

one-half to one. Except where angles may occur the ditch shall be made in straight lines, and all such angles be turned with gentle curves, to facilitate the flow of water.

(e) All stumps, roots, logs, or other obstructions, shall be cut and removed from the body of the ditch to some point beyond the berm.

(f) In timbered lands the trees shall be felled to a distance of ——— feet each side of the centre of the ditch, and the logs and brushwood shall be removed a distance of ——— feet from each side of the centre of the ditch.

The blank spaces can be filled in to suit the circumstances of the case, as no positive rule can be laid down to suit all. I consider, however, that the clearing should extend a distance of not less than six feet from the outside of the berm, and I would never make the berm less than three feet wide, and would exceed that by another foot in clay soils.

Grave mistakes are sometimes made by taking water out of the natural watercourse in order to make the ditch shorter, and again by putting the ditch along the sides of two roads meeting at right angles to avoid the cutting of a field at an ugly angle. The engineer cannot be too careful of such deviations, as a great number of long and expensive lawsuits have been the result of such false ideas of economy, especially in the latter case. Another thing to be avoided is that an engineer should lay out a ditch in such a manner as to take the water that formerly flowed through a certain lot altogether away from it.

It is sometimes the case, when a contractor has a contract that is not finished when winter sets in, that he will continue work if there be nothing in his articles of agreement to prevent him, under which circumstances great vigilance has to be exerted by the inspector or engineer. All snow must be shovelled clear of the spoil-banks, and the spoil-bank made on the natural soil, and not on the snow. The berm should be made wider and always kept clean, and at his periodical visits the inspector should see that all ice, etc., is removed from the ditch, for in winter a sheet of ice bears the same relation to the bottom of a ditch that an old coat and charity bear to sin.

When commencing a survey of a ditch, especially should it run through a beaver-meadow, the engineer will often be informed by "ditchers" (?) that it will be impossible to drain that place, and that they (the ditchers and others) have often shoved a twenty-foot pole out of sight, etc. It is generally very true about the pole, but it is not so true about the drainage so long as the fall that can be obtained is sufficient to allow the water to run off. There are very few beaver-meadows in the country with more than three to four feet of black muck on the clay, although the presence of clay might never be discovered by the running of a pole through the muck, for in an undrained state the clay is just as soft as the muck. In the bottom of a ditch, however, the clay very soon becomes stiff and hard just from the water flowing continuously over it. I have heard it stated that clay below a beaver-meadow will rise on the same being drained; but I think it was more on account of the muck falling than the clay rising that that idea was induced.

Ditches, like everything else, vary greatly in cost, ranging from ten cents per cubic yard, in a light, sandy soil, to sixteen cents per cubic yard