Drainage.

Drainage of Swamps.

In almost, if not every, township, extensive tracts of swamp lands are found, not only unfit, in their natural condition, for cultivation, but, in many instances, by reason of obnoxious effluvia, arising from stagnant water, dangerous to health.

In their natural state these swamps are usually covered with a heavy growth of timber; but the greater portion of them have been partially cleared, and many of them are mowed, producing a coarse, wild, and nearly worthless grass.

The soil of these tracts is usually a black mud or peat, partly the product of vegetable growth and decay on the spot, and partly the deposit of the lighter portion of the upland soil, brought down by the washing of showers and by spring freshets. The leaves of the surrounding forest, too, are naturally dropped by the autumn winds into the lowest places, and these swamps have received them for ages. Usually, these lands lie in basins among the hills, sometimes along the banks of streams and rivers, always at the lowest level of the country. Their surface is usually level and even, as compared with other surrounding lands. Their soil, or deposit, is of various depth, from one foot to twenty, and is often almost afloat with water, so as to shake under the feet in walking over it.

The subsoil corresponds in general with that of the surrounding country, but is oftener of sand than clay, and not unfrequently, of various thin strata, indicating an alluvial formation. Notoriously, such lands are unhealthful, producing fevers and agues in their neighborhood, often traceable to tracts no larger than a very few acres. In considering how to drain such tracts, the first inquiry is as to the source of the water. What makes the land too wet? Is it the direct fall of rain upon it; the influx of water by visible streams, which have no sufficient outlet; the down-flow of rain and snow water from the neighboring hills, or the bursting up of springs from below?

Examine and decide which and how many of these four sources of moisture contribute to flood the tract in question. We assume that the swamp is in a basin, or, at least, is the lowest land of the neighborhood. The three or four feet of rain water annually falling upon it, unless it have an outlet, must make it a swamp, for there can usually be no natural drainage downward, because the swamp itself is the lowest spot, and no adjacent land can draw off water from its bottom. Of course, there is lower land towards the natural outlet, but usually this is narrow and quite insufficient to allow of drainage by lateral percolation. Then, always, more or less water must run upon the surface, or just below it, from the hills, and usually a stream is found in the swamp, if none pours into it from above.

The first step is a survey, to ascertain the fall over the whole, and the next, to provide a deep and sufficient outlet. Here we must bear in mind a peculiarity of such lands. All land subsides, more or less, by drainage, but the soils of which we are speaking far more than any other. Marsh and swamp lands often subside, or settle, one or two feet, or even more. Their soil, of fibrous roots, decayed leaves, and the like, almost floats, or, at least, expands like a sponge, and when it is compacted, by removing the water, it occupies far less space than before. This fact must be borne in mind in all the process. The outlet must be made low enough, and the drains must be made deep enough, to draw the water after the subsidence of the soil to its lowest point.

If a natural stream flow through, or from the tract, it will usually indicate the lowest level, and the straightening and clearing out of this natural drain may usually be the first operation, after opening a proper outlet. Then a catch water open drain, just at the junction of the high and low land, entirely around the swamp, will be necessary to intercept the water flowing into the swamp. This water will usually be found to flow in both on the surface and beneath it, and in greater or less quantities, according to the formation of the adjacent land. This catch-water is essential to success. The wettest spot in a swamp is frequently just at its edge, because there the surface-water is received and because there, too, the water that has come down on an impervious subsoil stratum finds vent. It is in vain to attempt to lay dry a swamp by drains, however deep, through its centre. The water has done its mischief before it reaches the centre. It should be intercepted before it has entered the tract to be reclaimed.

This drain must be deep, and therefore must be wide and sloping, so that it may be kept open, and it should be curved round, following the line of the upland to the outlet. Often it has been found that a single drain, six or eight feet deep, has completely drained a tract of twenty or thirty acres by cutting off all the sources of the supply of water except that from the clouds. This kind of land is very porous and permeable and readily parts with its water and is easily drained, so that the frequent drains necessary on uplands are quite often unnecessary. Many instances are given of the effect of single deep drains through such tracts in lowering the water in wells, or entirely drying them, at considerable distances from the field of operation.

When the surface-water and shallow springs have thus been cut off, the drainer will soon be able to determine whether he has effected a cure of his dropsical patient. Often it will be found that deep-seated springs burst up in the middle of these low tracts, furnishing good and pure water for use. These, being supplied by high and distant fountains, run under our deepest drains and find vent through some fracture of the subsoil. They diffuse their ice-cold water through the soil and prevent the growth of all valuable vegetation. To these we must apply Elkington's system, and run a deep drain from some side or central drain, drawing off the water low enough beneath the surface to prevent injury. A small covered drain with three-inch pipes will usually be sufficient to afford an outlet to any such spring.

Rules for Drainage and Sewers.

1. Natural streams should not be arched over to form main sewers.

2. Valley lines and natural streams may be improved so as to remove more readily surface water and extreme falls of rain.

3. Main sewers need not be of capacity to contain flood water of the area drained; such flood water may be passed over the surface, in most cases, without causing injury.

4. Main sewers should be laid out in straight lines and true gradients from point to point with manholes, flushings and ventilating arrangements at each principal change of gradient and line. All manholes should be brought up to the surface of the road or street to allow of inspection and should be finished with a cover easily removable.

5. Duplicate systems of sewers are not required. Drains of natural streams in valley lines for storm waters may be retained and may be improved, or, if necessary, enlarged.

6. Earthenware pipes make good sewers and drains up to their capacity. Pipes must be truly laid and securely jointed. In ordinary ground they may be jointed with clay. In sandy ground special means must be used to prevent sand washing in at the joints.

7. Brick sewers ought to be formed with bricks moulded to the radii.

8. Brick sewers should, in all cases, be set in hydraulic mortar or in cement. In no case should any sewer be formed with bricks set dry to be subsequently grouted.

9. Main sewers may have flood water overflows wherever practicable to prevent such sewers being choked during thunderstorms or heavy rains.

10. Sewers should not join at right angles. Tributary sewers should deliver sewerage in the direction of the main flow.

11. Sewers and drains, junctions and curves, should have extra fall to compensate for friction.

12. Sewers of unequal sectional diameters should not join with level inverts, but the lesser, or tributary sewer, should have a fall into the main at least equal to the difference in the sectional diameter.

13. Earthenware pipes of equal diameters should not be laid as branches or