

Drainage.

The most obvious mode of getting rid of surface water is to cut a ditch on the surface to a lower place and let it run. So, if the only object were to drain a piece of land merely for temporary purposes, as where land is too wet to ditch properly in the first instance, and it is necessary to draw off part of the surplus water before systematic operations are commenced, an open ditch is perhaps the cheapest method to be adopted.

Again, where land to be drained, is a part of a large sloping tract, the water runs down at certain seasons in large quantities upon the surface, an open catch-water ditch may be absolutely necessary. This condition of circumstances is very common in mountainous districts, where the rain which falls on the hills, flows down either on the visible surface or on the rock formation under the soil and breaks out at the foot, causing swamps often high up on the hill-sides. Often, too, in clay districts, where sand and loam two or three feet deep, rests on tough clay, we see broad sloping tracts which form our best grass fields.

If we were attempting to drain the lower part of such a slope, we shall find that the water from the upper part flows down in large quantities upon us, and an open ditch may be most economical as a header to cut off the down-flowing water, although, in many cases, a covered drain may be sufficient.

At the outlets, too, of our tile or stone drains, when we come down nearly to the level of the stream which receives our drainage water, we find it convenient, often, and indeed necessary, to use open ditches, perhaps only a foot or two deep, to carry off the water discharged. These ditches are of great importance and should be finished with care, because, if they become obstructed, they cause back-water in the drains and may ruin the whole work. Open drains are thus essential auxiliaries to the best plans of thorough drainage, and whatever opinion may be expressed as to their economy, many farmers are so situated that they feel obliged to resort to them for the present or abandon all idea of draining their wet lands. We will, therefore, give some hints as to the best manner of constructing open drains, and then suggest in the form of objections to them, such considerations as should lead the proprietor who adopts this mode to consider carefully his plans of operations in the outset with a view to obviate as much as possible the manifest embarrassments occasioned by them.

As to the location of drains in swamps and peculiarly wet places, directions have been given in a previous article. We propose only to treat of the mode of forming open drains after their location is fixed. The worst of all drains is an open ditch of equal width from top to bottom. It cannot stand a single season in any

climate or soil without being seriously impaired by the frosts or heavy rains. All open drains should be sloping, and it is ascertained by experiment what is the best, or, as it is sometimes expressed, the natural slope on different kinds of soil. If earth be tipped from a cart down a bank and be left exposed to the action of the weather, it will rest and finally remain at a regular angle or inclination, varying from twenty-one degrees to fifty-five degrees with the horizon, according to the nature of the soil. The natural slope of common earth is found to be about thirty-three degrees, forty-two minutes, and this is the inclination usually adopted by railroad engineers for their embankments.

If the banks of the open ditch are thus sloped they will have the least possible tendency to wash away or break down by frost. Again, where open ditches are adopted in mowing fields, they may, if not very deep, be sloped still lower than the natural slope and seeded down at the bottom, so that no land will be lost and so that teams may pass across them.

The objections to open drains, as compared with under-drains, may be briefly stated thus:

1. They are expensive. The excavation of a sloping drain is much greater than that of an upright drain. An open drain must have a width of one or two feet at the bottom, to receive the earth that always must, to some extent, wash into it. An open drain requires to be cleaned out once a year to keep it in good order. There is a large quantity of earth from an open drain to be disposed of, either by spreading or hauling away. Thus, a drain of this kind is costly at the outset and requires constant labor and care to preserve it in working condition.

2. They are not permanent. A properly laid under-drain will last half a century or more, but an open drain, especially if deep, has a constant tendency to fill up. Besides the action of frost and vegetation has a continual operation to obstruct open ditches. Rushes and water-grass spring up luxurantly in the wet and slimy bottom, and often in a single season retard the flow of water, so that it will stand many inches deep, where the fall is slight. The slightest accident, as the treading of cattle, the track of a loaded wagon, the burrowing of animals, dams up the water and lessens the effect of the drain.

Hence, we often see meadows which have been drained in this way, going back in a few years into wild grass and rushes.

3. They obstruct good farming. We will suggest in another issue in detail, the hindrances open ditches present to the convenient cultivation of the land, and especially how they obstruct the farmer in his plowing, his mowing, his raking, and the general laying out of his land for convenient cultivation.

4. They occupy too much land. If a ditch have an upright bank it is so soft that horses will not step within several

feet of it in plowing, and thus a strip is lost for culture or must be broken up by hand. If, indeed we can get the plow near it, there being no land to rest against, the last furrow cannot be turned from the ditch, and if it be turned into, it must be thrown out by the hand. If the banks be sloped to the bottom, and the land be thus laid into beds or ridges, the appearance of the field may indeed be improved, but there is still a loss of soil, for the soil is all removed from the furrow, which will always produce rushes and water-grass, and carried to the ridge where it doubles the depth of the natural soil. Thus, instead of a field of uniform condition as to moisture and temperature and fertility, we have strips of wet, cold and poor soil, alternating with dry, warm and rich soil, establishing a sort of grid iron system, neither beautiful, convenient or profitable.

In addition to the above reasons for preferring covered drains it has been asserted by one of the most skillful drainers of the world, that proper covered drains of the same depth as an open ditch, will drain a greater breadth of land than the ditch can effect. The sides of the ditch become dry and plastered and covered with vegetation; and even while they are free from vegetation their absorptive power is inferior to the covered drain.

Hints for the Roadmaster.

The perpetual advantage of an easy grade should be secured at the beginning. Straight lines at a best and on like grades are cheapest; it is economy, however, to secure easy grades at the expense of straight lines where such grade is otherwise unobtainable, because the perpetual advantage to all users of the road more than offsets the disadvantage to the land owner from ill-shaped fields.

Capacious middle blind drains in all roads will dry the soil in summer and minimize the damage by frost in winter.

Side drains should never be omitted.

If natural soil of road be arched at centre, its drainage will be easier.

All stone liable to disintegrate the road surface should be rejected.

Comparatively large cost is unavoidable. Cheaply made roads will prove the most expensive.

Good Road Gospel.

Good roads cannot be made without considerable expenditure. There ought to be no shirking that fact. Improved streets in a city cost the owners of the abutting property a good deal of money, but it is recognized as a good investment, the increased value of the property because of the convenience very quickly making up for the cost. The people in a section where the roads are now bad cannot have roads that are really good without paying for them, and the expense will seem heavy to farmers.—*Cleveland Plain Dealer*.