The Columbia & Western Railway.

In our last issue we gave the report on the first section of this line, from West Robson to Greenwood, by H. B. Smith, C.E., who inspected it on behalf of the B. C. Government. Following are extracts from his report on the second section, from Grand Forks to Greenwood, up to Nov. 22, 1899, which has only just been made public :—

The Grand Forks-Greenwood division of the C. & W. Ry., is an indirect extension westward of the Rossland-Trail, Trail-West Robson, & West Robson-Grand Forks divisions of the same railway. Beginning at Grand Forks, 1,700 ft. above sea level, at the junction of the North Fork of Kettle River with Kettle River, & distant from West Robson 67 miles, it extends along the west slope of the valley of the North Fork of Kettle River, northerly to Niagara, a small town 2,230 ft. above sea level, & 72.7 miles from West Robson. From Niagara it continues directly north to Brown's Creek, a small tributary of the North Fork of Kettle River, 79 miles from West Robson. At Brown's Creek the railway deflects almost due west, & continues on that course to Eholt, a mining settlement on the summit between the North Fork of Kettle River & Boundary Creek. Eholt is distant from West Robson 80.8 miles, & is 3,080 ft. above sea level. At Eholt a branch railway, 4½ miles long, proceeds to the B. C. mine, & another, 9½ miles long, to Phœnix. From Eholt the course of the railway is south-westerly along the banks of Eholt & Attwood Creeks to Boundary Creek, 2,500 ft. above sea level, & 88.4 miles from West Robson. Here the course deflects almost due south, & continues in that direction to Greenwood, a mining town on the east bank of Boundary Creek, 2,450 ft. above sea level, & 89.7 miles from

West Robson. Greenwood lies north westerly from Grand Forks, & is distant from it in an air line 12¾ miles. By the railway the distance is 22.7 miles. Between Grand Forks, at mile 67 & mile 77, the country passed over is a very irregular rocky side-hill, not precipitous, but broken into scattered elevations & depressions. Between mile 77 & Eholt, at mile 80.7, the railway passes over earth flats & side-hills. Between Eholt & Greenwood, at mile 89.7, the country traversed is fairly level, consisting chiefly of earth flats, bogs, & gravel side-hills. It is proposed to construct a branch, 2½ miles long, from Grand Forks northerly to the Granby Smelting Co.'s smelter, & from Greenwood a branch, 5 miles long, is being constructed westerly to the Deadwood Mining Camp.

Considerable skill has been displayed in the choice of alignment, & the result obtained has proved satisfactory so far as economical construction is concerned. It would appear to be possible, & even necessary, to dispense with many existing curves without adding excessive additional cost. The total amount of curves is 53.5% of the whole alignment, whereas the total amount of tangents is 46.5% of the whole alignment. · This is not good railway practice, & a change is desirable. Trestling has been skilfully avoided, & all flats affording suitable grades have been taken advantage of.

On all tangents & curves not exceeding 4°, or 1,433 ft. radius, the gauge is standard, the rails being placed 4 ft. 8½ in. apart from inside to inside of rail head. On curves sharper than 4° an additional width or spread, varying with the degree of curvature, has been allowed, in order to prevent the binding of car wheels in passing over them. The additional spread is as follows : –
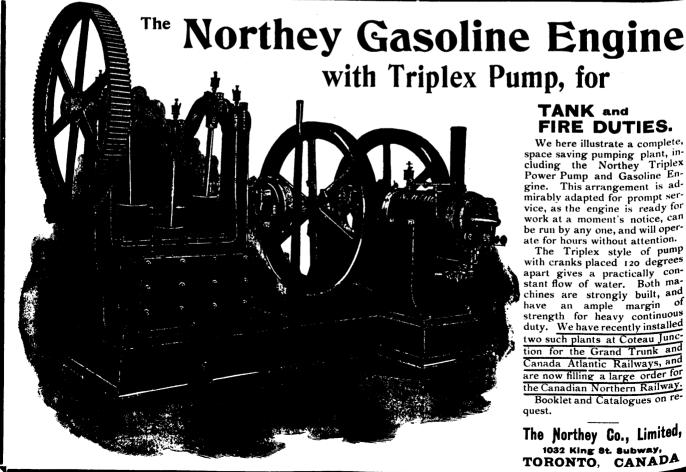
4 degrees to 6 degrees, ⅛ of an inch.
6   "   8   "   ¼   "

8 degrees to 10 degrees, ⅜ of an inch.
10   "   14   "   ½   "

Curves vary from 40° to 14°, or from 8,594 to 410 ft. radius. These curves are light in mountain railway construction, and in this respect the curvature is not excessive. The total amount of curvature, however, as shown by the subjoined table, is unusually large, and does not appear to be warranted by the physical features of the country traversed :

Degree.	Radius in feet.	No.	Length in feet.
'o 40 to 1	8,594 to 5,730	1	1,561.7
1 " 2	5,730 " 2,865	2	1,166.6
2 " 3	2,865 " 1,910	7	5,771.3
3 " 4	1,910 " 1,433	13	10,491.9
4 " 5	1,433 " 1,146	12	7,627.2
5 " 6	1,146 " 955.4	11	6,003.7
6 " 7	955.4 " 819	8	4,944.2
7 " 8	819 " 716.3	5	3,922.7
8 " 9	716.8 " 637.3	11	4,549.8
9 " 10	637.3 " 573.7	2	674.8
10 " 11	573.7 " 521.7	17	6,934.4
11 " 12	521.7 " 478.3	4	1,699.3
12 " 13	478.3 " 441.7	11	4,031.3
13 " 14	441.7 " 410.3	0	
14	410.3 "	14	5,588.2
Totals		118	64,957.1

The total length of the railway from the center of Grand Forks siding to the centre of Greenwood siding is 121,068 ft. The combined length of curves, as shown by the preceding table, is 64,957 ft. The combined length of tangents is, therefore, 56,111 ft. Hence, as before stated, the total curvature is very nearly 53.5 % of the whole length of the railway. The curves of most frequent occurrence are from 10 to 11°. The curves of least frequent occurrence are from 40 minutes to 1°. The longest curve is a 3½ degrees 1,646.2 ft. long ; the shortest is a 4 degrees, 100 ft. long. The longest tangent is 5,707.3 ft. in length, and the shortest, 100.9 ft. in length.

From Grand Forks, mile 67, to mile 68, grades are light, varyiug from level to 0.525