

ly. Every man upon this earth has a claim upon every other man to be treated *civily* by him till he prove himself undeserving. This obtains in virtue of the common brotherhood of the race, and of the obligations which flow from it. Agents are now a mighty army, an indispensable medium in carrying on the barter of the world, or, to put it in another form, a medium which at present, at least, the barter of the world will not consent to do without.

The simple remedy is just for the farmers *not to allow themselves to be bled*. A firm negative should be enough to an agent of good manners; where it is not efficacious, a gesture in the direction of the highway, and the resumption of work will usually suffice. Nor need the farmer waste his precious time with the agent listening to his endless yarns. He can simply excuse himself and go on. The merchant and the lawyer do not waste five minutes with the agent who is not wanted, and why should the farmer? Above all they should never, never, never sign a document without knowing its full import.

First Prize Essay.

ON THE BEST METHOD OF UNDERDRAINING THE DIFFERENT SOILS OF ONTARIO, THE COST AND THE PRACTICAL BENEFITS RESULTING THEREFROM.

(By the Editor.)

(Continued from March Journal.)

Our essay calls for information (1) *On the best method of underdraining the different soils of Ontario*; (2) *the cost*; (3) *the practical benefits resulting therefrom*. Regarding the nature of the information asked by the divisions 2 and 3 there need be no uncertainty, but we frankly confess we are not quite clear as to what was in the minds of the framers of the subject when they use the term "best method," as applied to the underdraining of the different soils of Ontario, nor have we any means of certainly divining. And yet this is just where the bull's eye should be pierced; here it is that the spring should be tapped by the lateral which is to convey its waters to the main drain of the whole argument. If the term "best method" has reference only to the materials used as best adapted to the different soils, then the subject is very much narrowed, as we claim that we have already shown that tile is incomparably the best material on the grounds of cheapness, efficiency and durability, which latter quality alone gives them an immense advantage over every other form of material. But if the clause referred to include the details of construction, the subject is greatly widened. We are inclined to take this latter view, and shall proceed accordingly.

The surface of Ontario is made up of clay, clay loam, sandy loam, sand, black loam, gravelly soil, stony ground and rock, with a limited amount of swamp, bottom land and springy ground, which latter are included in one or other of the varieties of soil first named. Swampy land is usually made up of black loam, and springy land is oftener sandy in its texture. When sandy soil rests on an open subsoil of considerable depth, it does not need draining; when very light and resting on other subsoils, it will not repay the draining. Gravelly soil, porous a long way down, will not give back the outlay, and soils in which both the surface and subsoils abound in large stones had better be left alone.

The principal soils of the Province are clay, clay loam and sandy loam. These largely predominate in many of the counties, and in area, clay loam exceeds the others. Although this latter is sometimes found resting on a subsoil of gravel, hard pan, etc., it oftener rests on one of clay more or less porous, so that if we

give a hurriedly detailed description of the "best method" as yet known of draining this class of land, we shall then have a fair type of the method to be adopted in draining the other "different soils" of the Province, for really the variations in mode are far fewer and less important than one would imagine at first thought. The material to be used is the same—tile; there are not many variations in mode of cutting, ditches, and fewer in the mode of laying the tiles.

We shall give, therefore, in brief detail what we consider the best method of tile-draining clay soils. This we shall regard as our leading main, and dovetail into it the laterals of divergence relating to any differences of procedure that are necessary in treating of the "different soils" other than clay, something after the fashion in which Messrs. Boynton & Co., of New Jersey, unite them with their junction pieces. We shall thus try and keep out the silt of all extraneous reference, and after constructing the submains relating to "cost" and "advantages," conduct them to the one grand outlet, the magnificent return in Canadian gold, which is the certain and speedy outcome of the judicious underdraining of our soils.

And here we pause to remark that in giving the details of method we are indebted not a little to that inimitable work, "Draining for Profit and Health," by Waring, a book that every farmer in Ontario should not only read with the utmost care, but the contents of which he should talk over with his sons, both in the house and in the field.

Of the considerable number of Canadian farmers whom we have consulted, and with whom we have corresponded in order to ascertain their practice, we may mention the names of James Thompson, of Whitby, one of the few pioneer tile-drainers of Ontario; John Dryden, M.P.P., Brooklin; W. Heron, Ashburn; Messrs. C. and W. Graham, Ottawa; W. Rennie, Toronto; S. Rennie, Milliken (Markham); A. Hood, Hagerman (Markham); F. Green and F. Malcolm, Innerkip; and J. McMillan, Constance (County Huron). Where we have occasion to refer to the concurrent testimony of these men and of others not named here, but whom we shall refer to further on, we shall do so by the use of the phrase *Canadian Practice*, as these are representative men, and living, as several of them do, in places widely apart.

LAYING OUT AND CONSTRUCTING THE DRAINS.

We shall treat of these together. Underdraining a piece of land requiring it is like making a deposit which gives a splendid return every year and where the security is absolutely secure; but only on the condition, first, that the work be economically done; and second, that it be well done. The first of these conditions qualifies the laying-out of the drains, and the second the construction. When the work is done properly it will last a very long time, but if injudiciously performed (not necessarily in a careless manner), it is only a source of sorrow to the spirit. Mr. Dryden speaks of a farm in his county where the draining was done by contract without the proper supervision, which in certain parts has been *made a quagmire* in time of wet, through means of the wretchedly laid drains.

By laying a system of drains out properly, a saving may be effected in the length of them, amounting in some instances to *one fourth*. Where it is undertaken, then, on a large scale, it would be money well invested to call in the aid of a practical draining engineer, not a professional ditcher, who too often finds reasons for placing a large number of drains. The best thing, however, in ordinary practice, is to secure the assistance of some neighbor who has had experience in the work in laying out the drains, until that

day dawn so full of promise, when a considerable number of our young men shall have learned at least the outlines of practical engineering.

It is better to make a *map* of the land before the work is commenced, containing the proposed route of all the drains, after having first carefully taken in the contour of the land. Where this has not been done before, it should certainly be done after, that when any repairs are needed the drains may be easily located.

The best instrument, perhaps, in ascertaining the *levels* is the ordinary telescope level used by railroad engineers, especially when in the hands of one of mechanical tastes. Some use the ordinary level and straight-edge. The level in favor with Mr. Dryden and others "is made by inserting a common glass level or tube in a piece of hardwood which will not warp or twist, nor become easily bruised by occasional hard knocks. The wood must be planed perfectly smooth and true, and should be eight or ten feet long, one and a quarter inches thick, and say six or eight inches broad. The glass is firmly imbedded in the centre or edge of the wood, so as to be below or even with the surface, that the sight may not be impeded. If desirable the whole may be firmly bolted to a strong stake, which may be driven in the ground at any desired point."

In laying out the drains the location, depth and finish of the *outlet* should be most carefully considered, and also the course and depth of the *main* drains, the *sub-mains* and the *laterals*, which in practice may be indicated by placing stakes at certain points. It is more systematic usually to ascertain where to locate these by actual measurement. It is well to weigh the provision that should be made when necessary for carrying off the water of *springs* or that flows over rock that may lie near the surface, or for the prevention of the accumulation of silt, and to give due thought as to the kind and size of tile to be used.

The *outlet* should, where at all practicable, be placed at the lowest point. A good strong floor of stone should be placed below. All the better if the bottom stone is a broad flag extending some distance forward to receive the flow, and up the drain to prevent undermining, as drainage repairs are costly and particularly unpleasant. Stones can then be built up around the tile and extending a little distance up the drain, and forward beyond the end of the tile. Brick will answer the same purpose where stones are not at hand, in which case they should be laid on a stout, broad plank. The end tile should be of glazed work or vitrified ware, with earthenware grating, which is movable, as manufactured by Messrs. Boynton & Co., of Woodbridge, New Jersey, and should extend over a step, to show perfectly the action of the water. The number of the outlets should be reduced to a minimum, owing to the cost of constructing them properly and keeping them in good repair. For this reason, amongst others, open ditches are objectionable, even where there is a strong flow of water. Where the land slopes both ways toward a depression, channelled by an open ditch into which the drains flow, it necessitates the construction of a large number of outlets. The open ditch is also a serious injury to tillage, and is not in any sense ornamental. It is better, then, unless there is a very strong flow of water at certain seasons, to lay one large main instead. Canadian practice is divided in reference to the matter. The names of Messrs. Thompson, Dryden and Rennie are arrayed against the open ditch.

The *main* drains should lead up the lowest part of the valley, be of sufficient depth to secure a fall, and the utmost pains should be taken to have the grade