

Mr. Low.

The writer has had considerable experience in the location of railroads, both by the "practiced eye" and by the more scientific methods of topographical maps. In the location of the Pittsburg Southern Railroad, now the Pittsburg-Wheeling Division of the Baltimore and Ohio Railroad, the former method was used. A preliminary line had been run, and it was the intention to plot this, and project a location in the ordinary way, as is now common. As the contract for the road had been let, and the contractors were waiting to start work, with not a location stake driven, heroic measures had to be adopted. The line crossed a number of summits, and, therefore, it was decided to plot only these parts, project enough location to cross them, and run in the remainder by the "practiced eye."

Much of the line was on a maximum grade, and on these portions grade stakes were set ahead, by means of the level and the chain, for suitable distances. This could be done readily, as the line generally passed over cleared and grazing lands. A location was then fitted to the stakes thus set, and it was surprising how, after a few days' practice, the required curvature could be guessed at.

In the valleys, this procedure was not needed, and the line was run as the judgment of the locating engineer indicated. This judgment was sometimes warped by trying to avoid artificial as well as natural objects, in fact, in one instance the location was influenced by avoiding some favorite apple trees, which, unfortunately, were in the way; the line being deflected to avoid them. At other times, growing fields of corn would limit an extended vision ahead, but, from a convenient tree, a sufficient altitude could generally be attained to make a survey of the conditions ahead.

Notwithstanding these limitations, good progress was made, and if the writer remembers aright, a stretch of 14 miles, through a very hilly country, was located in a few weeks, the party covering themselves with glory by having made the maximum number of miles per day, regardless of all other considerations.

It would be gross flattery to say that the best possible alignment was obtained by such methods, but still the road, when completed, was good enough to whisk trains over at 30 miles or more per hour.

One feature, not touched in the discussion, relates to location: not whether the best location on a certain grade or alignment has been obtained, but whether or not the railroad has been built in the best locality. The following is an example: The former Pittsburg and Connellsville Railroad (now the Pittsburg Division of the Baltimore and Ohio Railroad) was located and built by the writer's father, Sigismund Low, C. E., under the direction of the late Benjamin H. Latrobe. At Pittsburg, Pa., between the city

terminal proper and the suburb now known as Glenwood, there was a choice of location, along the foot hills bordering the Monongahela River, or along the river bank itself. The writer's father strongly advocated the river bank line, but his selection was over-ruled, and the line built at a higher elevation, back from the shore. Since then, part of the line has been changed to the first suggested location. At other points rival railroads which control these have been built. For another long distance, large manufacturing plants have sprung up, and these now prohibit the occupation of this land by a railroad.

Had the line been built originally along the river, inestimable advantages, in the control of the river front, would have accrued to the present company, and these cannot now be procured, except at the cost of millions of dollars. Of course, the immense developments which have taken place, since the original construction, could hardly have been foreseen, but, still, some of them might have been anticipated. It is likely, in this case, that the controlling factor in adopting this particular location was cheaper first cost.

For some years the writer was locating engineer on the Nescopeck Railroad, a branch line of the Pennsylvania Railroad in the anthracite coal regions. One of the features of this railroad was the location of a grade line, north of Rock Glen, Pa., down Black Creek to Nescopeck Creek. The original location was made on a 1% compensated grade. Subsequently, this was changed to 1.1, 1.2, 1.3, 1.4% grades, and, finally, to a 1.5% grade. Each line was a perfect one, as far as location went, but the steepest one was selected, because the construction was the cheapest.

The writer was also associated with the late A. M. Wellington, M. Am. Soc. C. E., as Locating Engineer on the Guanajuato Branch of the Mexican Central Railroad, of which his father was in charge. As Guanajuato is off the main line, it had to be reached by a branch, and several junction points were suggested, among others, the cities of Irapuato and Silao. The line to the former was the longer, but that to Silao crossed a range of hills. A tunnel line had been located, but was rejected for this reason, and a line over the hills was ordered. The most feasible one, up the thalweg of the valley, on the western slope, was first located, but had a 2½% maximum grade, but with very light work, a very direct alignment, and no curvature of any moment. This was considered too steep, and an easier grade line was ordered, against which the writer's father offered strenuous objections, as being impracticable. The writer was delegated to locate this line. The valley mentioned was bordered by very steep slopes, cut up considerably by gullies. The lighter grade, with a high compensation, soon brought the line along the steep slopes, and, to avoid heavy work, had to wind in and out