

or four feet deeper, until water rises into the bottom of the drain,—where these succeed many holes should be bored.

Another plan I have adopted is sinking holes in the bottom of the drains, (the drain being as narrow as a man can work in,) fill these up to the surface of the bottom of the drain with small stones. Both these plans are a great saving of labor, for when you cut through the porous beds where the springs are always found, these holes will draw the water from a great distance. This mode of draining will give a depth of from six to eight feet below the surface of the plain and thus the water will flow away rather than rise from the lower springs or apertures of the stratum through the incumbent soil to the surface of the plain which is so many feet higher, to secure this is the great secret of draining these grounds, when the springs cannot be cut into simply by a common drain. I have known water in such situations to follow the augur to the surface and run in a stream ever after, and when dammed supplied power for a threshing machine. Still I am aware that this one drain, deep although it be, is not of itself sufficient to dry a field properly if the field or plain has a great declivity. There may be other situations at a lower depth which run out on the surface at a lower level, perhaps half way down the field, or perhaps more, if so these oozings must be interrupted the same as before shown, but it is likely the drain will not be required to be more than half as deep as the former. As to the filling materials, nothing can be more obvious than that the preference should be given to the most substantial and lasting. I have used a variety of materials—such as stone-built rubble, gravel, tiles, whins, thorn brush, &c., and many other materials which would take too much space to particularize in this paper. Such drainage as I have been describing should be filled with stone or tiles, I may mention that I do not think stone is so safe a material to fill with in this country as they are in Britain, owing to the frost penetrating so much deeper here, opening the soil over a drain so much more, thereby increasing the danger of the water washing the soil into the drain from the surface and closing it up, especially if the drain has not a great descent with a large conduit. I have observed many instances of such cases with stone drains in Britain, and timber-filled drains in Canada. However, where stones are convenient they will answer the purpose, and they may with care be used in deep drainage with advantage. In this case it would only remain to decide whether the handling of stones would not cost more than pipes. In constructing such drains the conduit should be from four to six inches square, but of course depending on the quantity of water to be conveyed. In constructing these drains the stones should be placed in a row on each side of the drain at the bottom and a flat stone laid across the side ones, then fill up about a foot and a half with small stones and the remainder with earth. If the stones be flat and slaty they may be laid in the shape of the letter A or the letter V, that is to set two flat stones apart at the bottom and join them at the top filled up on both sides, or the reverse,

open at the top and joined at the bottom and placing a stone on the top in such a way as to drop in a little between the side stones, then fill for a foot and a half with small stones and the remainder filled as before. It will be seen that the two former methods require the drain to be wider at the bottom than the last mentioned. In a soft quicksand bottom, soles must be used, but in solid tilly sub-soil they may be dispensed with. Deep drainage, which is principally to carry off spring water, I do not think requires to be filled to such a great depth with porous materials; I would recommend sod, or straw, or shavings, to be placed immediately on the stones followed by the sub-soil dug from the drain, and made solid, and the remainder filled with what remains of common earth, because the water should be drawn into the drain from the sides near the bottom of the drain, and not from the top. But tiles with small stones, gravel, or other porous materials over them is superior to any thing else, even in deep drainage.

So far these remarks allude to the necessity of drainage and proper management of land where the water arises from springs, and there is a large portion of our soils in Canada where, from the retentive clayey nature of the subsoil, the surface water does not pass away freely, therefore the subsoil is cold and chilly, and every kind of crop sown upon it grows stunted and slowly, therefore the season is far advanced before they cover the ground, in fact the best growing part of the season is lost. At this advanced period our hot sun and scorching winds commence with severity, carrying off moisture so rapidly by evaporation that the soil bakes, and the plant is held as it were in a vice, then, of course, soils in such a state cannot absorb moisture from above or below. To remedy these evils recourse must be had to thorough draining, that is cutting drains parallel with the declivity of the land at narrow intervals apart, the distances depending on the tenacity or porosity of the subsoil, the distance may vary from thirty to sixty feet, but so long as the water does not readily leave the soil, or any unnecessary moisture is retained, we may be assured that the full benefit of draining has not been attained.

Mr. Stephens says the depth of furrow drains should be from 2½ to 3 feet. I do not think that the frost would injure tiles or pipes at 2½ feet but when stone is used 3 feet would be required. The sub-soil on heavy lands is generally free from stones, therefore I think the cost of cutting might be greatly lessened by the use of the plough. I suppose a broad-cutting plough would cut eight inches deep by twelve broad followed by a narrower one lifting six by nine, thus making fourteen inches, then a subsoil plough succeeding loosening six inches more, to be lifted out with a scoop-shovel made for the purpose, a repetition of the subsoil plough would loosen five or six inches more, this in a 2½ foot drain would only leave four inches to be dug with the spade, which would be necessary to level the surface of the bottom for the tiles or filling material. Our subsoils are not quite so tenacious generally as those in Britain, our climate being much drier indeed.