

possible should be rendered the leveller and his rodman. Plus stations marked on poles, fences, stakes, culverts and bridges will all aid in making measurements. If the road does not vary much in elevation from one side to the other and if the ground on the sides is about the same, it is evident that quicker progress can be made by only taking side levels every 200 instead of 100 ft. Other opportunities of saving time will present themselves to the leveller. The successful levelman is he who is so watchful that he does not waste time by taking useless notes and at the same time makes his notes so complete that a profile can be made of the transit line, of the centre line and of each side of the wagon road; and any cross-section that will show decided cutting and filling in widening the road.

work, both in recording the notes and in plotting them. This is to place all the rod readings in one column and the elevations in another, and on the opposite page show by notations the places where these levels were taken. This is shown by a sample page, Fig. 1.

The second method is similar to keeping cross-section notes. The rod reading for the transit line and its corresponding elevation is recorded, as usual, in the columns on the left-hand page and the rest of the readings on the right-hand page, as shown in Fig. 2. It is possible to set down the elevation directly instead of the rod readings, by doing some extra work in the field. Thus, above the break shown on the page, the top figures are rod readings and the bottom figures distances out from the transit line. The letter "C" denotes the centre

Sta.	B.S.	H. of I.	F.S.	Rod.	Elev.		
B.M.					62.314	On Root of Spruce Tree 50' left of Sta. 0	
	5.142	67.456					
0				6.2	61.3	Transit Line	
0				6.2	61.3	2' right C. Road	
0				6.4	61.1	8' right Side Road	
0				4.1	63.4	12' " Bank	
0				6.5	61.0	8' left side Road	
1				5.8	61.7	Transit Line	
1				5.7	61.8	3' right C. Road	
1				5.5	62.0	9' right Side Road	
1				5.3	62.2	11' right Bank	
1				5.4	62.1	7' left	
1+50				4.8	62.7	Transit Line	
1+50				4.8	62.7	C. Road 3' right	
2				3.2	64.3	Transit Line	
2				3.1	64.4	4' Right C. Road	
2				3.0	64.5	10' right Side Road	
2				2.9	64.6	6' left side Road	
3				1.2	66.3	Transit Line	
3				1.2	66.3	5' right C. Road	
J.P.			0.912		66.544	on rock near Sta. 3	
	10.865	77.409					
4				9.8	68.6	Transit Line	
4				9.7	68.7	6' right C. Road	
4				9.6	68.8	12' " side Road	
4				9.5	68.9	4' left " "	

Fig. 1.—Ordinary Level Book, With Notes.

At cross roads levels should be run down the centre of the roads for such distances as to show the grade of these roads and how they may be affected by changes to be made. This may mean 100 ft. or more. On private roads and entrances to farm houses, levels should be taken for at least 100 ft. or to the houses. At culverts and bridges, in addition to levels taken in the road, the elevation of the banks of the stream, the surface and bottom of the water should be ascertained, and any other elevations that may affect the building of a new bridge or culvert.

**The Levellers' Note Book.**—The keeping of level notes is not a difficult problem, but unfortunately the manufacturers of note books have not kept abreast of the times, there being no special book for highway surveys. The one in common use is well adapted to railroads, but is poorly suited to highways as it causes much extra

of the wagon road. The figures written vertically are the elevations of the points alongside of them.

Below the break in the page (Fig. 2) the top figures are the elevations and the bottom figures, distances out. In this the rod reading is not recorded except for the reading on the transit line. Thus, at Station O (zero) the rod reading is 6.2 on the transit line, the instrument height being 67.5; the elevation as recorded is 61.3. Now, keeping the rod 6.2 on a piece of paper, as the mean rod for that cross-section, the reading at the centre of the road, being 6.2, gives an elevation of 61.3, which is set down on the right-hand page as 2 ft. on the right and at centre. The reading at the edge of the road, 8 ft. out, is 6.4, being 2 tenths lower than the transit, making an elevation of 61.1, which is so recorded. At 12 ft. out the rod reads on top of the side of the cut 4.1, making a difference of 2.1 with the mean rod, thus adding 2.1 to