would be 10 ft. 9 inches, and so on with all other stakes.

To find the fall from any one stake to any other, we have only to subtract the elevations as given in the last column. For instance, the rise from stake O to stage 800 is 14 ft. minus 10 ft., equallying 4 feet, the same as we obtained by subtracting the total falls from the total rises. This last column, while not absolutely essential, is the most convenient method of comparing any one station with any other. If starting our survey at the source instead of at the outlet we would choose for the elevation of the starting point some height greater that the total fall to the outlet.

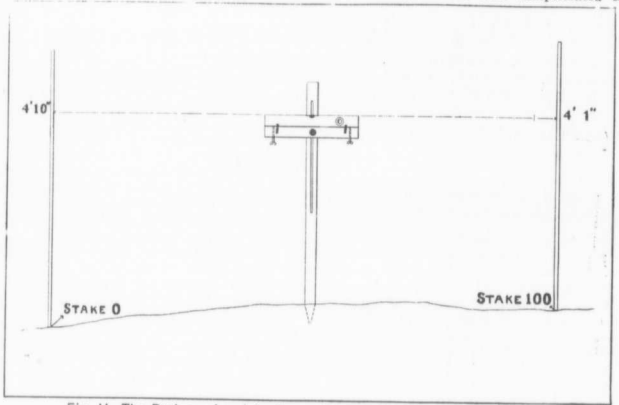


Fig. II—The Drainage Level in Use as Described in Accompanying Article

SOME OF THE DIFFICULTIES.

But to return to our instrument. It is simple and the method of using it is simple, yet we find that many have difficulty in using it because: (1) They are not trained in sighting, and it is difficult to sight accurately along a straight edge; (2) On a warm day the sun beating down on the spirit level heats it, and it in turn heats the air, which is thus made less dense, "thinner" we would say, using a colloquial term, than the air beyond the ends of the level, so that the rays of light coming from the target to the eye are bent—refracted, to use the technical term—in passing from the dense air at the end of the "thin" air over the level, and consequently we see the target higher up than it really is and thus get a false reading.

We are all familiar with refraction, even the youngest schoolboy has put a stick in a pail of water, or maybe a pond, and wondered why the stick was "bent". The rays of light coming from the submerged part of the stick are refracted or bent in passing from the dense water to the dense air, making the stick appear too high in the water. Similarly the light from the target in passing from the dense to the less dense air is refracted, giving a false reading. The trouble may be overcome in a measure by sighting along the corner of the level instead of over the top, but even then it is very difficult to eliminate the error entirely, and very hard on the eyes, both of which those who have tried to sight over a spirit level on a hot day know full well.

Fig. III—A Pair of Peep-sights

HOW DIFFICULTIES ARE OVERCOME.

Since the home-made drainage level was first described we have been striving to devise a simple set of sights that would overcome the difficulty and we have now succeeded. Fig. III shows a pair of them. The chief point to note is that each has a peep-hole and a cross-wire. When in use they are clamped on a spirit level, so that the peephole of one is opposite the cross-wire of the other. With these the line of sight is raised sufficiently above the level to avoid the error of refraction, and the most inexperienced can sight accurately with them, as looking through the peep-hole it is very easy to tell when the target is in line with the wire.

At this point it might be well to remark that a dark lead pencil or anything dark makes a poor target for use either with or without the sights. Something pure white is much better, and for a simple reason, both the level and the wire are dark in color and the white target gives more contrast and is therefore more easily seen, more accurate and easier on the eyes as well. A little strip of wood painted white, and which may be carried in the vest pocket, makes a splendid target. We make ours about six inches long and one-half inch wide for half its length and an inch wide for the remainder. The narrow end is used when sighting short distances, up to 50 feet, and the wide end for longer distances. We also cut a slot up the centre of the target for use with the sights, and note the reading through this slot.

With the sights, distances of 150 feet on either side of the level can be read accurately and if a wider target were used greater distances, still might be read, but here comes in another difficulty. One cannot be certain when the spirit level is absolutely level, for it has no graduations on the glass by which one can tell when the bubble is exactly centred. By frequently testing spirit levels with a surveyor's instrument over various distances we know they cannot be relied on for more than 50 feet each way, and consequently we advise against using the home-made level over greater distances than 50 feet.

The body of the sight is made out of one piece of sheet brass bent into the shape shown in Figure III. It is punched and drilled as required, the wire soldered in, and a nut soldered on one end for the set screw. At first we hoped they were so simple that farmers might have their tinsmiths make them up. Every set we made was correct on first trial but, after testing with our surveyor's level several sets made by tinsmiths, we found that it was a pretty difficult thing for them, not understanding the value of absolute accuracy, to get the two peep-holes and the two-cross wires all exactly the same height, and that a small variation made a considerable error in the readings, and that therefore it was necessary to have a set tested, and corrected if in error, before they could be relied on. Convinced, however, that the sights would be of great practical value to those wishing to do drainage work, I submitted the idea to a firm which has facilities for making the sights accurately and testing them, and they consented to make a small trial lot and, if the demand is sufficient, to make more and keep them in stock for sale.

As these sights must often be carried about in the pocket when not in use, and as the cross-wires are very fine and therefore frail, it was necessary to devise some simple means by which the latter might be protected. When not in use the two sights are clamped face to face by a small brass keeper. In this position the wires are absolutely protected and the sights may be conveniently carried in the pocket.

By actual test with a surveyor's level we know that this simple outfit, consisting of the cross, the spirit level and the sights, is accurate enough for practical purposes and that with it a man can readily decide whether he has fall enough for underdrainage. Moreover, he can determine the grade per 100 feet, and he can also use the same instrument in digging his drain true to grade.

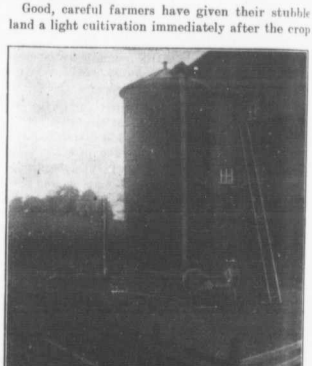
Fall Cultivation

A. C. Hallman, Waterloo Co., Ont.

There is a wide difference of opinion to what constitutes the best method of fall cultivation. No hard and fast rule can be laid down. Local conditions and previous cultivation have a great deal to do with it. We must, however, adhere to the old rule, "Whatever is worth doing, is worth doing well." In the hustle and bustle of a busy fall, especially in a late season, very often things are apt to be done in a slip-shod manner on the cut and cover plan, taking little time to do things well, our effort being only to cover as many acres in a day as possible. We find no fault in how many acres are laid over in a day so long as it is done well.

Good, careful farmers have given their stubble land a light cultivation immediately after the crop was removed, either with a disc harrow, gang plow or cultivator, to germinate weed seeds and retain moisture in the soil. In a dry season, probably the first mentioned is the best implement to do this work.

Good plowing, is the first step to good farming.



Filling Silo on Farm of W. E. Vail, Cowansville, Que.

Silo filling is almost completed in some sections of Ontario and Quebec, and is well under way in all other districts. The silo here shown is 30 x 14 feet. The engine used is seven horse power, portable. Mr. Vail may be seen standing at the cutter.