have what is known as the Victoria Macadamized Road running through this township. Some hills on this road were springy every spring when the frost was going out, and one in particular was impassable for teams. This one was tiled through the center from top to bottom of grade with 6-inch tile, then across to the ditch about 160 feet. This was done four years ago. The road is in good shape ever since. I believe the other hills on same road will be tiled next summer. This was a clay loam, sandy bottom.

J. B. McLean, Clerk of Vaughan Township.—About 100 rods of tile underdrains, all told, have been used on hills and places that were springy, and the soil a clay loam. We have only used 3-inch tile on several boggy hills, and on some short pieces of roadway where the ground was springy, and the results have been satisfactory. Roads and hills almost impassable have been made quite good after being drained and gravelled.

C. S. Burton, Clerk of Flos Township.—Tile has been used here in two instances. One was a very springy grade, that would, in wet seasons, be almost impassable. Two-inch tile was laid, beginning at the center of the road and extending down the grade diagonally to the side ditches. The road was then laid with about 18 inches of broken stones. The road has been in excellent condition since. The soil was clay, mixed with sand.

Wm. Lilly, Clerk of Tecumseh Township.—Tile underdrains have been used, mostly on springy hills, perhaps in eight or ten places. Tile was put in the center of the road where wet and springy. Three-inch tile were used, I think, and carried to a proper outlet, perhaps three hundred feet. We find it a benefit to the road in clay soil, as the road dries up sooner and becomes solid, but does not work so well in sand or quicksand, as the tile become useless on account of filling up with sand.

Peter F. Schummer, Clerk of Wellesley Tp.—Tile underdrains have not been used to a great extent under the center of roads, but more so on the side of the roads. The size was from 3 inches up to 10-inch. They are used in all parts of the township, mostly short drains. The soil is quicksand and clay. Before laying, the roads were bad in spring when frost came out, and the object was to keep the roads from heaving up in the spring season. Results, good.

Francis Jacob, Clerk of Logan Township.—Tile underdrains, when used on roads, are made under engineer's awards or agreements, very seldom for construction of roadways. Location of tile on roadway is at side. The size of tile varies according to engineer's order in award, the length as required by award or agreement. The class of soil varies from heavy loam to a mixed, sandy soil. Laying the drain greatly improved

the road. The object of laying the drain was to give outlet to party or parties, and improving road. Benefits resulting from the underdrains on roadway are very satisfactory, providing there is a sufficient outlet.

A. Martyn, Clerk of Huron Township.—We have a good many tile drains crossing the roads, and some draining hills; possibly a mile of tile drains on hills and along the side of the road. Hills are drained in the center or roadbed, and where tile are used on level roads they are placed at the side. Sizes used are from 3-inch to 8-inch. More or less is done every year. The drains are in clay land. The roads were wet and spongy, and the object was to make it dry and hard. Results have been very satisfactory, the object aimed at being attained.

F. Littlejohn, Clerk of Oxford Township.—Tile drains have been used on the roads of this township quite extensively for the past twenty-five or thirty years. The location of the tile drains, almost without exception, has been at the sides of the roads, varying from 12 to 18 feet from the center of the roadbed. Different sizes of tile used, from 4-inch to 12-inch, not many larger than the 12-inch; and the drains are of various lengths—from a few rods to one mile. We have all classes of soil through which these drains pass, viz., clay, gravel, sand, muck and quicksand. The general condition of the roads in the clay soil and the muck, before drainage, was very bad. The object was to carry away the water, and thus allow the soil to dry out. The benefits resulting from this drainage have been very satisfactory where tile large enough to give proper drainage have been used, and where both sides of the road have been drained properly; but where too small a tile or too little an amount of outlet has been provided, then the result has been very unsatisfactory.

A. W. CAMPBELL,
Deputy Minister of Public Works.
Toronto.

SILO SAVING ON THE FEED.

Last spring we put up our silo, and, while not yet in a position to say much about it, I know that it is saving on the feed. It is 25 feet high, 14 feet in the inside, and 10 inches thick at the bottom; then I had it drawn in as it went up, and we left it 6 inches at the top. The reason I built a cement-concrete is because I think it is saving on the feed, and I think it is there for a good many years. It did not cost us a great deal, because we had our own gravel. It cost \$105, everything complete.

ELGIN CO., ONT. WILSON WARNER.

THE DAIRY.

COMPULSORY GRADING OF DAIRY PRODUCTS.

While the agitation for compulsory official grading of dairy products in Canada as they do it in New Zealand, which agitation "The Farmer's Advocate" opposed in a fairly exhaustive editorial last summer, has met with little or no favor among dairymen, factorymen, or the trade, it will do no harm, and may possibly be of some good, to reproduce the following extract from the New Zealand Dairyman of December, 1907, on the value or otherwise of the system in that country. It is headed "The Value of Grading—Some English Merchants' Opinions."

"Some time ago Sir William Lyne attempted to force the principle of compulsory grading and stamping of grades under the provisions of the Commerce Act, but the hostility shown by the producers and manufacturers in Victoria and New South Wales was so very general that he retreated from the position taken up. At this time, the manager of the Gippsland Butter Factories Co-operative Produce Company, with a view to getting the opinion of London agents, wrote to four of the largest firms, namely, Lovell & Christmas, J. & J. Lonsdale, Andrew Clements & Sons, and Anglo-Continental Produce Co., asking for their opinion as to the value of grading. The questions and answers appeared afterwards in the 'Melbourne Age,' and were as follows:

"First.—Have you been able to get higher prices for butter branded 'First Grade Superfine' than you would have done had it not been so branded? Andrew Clements & Son: No; quality would have got the price without the grade mark. Lovell & Christmas: No; we sell all our butter on inspection, according to quality; buyers take very little notice of grade marks. Anglo-Continental Company: No. J. & J. Lonsdale: No. "Second.—Have you, as a salesman, been assisted in any way in selling butter sent to you on consignment by reason of the grade marks being branded on the boxes? Andrew Clements & Son: On the spot or landed goods, no. Lovell & Christmas: No. Anglo-Continental Company: No. J. & J. Lonsdale: No."