

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 out 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.

Whatever material we are to use, we may start by taking three draws of the common spade, each draw to be carefully shovelled out by the second man working with his face to the digger, who works backwards. This will give us about 3 x 9

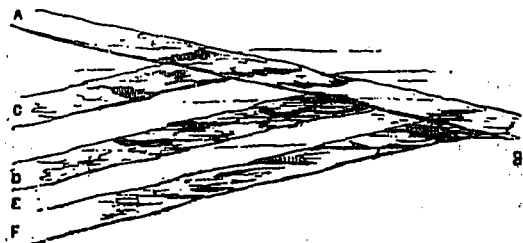


Fig. 3

27 inches in depth, and, at our proposed depth of 33 inches, as the shallowest admissible, it is time to think of the bottoming.

Suppose we are going to use bushes. The brush should have been prepared in winter, or at any rate when the leaf is off, and should consist of fresh, limber twigs about 3 feet long, as full of life as possible, and with nothing thicker than half an inch in diameter amongst them. If any of the boughs seem inclined to lie awkwardly, a slight tap with a sharp axe will correct the fault.

The drainer, still working backwards, should remove the remaining 6 inches with the narrowest

spade, leaving the bottom 4 inches wide, and neatly finished, taking out the crumbs with the flat draw scoop. You may observe that there will in this case be a trough left at the bottom of the drain 6 inches deep, by 4 in width. This is the real conduit, the bushes are only meant to keep it open. In a few years they will perish, but the arch of the drain will remain for several years more if treated as I shall advise in the sequel.

The drain being now ready to receive its filling, let the workman take a sufficient quantity of the bushes in his hands, straightening them as much as possible, and lay them carefully at the bottom of the drain, trampling them firmly down. Then another man, a boy will do, should hand the drainer a fresh bundle to be laid further on, but with the top ends resting on the bottom end of the first bundle, and so on up the drain as far as it has been bottomed out. Care should be taken not to brush in earth from the sides.

Now the filling-in may begin. Remembering that the water is to enter the drain from the bottom, our main object should be to prevent any rush of water downwards into the top of the drain, bringing earth and sand with it, and thereby choking the duct: we take the stiffest, soapiest clay we can find, place it carefully on the bushes, and trample it down firmly. The firmest part of the original earth taken out of the drain is then returned on to the clay, and the rest thrown in anyhow.

If in bush drains the junctions with the main drain were made with pipes, it would be all the better, and the discharge of the main into the open ditch should be invariably piped for four or five yards upwards: wooden pipes, square or round, will do. The fall towards the mouth of the main where it joins the ditch should be as rapid as possible, to avoid a sudden stoppage from frost.

It may be necessary, in very level land, to use mechanical means to determine the fall of the ground. An ordinary *spirit-level*, mounted on a pole with a spike at the end, is quite sufficient for the purpose, and is used in this way.

Set the level in the middle of the ground to be drained, and placing the eye-sights in the proper direction, turn the screw until the air-bubble rests in the middle of the glass tube. An assistant should hold up a rod at the end of the ground in that direction, and mark a point indicated by the