Line A, the Six-mile-tunnel Project.

Of this not much need be said. In view of the foregoing, I regard such a line as unnecessary. It could probably be worked at a somewhat less annual expense than line B, but I doubt even this. The care of a six-mile tunnel would prove more expensive than one of between three and four miles. There are no available data respecting the cost of maintenance of track in tunnels, but the rapid waste of rails in them, and the difficulty of maintaining a good track where men have to work in the glare and flare of lamps, or electric lights, does not suggest that such a long tunnel could be maintained at the same cost per mile that would apply to ordinary outside track. However, admitting that line A could be worked for a percentage less than either lines B or C, the total annual charges, including interest, count against it in a marked degree.

The elevation of grade at the summit of line B is 2,530 ft., while that of line A is 2,392 ft., a difference of 138 ft. in favour of line A; also line B is a mile and a half longer. It amounts to this, therefore: that, to save going over a hill 138 ft. high and a mile and a half of distance, a six-mile-tunnel project is proposed to be built in preference to a 3·6-mile-tunnel project, which can be built with much less money.

With line C the project would be that, in order to avoid a hill 362 ft. high, and making a saving of distance of two miles, it is thought worth while to build a six-mile summit-tunnel project in preference to a $2\frac{2}{5}$-mile summit-tunnel project, which can also be built for much less money. A summit tunnel of such great length as six miles ought to accomplish more.

If it was required to connect a great commercial port on either coast with a vast region beyond the mountains the situation would be different; but even in such case one of the B lines would present a solution which, in my opinion, would be more practicable and more reasonable than line A.

Considering that the summit tunnel of line C would be so much shorter than that of either line A or line B, thus making a great saving in the time required to build, it seems to me desirable that an instrumental survey should also be made of it as well as of the B line, and that its variation, C1, should be included therein.

One line would have to be surveyed in any event, and the extra cost of surveying the other would not amount to much. It is always desirable to get all the information that may have a bearing on such a subject, and have it in view when final determination is being made.

In the last analysis the question is going to arise, what is most reasonable and practicable in view of all the conditions, and what would be best for the country. While I am, in my own mind, quite satisfied that the best solution is in the B line, it would be more satisfactory if my conclusions were confirmed by actual instrumental survey.

As part of the surveys of lines B and B1, it would be a good plan to have, say, two borings made along the line of proposed summit tunnel—one at least on Pegleg Flat—to ascertain the depth to solid rock, and another at some other point which may be selected by the engineer.

It is proper to explain that my study of the B1 line has been going on during the preparation of this report, and that it has not therefore been included in the tables. It is, however, so much like line B that this is not material, especially as the points in which it differs from line B are sufficiently covered in the text.

In view of the possibilities and improvements in the use of liquid fuel, and because I have not with me the required data, the question of electric traction in summit tunnels has not been considered in this report. The working-cost of such a plant, however, where the number of daily trains was small would be comparatively excessive. It is only where heavy business is being done that it can be an economic success.

I concur in the report of the Government Geologist respecting the geology of Arthur's Pass, and also believe that the rock will be found good driving-ground, and comparatively free from water, for any one of the suggested summit tunnels. I much doubt if either of them would require lining, except in localities here and there.

The curvature of the several lines above described would not be excessive in any instance, either as to minimum radius required or percentage of line curved. On the contrary, for a mountain line the amount of curvature is comparatively small in each case.

I am under many obligations to the Engineer-in-Chief and the Superintending Engineer for the aid I have received, both from them and their assistants, and for their uniform courtesy.

I have, &c.,

The Hon. the Minister for Public Works. V. G. Bogue.