

but in surveying the latter we cannot use the sea as a datum, for we do not know how much stake 0 is above the sea, hence we must choose an arbitrary datum.

In the example given we have chosen it ten feet below the ground surface at stake 0. Then the elevation of the surface above this datum plane at stake 0 is 10 feet. Since there is a rise of 9 inches to stake 100, its elevation will be 10 feet 9 inches, and so on with all other stakes. To find the rise 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 0 to stake 800 is 14 feet, minus 10 feet, equalling 4 feet, the same as we obtained by subtracting the total falls from the total rises. Thus the last column, while not absolutely essential, is the most convenient means 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 than the total fall to the outlet.

#### DIFFICULTIES IN USING HOME-MADE DRAINAGE LEVEL.

The home-made drainage level is simple and the method of using it is simple, yet we find that many have trouble with it because: (1) They are not trained in sighting, and it is difficult for some to sight accurately along a straight-edge; (2) On a warm day there is a sort of blur when one sights over a spirit level. The sun beating down on the level heats it, and it in turn then 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, and for a short distance above the level the layers (?) of air vary in density with the height, 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 to the "thin" air of varying density over the level, and consequently we think the target higher up than it really is, and thus get a false reading. We are all familiar with refraction; even the youngest school-boy 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 less dense air, making the stick appear too high in the water. Mirages, so common in the West, are due to refraction—the light passing through air of varying density makes distant objects appear suspended in the sky. Similarly the light from the target in passing from the dense air to that less dense and less uniform in density 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.