apart, may run straight down, and nearly parallel. (1) They should never run obliquely down. Fig. 1 shows how ditches from the high side of the field at *B*, directly down to *C*, drain the land on both sides (the double lines representing the ditches), the water soaking obliquely from the dotted line on each side in the direction of *a* to *b*, or of *d* to *e*, into the drains. Fig. 2 represents oblique drains, taking the water
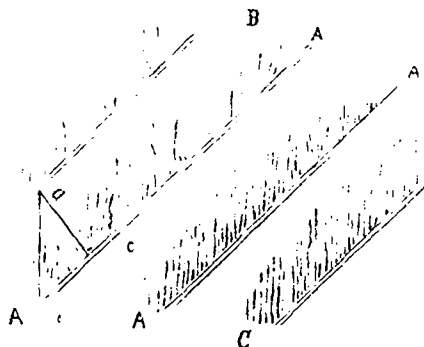

Fig. 2.

only on the upper side, or from *B* to *C*, conveying it more slowly and often leaking out sidewise from the bottoms, as shown in fig. 3.

Fig. 3.

3. On uneven land, or with knolls and hollows, as shown in fig. 4, place the drains in the hollows, so as to run in the direction shown by the arrow. If the side hills need more draining, branches may be cut running into these bottom or main drains, fig. 5.

4. The size of the pipe-tile to lay in the ditches must vary with the slope of the land and the amount of surface to be drained ; and they must be larger, if they are to carry off the water of springs than mere rainfall or melting snow. A few examples will assist the farmer in judging approximately
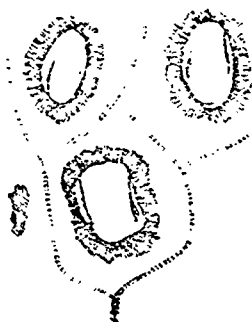

Fig 4.

how large the tile should be. A pipe tile of two inches bore will carry off the surplus water in an acre of soil, in from twenty-four to forty-eight hours, with a descent of one foot

in twenty ; the acre being equal to a strip of land two rods wide and eighty rods long, with the ditch in the centre. With a descent of one foot in a hundred, it will require rather more than twice as much time. As a general rule, water will
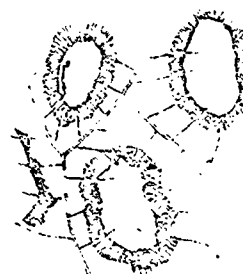

Fig. 5.

run off in pipe-tile over three times as fast with a descent of one foot in ten as one foot in a hundred. A four-inch pipe will convey water six times as fast as a two-inch pipe. These facts will assist in deciding how large the tile should be for drains of different lengths, or for main drains which receive several smaller ones. (1)

5. Ditches should never be less than two and a half feet deep in the hardest ground, and three feet is better. (2) They will vary somewhat with unevenness of surface.

6. There must be a constant descent of the bottom, which may be graded by the use of the simple instrument shown in fig. 6, the two legs of which are set in the bottom of the ditch
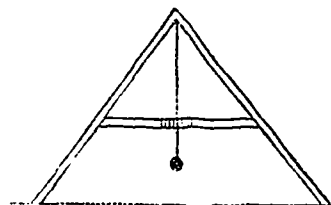

Fig. 6.

and if the plumb always hangs nearest to the lower side, the ditch has a constant descent.

There are several other general rules and directions which should be observed for draining land, namely :

1. To ascertain where draining is needed, dig holes here and there, three feet deep, and if water remains some days in them during a wet time, the land needs draining, no matter how dry the surface appears to be.

2. A good outlet must be always provided, and this should be protected from the entrance of mice with an iron grate, or with a mass of fine or broken stone which they cannot pass.

3. Branches should enter mains, and drains enter streams in nearly the direction of the current, to prevent obstruction, and short curves should be avoided.

4. Drains near trees of hedge-rows should have the entrance of future roots prevented by close fitting caps or collars at the joints. (3)

(1) Quite parallel, unless impossible   A R. J. F.

(1) Inch and a quarter pipes are quite large enough All our pipes here weigh twice as much as necessary   A. R J F

(2) At 2 rods apart, 30 inch drains would do but little good Four feet, at that distance, is not too much.   A R. J F.

(3) Useless expenditure, for the roots will get in if a hole as fine as a pinhole is left   A R. J. F.