

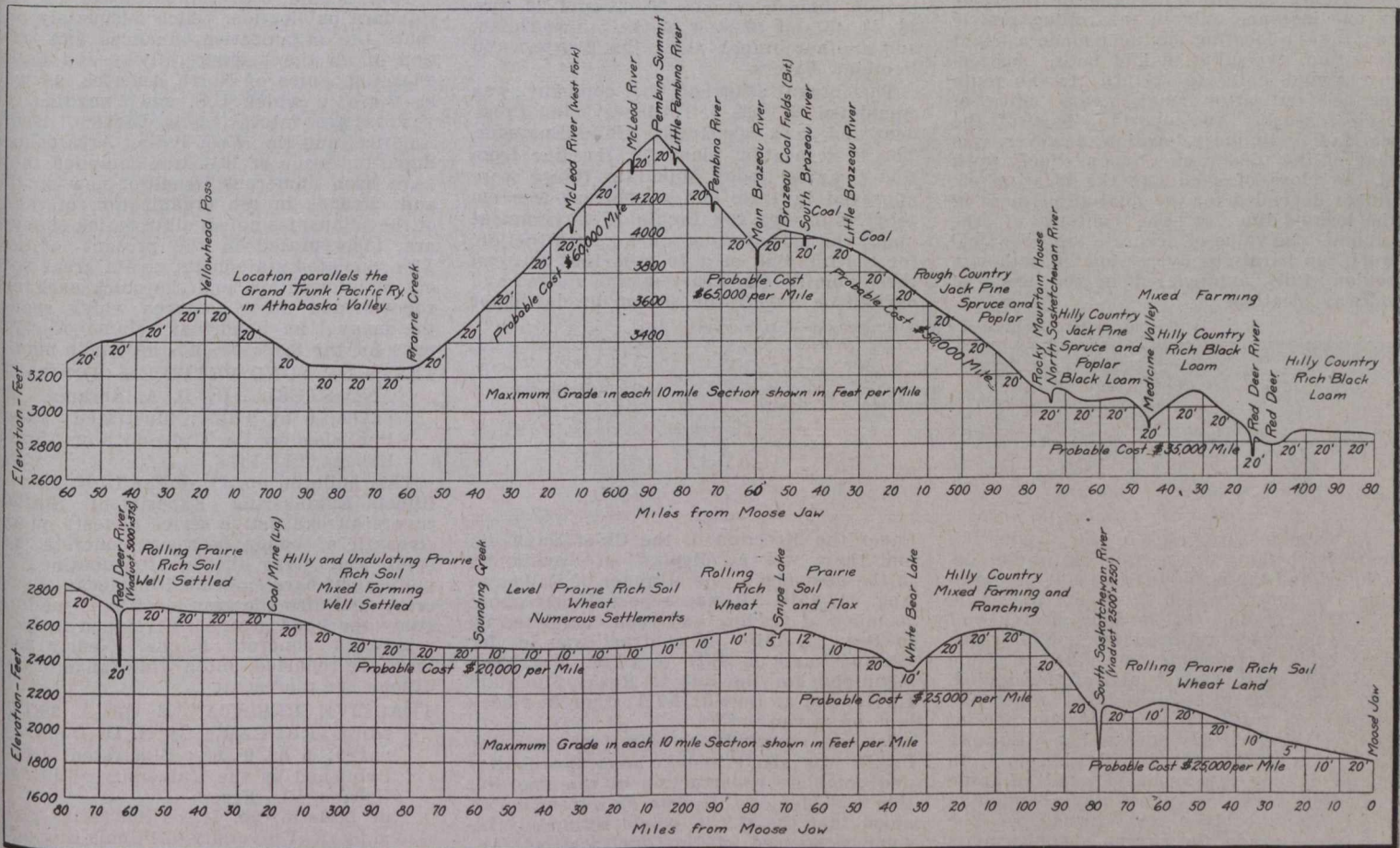
for a moderately cheap line, but from Red Deer to the mountains many long detours were necessary to attain this purpose. In the latter case it is evident that in endeavoring to obtain the shortest possible routes the topography will invariably develop long stretches of maximum grades. The question as to what extent distance should be sacrificed in order to avoid this so-called objectionable feature necessarily involves one or more of the intricate problems of railway location, and in order to provide for this during the work of reconnaissance sufficient margin was left for the locating engineer to work out the economic equations dependent thereon. The possibility of introducing velocity grades at favorable points during location was also considered. These were the governing features of the work of reconnaissance as carried out, but nevertheless the application of so extremely low a ruling grade was often found to be difficult and uneconomical.

two 3 in. field aneroids reading to 15,000 ft. After carefully considering the advantage of stationary readings and self recording aneroids for correcting the error due to atmospheric conditions the writer was induced to abandon these methods and adopt a method by which a vigilant observer can ascertain the correction for atmospheric changes to better advantage in the field. Two instruments were in use in the field, one for observing the altitudes and the other in reserve in case of emergency and for detecting errors of a physical character in the instruments in use.

One day's work will suffice to illustrate the method of recording the observations and corrections made for determining the altitude. A start is made at some point, the altitude of which, above sea level, is already known and carefully recorded by the aneroid a few hours before starting. Another observation is made by the same instrument at the same spot when starting, the

ined at the start, or wherever available during the progress of the work, was added or subtracted, as the case might be, and the result entered in the column for "Elevations above sea level." The condensed profiles which accompanied the reconnaissance reports were afterward prepared from the elevations above sea level. These profiles pieced together form the continuous profile accompanying this article and cover a distance of more than 700 miles.

The accuracy of the work was amply proved to be satisfactory for the purpose of a reconnaissance. The country from Red Deer eastward 200 miles was explored from Red Deer and checked on the return journey. The country from Moose Jaw westward 250 miles was covered by a single trip from the Moose Jaw end, making connection with the work from Red Deer eastward near Sounding Creek. On comparing the reading with sea level after a trip of 250 miles the error was found to be not more than 20 ft. Of



Reconnaissance profile, showing main characteristics and estimated unit costs for various sections, Alberta Central Railway.

The work in the field was facilitated by reference to the township maps and section corners. A straight line was drawn between objective points on the map and a zone of country 3 miles wide on each side of this line laid off to indicate the extreme limits of deviation. Next to grades in importance were to be considered the instructions relative to directness of route, but it was considered by the writer that a route which did not vary much more than 3 miles on each side of a "crow-fly" line would in a distance of 300 or 400 miles be considered fairly if not unusually direct, even on the prairies.

To those familiar with the use of the aneroid, with its contingent variations and vagaries, and the vigilance necessary to avoid errors in the field, the writer's experience may be of more than ordinary interest. The instruments used were one 4½ in. compensated surveying aneroid, reading to 8000 ft. for stationary reading, and

difference of the two readings giving any local variations. The practice was to take observations of local variations every few hours, usually at meal hours. If the weather appeared unsettled, a rest of half an hour between meal hours was often found to be time well spent on the journey. Observations were always made on retiring at night, on rising in the morning, on starting out for the day and on arriving at the next camping place in the evening.

Record of Observations.—The accompanying blank form will illustrate the system used for recording aneroid observations in the field book and afterward reducing them to sea level. By carefully studying the fluctuations of the barometer during the day the corrections for each observation were determined by interpolation and entered in the column for "Corrected barometric readings." The difference between the corrected reading and sea level, which was deter-

course this does not indicate that the error throughout the work was not at any time more than 20 ft. It would be more reasonable to suppose that in such a long distance, without a check, errors would compensate for errors, but at any rate the result is sufficient to show that accurate work can be done by the method explained. It may be added that the weather was extremely favorable for barometric observations.

The work of reconnaissance west of Red Deer was more tedious, particularly in the unsurveyed territory west of Rocky Mountain House. Several long journeys were made ahead of the preliminary survey party to define certain summits, but except for these occasional trips the reconnaissance engineer kept in touch daily with the preliminary survey party—which is, after all, the only satisfactory way of doing the work in rough country if preliminary surveys are already authorized.