

The second topographer, supplied with a transit and assisted by the two tapemen, determined the drainage areas, located the property lines and section corners, got names of property owners, etc. This method was found much more economical than to have the whole transit party held up while the transitman and chainmen were getting this information.

With the information thus obtained by the two topographers, the profiles and map of the final location, which were finished within a few days of the completion of the survey, contained all the information necessary to proceed with the construction.

It should be noted here that there were exceptional circumstances in connection with this survey which made it desirable to employ two topographers. Ordinarily, one is sufficient, and a good man will easily take 80% of the topography. Generally, about moving day, the topographer is a day or two behind, in which case the whole party is broken up into topographical parties, and the work cleaned up to the end of the line in a part of a day. Also, when only one topographer is available, when the final location is run in, the Assistant Locating Engineer is occupied about two-thirds of the time in getting land lines, drainage areas, etc., and assisting with the office work, while the Locating Engineer looks after the actual running in of the line. This is ordinarily the most economical arrangement, but, in the survey referred to, it was necessary to rush the work, regardless of the slight extra expense of using men occasionally at a disadvantage.

In carrying out the third requirement, of keeping headquarters in touch with the work, a weekly report was made by the Locating Engineer; and the following maps, etc., were kept in shape and up to date:

On preliminary lines: General map, scale 5 000 ft. to 1 in., at the bottom of which was a condensed profile of the projected location, scales 1 000 and 100; detail map, scale, 400 ft. to 1 in.; profiles of preliminary lines and profile of projected location, Plate A paper, scales 400 and 20; profile of projected location on tracing profile paper.

On final location: Line inked in on 400-ft. map, and drainage areas shown; right-of-way map, scale 2 000 ft. to 1 in. (required only in Indian Territory); maps of station grounds, scale 100 ft. to 1 in.; final profile on Plate A paper; final profile on tracing profile paper, in 10-mile sections; ravine sections of all bridge sites.

*Office Work.*—The first duty of the field draftsman was the preparation of the general map on the 5 000-ft.-to-1-in. scale, from the best available sources, covering the whole of the country in which the proposed line might lie. In most of the country in the West, where topographical maps have not yet been prepared, the Government maps of the Public Lands Surveys, showing the section, township and county lines, town sites, and the location of the main drainage, will form the basis of this map.

This 5 000-ft. map and profile are absolutely essential to a broad comprehensive study of the line as a whole; it can be readily seen from this whether or not a good general direction is being maintained, and the general relation of the line to the surrounding country is shown. Such a map, with the omission of the preliminary lines, is of considerable aid to contractors in computing the haul of construction material and for other uses; it is also generally sufficient to accompany such reports as are made to the higher officials, in fact, it gives them a more comprehensive idea of the line than a more detailed map. Plate XII shows a portion of a 5 000-ft. map, but shows the located line only; the writer regrets that he has not available a map as described, showing also the preliminary lines and condensed profile.

A tracing was made of this map and, as soon as completed, sent to headquarters; from day to day, the preliminary lines run were platted on it, and, also, the projected location and profile, as they were made.

At the end of each week a tracing of the portion of the map showing the additions made to it during the previous week was sent to headquarters, where the information was transferred to the original tracing.

The weekly report which accompanied this map explained in quite full detail such points in connection with it and the work as seemed to require explanation. It explained, in particular, the natural features of the country, the availability or otherwise of timber (especially for ties), stone, sand, etc., the condition of roads, water supply, and, in general, the work of the party during the preceding week.

All the preliminary lines run during the day were platted on the 400-ft.-to-1-in. map in the evening, from the calculated courses and distances; no platting from deflection angles was allowed. The work of the draftsman was checked by the Assistant Locating Engineer.