heavy grades, and the reduction of the expense and delay due to snow. A comparison of the two lines is made in the accompanying table.

Comparison of Old and New Lines at Roger's Pass.

	Old line open summit.	New line summit tunnel.
Length, between same points..	23 miles	18 miles
Max. grades (compensated) ...	2.2%	2.2%
Length of max. grades.....	22.15 miles	6.61 miles
Grade through tunnel (tangent).	.....	0.98%
Summit elevation	4,330 ft.	3,791 ft.
Sharpest curves	10°	10°
Max. train load	870 tons	870 tons
Track	Single	Double

have the big undertaking finished by December 31, 1916, 3½ years from the time the work was started. Building a passage 5 miles long is a lengthy process in the ordinary way. Only a limited number of men can work in the heading at one time and delays constantly occur on account of blasting and other causes. With the pioneer bore, the work will be greatly facilitated. The side drifts leading into the course of the main tunnel will enable the drillers to attack a number of points at once. While blasting is proceeding in one part of the shaft the workers will be able to continue their activities in another instead of having to cease work each time a shot is fired, as would be the case with the one heading. The same applies to the excavation part of the work. Lines of cars loaded with material can be kept continually in motion from the various drifts.

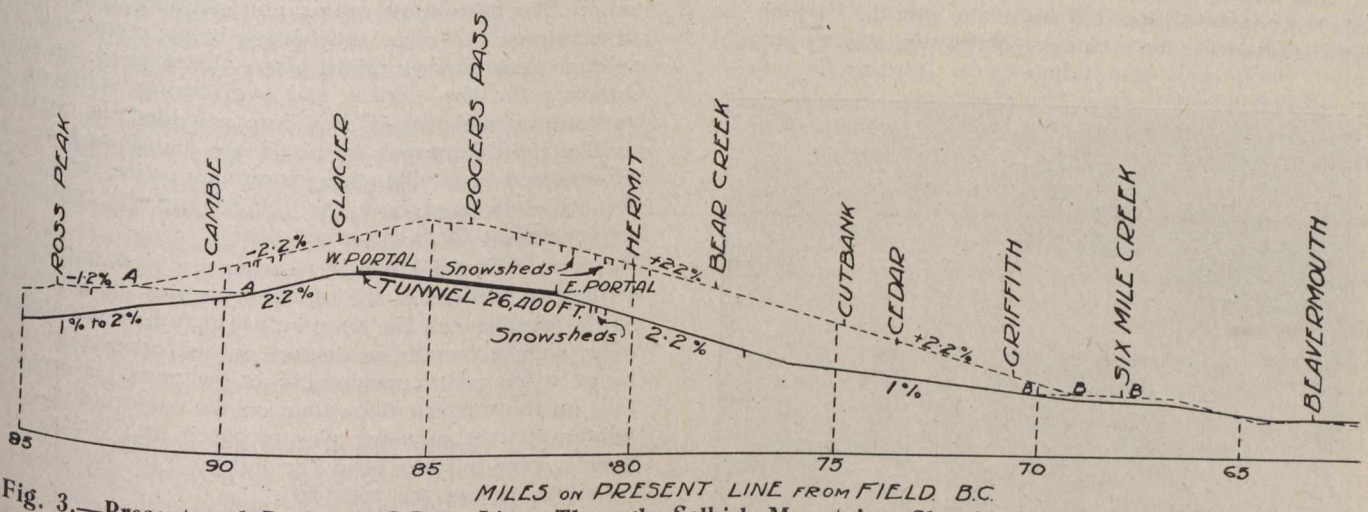

Fig. 3.—Present and Projected C.P.R. Lines Through Selkirk Mountains, Showing Location of Tunnel and Comparison of Grades.

For about 1,100 ft. at each end of the tunnel the material encountered consists of clay and boulders. The balance is expected to be in solid rock, mica schist and quartzite, so far as can be judged from the investigations made. The maximum depth of rock above the tunnel will be 5,690 ft. In cross-section, the tunnel will be 24 ft. high and 29 ft. wide, with concrete lining through the softer materials.

Method of Construction.—The contractors who have in hand the tunnel scheme are applying an entirely new method of tunnel piercing. A pioneer heading or tunnel 7 x 9 ft. in cross-section is being driven 45 ft. from the centre line of the main tunnel and with its grade 10 ft. above the subgrade of the latter. From this pioneer tunnel crosscuts will be made to the line of the main tunnel at such distances as may prove desirable, probably 750 to 1,000 ft. apart. Drifts from these crosscuts will be driven along the centre line of the main tunnel, from which drilling and shooting can be carried on while mucking will be done with air-operated shovels in the enlarged section of the main tunnel. The muck will be handled by 16-yd. side-dump cars and compressed-air locomotives. The drills and ventilating fans will also be operated by compressed air. The idea is quite in the nature of an experiment and was decided upon only after careful calculation and mature consideration. One of the principal reasons for its adoption was the fact that the C.P.R. wished to

Another great advantage is the fact that the pioneer bore will act as a ventilating shaft, enabling the passage of a current of air through two bores and the connecting passages. It will also serve a permanent purpose in the same connection on the completion of the main tunnel. This pioneer bore was started last autumn.

The work is pursued in much the same way as in the levels of a mine. Stopes are driven and holes are bored with air drills, charges set and exploded and the shattered material placed on cars and run out along

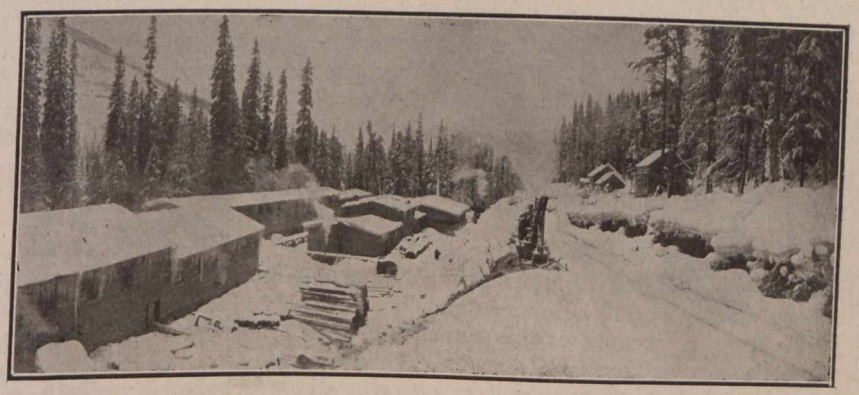

Fig. 4.—Eastern Portal of Roger's Pass Tunnel.

narrow gauge tram lines. Electric fans keep a current of air in circulation, removing the dust from the drills and clearing the atmosphere of the poisonous gases from the blasting. Gangs of drillmen will be employed in three