

be generally found sufficiently close. When the density of the soil required them to be placed closer together, I would diminish the depth, but the minimum should not be less than three feet. In England some people contend that no drains should, under any circumstances, be laid at a less depth than four feet, while others affirm that in some very heavy and retentive clays four feet drains are perfectly inoperative, and have been obliged to be replaced or assisted by three feet drains at less intervals. It would therefore seem advisable when a soil of this extreme character is met with, to lay out the drains for a depth of three feet at a distance of twenty-two feet. This will give 120 rods per acre instead of eighty, under the former calculation of the smaller branch drains. But as under ordinary circumstances the expense of four feet drains will be 16 or 17 cents per rod, and that of the three feet drains not over 8 or 10 cents, the main difference will be the additional number of tiles, say 660, which, at \$5 per thousand, and deducting the difference, which will be in favor of the three feet digging, will give an increased expense of, say \$5 per acre. This expense, however, may be incurred with the confident expectation of a full remuneration. Such soils, by the opportunity afforded by the effects of this treatment of easy, deep cultivation, at all times will be found to contain within themselves almost inexhaustible sources of vegetable wealth. In some remarks by Mr. Johnston, of Geneva, N. Y., lately quoted in our Provincial papers, he expresses his opinion that it is useless to sink drains any lower than the bottom of the porous soil, and that in his own land, when he meets with a hard, impervious substratum, at a depth of about thirty inches, he does not attempt, nor would he recommend, any deeper drainage. Unless the soil above this stratum is itself also of an extremely dense and retentive nature, I think that Mr. Johnston's opinion and practice are unsound; for, if the upper thirty inches of soil is of at all a permeable nature, there would be no difficulty in the water reaching through the lower twelve or eighteen inches, making in all four feet, which would then form a large reservoir, for the collection of water which could not immediately escape by the drains, in case they were of less depth, and would at the same time afford a greater range for the roots of crops planted on the surface. It should also be borne in mind that there are few soils, however tenacious, which are entirely uniform, and not continually intersected with numerous veins of sand, and other porous material. To persons who have not and will not take the trouble to examine for themselves, the accounts of the depth to which the roots of plants will penetrate seem absurd misstatements. In a field drained by myself last spring (1859) to the depth of four feet, of a moderately stiff, though not extremely retentive clay, I followed the root of a carrot down thirty four inches, and then failed to find the end, the size of the root where it broke off being still 1-16th of an inch in diameter. This, too, was in a soil which I believe has never been manured.

The next point, upon which there is a diversity of opinion, is the direction in sloping ground in which the small branch drains should be run. The majority of opinions, and with them I agree, are in favor of running them immediately up the slope, and not transversely to the fall. There certainly are situations where one or two transverse drains will be most beneficial to intercept the water when it issues below a rise of ground; but, in most lands thoroughly drained, those drains which are dug transversely only drain from the upper side, while those in the contrary direction will act on both sides, which will make the drainage more uniform and perfect. I will now proceed to give some explanations as to the mechanical performance and probable cost of the work. Clay lands, though more laborious to work, are the simplest and easiest to drain securely, on account of there being little danger of the pipes being filled by the soil running in; so that although the labor part may be more expensive in the first instance, yet it is more likely to be safely done and permanent; and the best season for doing the work is when the ground is wet, as not only it is then easier to dig, but the water with which the soil is charged serves as the most

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