ing at figure 3, in which *a b* is the plane of the surface soil, and *c d e f*, substrata concealed from view by the surface, it is evident that drains across the surface *a b* might very easily miss cutting any one or more of the substrata, which, as springs almost always break out at the point of intersection, would be an awkward affair. So that, although oblique drains *might* cut through a vein of sand or gravel, and thereby carry off the water it contains, the drains along the greatest fall *must* cut it; and they are so preferable, as has been shown, in other respects, that they should always be adopted.

Main drains should of course occupy the lowest place in

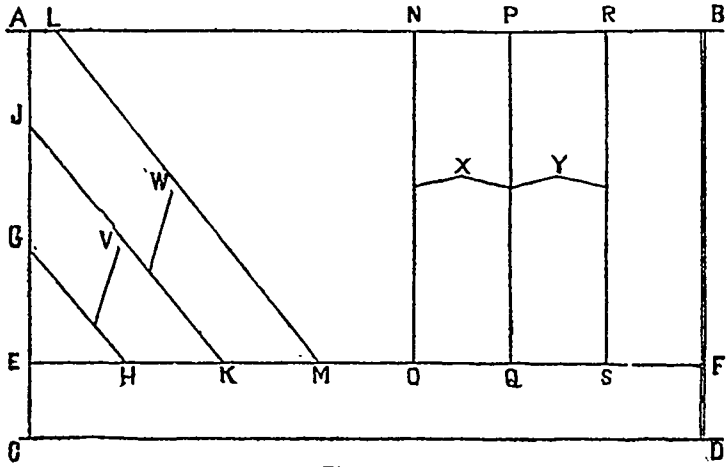

Fig. 1.

the field, or part of the field, to be drained, and where this is attended to as it ought to be, many a dollar may be saved For example, many of our Kentish farms lie along a valley formed by a tiny brook, which acts as the receiver of the ditches which, in their turn, carry off the water which issues from the drains. The fields all run *N* and *S* from the brook. The bottom of the fields is fine loam on gravel extending half way up the slope; the top a stiff (oh! very stiff) clay, full of springs and of a conglomerate of lime and shells. A grand

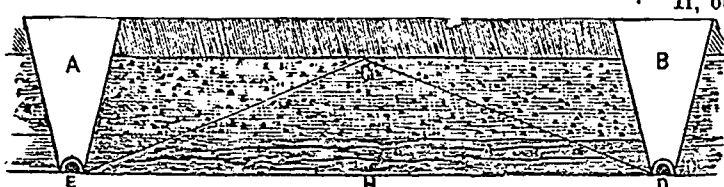

Fig. 2.

opportunity of wasting money in draining the whole piece! Whereas, in each field one main drain running into the open side ditches about the middle of the field, and receiving short side drains 45 feet apart, and from 4 to 5 feet deep, cured the whole of the farms at a very moderate outlay. Such a state of land may be seen any day for many a mile along the road from Lennoxville to Coaticook. Springs, finding a weak spot between the strata of rock, burst out, and spewing all over the lower ground, spoil every year twice as much at least as it would cost to drain it.

It may be as well to say here, once for all, that whether we are draining a town or a field, the small drains should always run into the main at right angles, with a curve for the last few feet, to allow its water to run with instead of against the current of the water it meets with in the main.

Whether the main should be lower than the small drains is a doubtful point. I prefer that they should be level, as the wash of a rush of water in sudden storms is a dangerous thing, if there is any fall at the junction. At all events, great care should be taken, whatever materials are used, to make the junction as secure as possible. When the main is being cut, the distance between the side drains having been determined upon, each side drain should be opened for a couple of yards as the main goes on: thus the main can be finished, materials placed, and the earth returned, from end to end without stopping. On springy ground, this will be found very important.

Where land is subject to more or less permanent bursts of water from springs, I advise all drainers to strike the outburst straight in the face. Cunning men, in backward districts in England, try to dodge, or circumvent, the "weeping spots", as they call them, and invariably cost their employer about four times as much as their work is worth. I knew three or four of these worthies. They always worked alone, whereas there never should be less than 3 men at a drain, and 4 are better still. All the drains I have seen made in this country are too wide atop. The great saving of expense lies in keeping down the quantity of earth moved, and if you start with two feet instead of 14 inches, it will amount to a great many pounds weight of unnecessary earth to be moved in a thousand rod of drains Fourteen inches are plenty for the top spit, diminishing gradually till, with pipes, the conduit just fits the drain. And this bring us to another important point: the tools to be used in draining, and the materials that are to serve as the conduits, or ducts, for the water.

Now it will depend upon the latter, the ducts, what *tools we want, especially for the bottom spit and the* last crumbs or mud. At all events we shall need a line of some sort to mark out the lengths of drain; a spade of ordinary dimensions for the two or three first draws; a pick to dislodge stones, or to get through any *hard pan* we may meet with; a shovel to throw out the crumbs with, and a draw-scoop to finish off the bottom with.

If we are to use pipes, we shall need a narrow semi-cylindrical tool, sold at any of the seed warehouses, made on purpose to cut out a narrow bed closely fitting the pipe.

If, on the other hand, we use stones or bushes, the last spit must be removed by means of a very narrow spade of the ordinary shape. The pick had better be of the *tramp* sort, as in that case the men can all work with their faces towards the opened part of the drain, except the shoveller.

The draw scoop must be semi-cylindrical for pipes; but flat-backed and 4 inches broad, if for other materials. In laying the pipes, the workman stands across the drain, and begins to lay from the mouth of the drain backwards, laying each pipe in its seat by means of a pole at the end of which is a short rod of iron at right angles on which the pipe is threaded, dropped carefully down, and adjusted to its place by the rod.

But this by the way, for fear I should forget it. I need hardly say that the tools should be kept sharp, and where *there is a tenacious clay to be cut, the workman will be all* the better for a bucket of water handy, to dip his spade into. Having drawn out our line of drain with accuracy, the question arises. shall we use a plough for the first 10 inches or not? It depends. If the subsoil is hard and not given to fall (cave) in, a plough may be used to advantage; but if the ground is wet and crumbly, rough and *tussocky*, and the drains are to be of decent depth, considering the risk of straining the horses, and of causing extra work in throwing out fallen-in sides of the drain caused by the tramping of the horses, I prefer taking the whole out by manual labour.