

outlet is provided by an under drain. The water is heavy and limpid; its natural course is downward; it enters the drain tile through the openings between the different lengths of tile (the "joints") and runs along down the grade inside the pipe till it reaches the outlet.

Each little channel between the particles of earth acts as a feeder to the drain and each drain will clear the earth of drainage water down to about the level of the tile. The water cannot leak out through the open joints of the tile because the earth below and at the sides of the tile is already completely filled with water and cannot contain more, and as long as the channel of the drain is not entirely filled with water, the soil will continue to empty its drainage water into the tile. Figures 10 and 14 show the way in which an earth road is drained by one or more lines of tile.

LEVELLING.

The use of a simple drainage level is easily learned, and the roadmaker who can employ a level in his work is certain to have the best results.

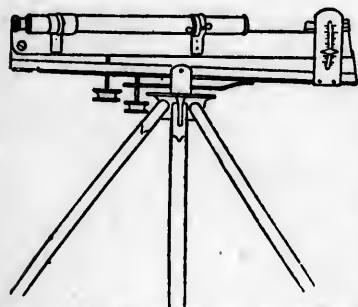


FIGURE 15.—HARRIS'S GRADE LEVEL.

It will aid him in fixing and staking out grades for the roadway, for surface ditches and for underdrains, rapidly and accurately, and besides insuring a better and more permanent job, it will be a source of satisfaction to him in every branch of his work. The cheaper forms of levels sold by dealers in surveyors' instruments will generally answer every purpose. There is now in the market a special "drainage level" which, by an ingenious mechanical device, is made to indicate grade at each point of the ditch or roadway without requiring the roadmaker to "figure it out." The appearance of the grade level is shown in Figure 15. The price ranges from twelve dollars upward. Full directions for using the level is contained in a handbook supplied by the maker, and it is scarcely worth while to include them here.

THE DRAIN DITCH.

Before beginning to dig, lay out both sides of the ditch by two lines of stakes set 25 feet apart lengthwise with the ditch. Do this carefully. For a depth of four feet, in stiff clay soils, a width of 16 to 20 inches at the top of the ditch will be about right if narrow drain tools are used. If any part of the ditch is deeper than four feet, widen the top in proportion to the increase of depth. Use sharp narrow spades for digging and cutting the sides of the ditch, and if you have much underdraining to do get a set of draining tools, or at least a ditching spade, a tile spade, and a "draining scoop" or finishing scoop to use in