

29. Was it similar to the Otira Tunnel?—No, not particularly similar. I mentioned it in regard to the experience I have had in dealing with tunnels. It was driven on the American system, which is different, and it was only one mile long as compared with five miles in the case of the Otira, and the material was dry and the weather favourable.

30. What is the American system?—They drive the upper part of the tunnel to the full size, and then take out the bottom part to the full length behind. That is a cheaper way.

31. Could that system be introduced to Otira?—I do not know. The rock is hardly good enough. It could not be used with advantage at the Bealey end, but it could perhaps at the Otira end.

32. *Mr. Reed.*] You think 25 per cent. additional is sufficient to make up the difference between a single-track tunnel and a double-track tunnel?—Yes, I think so. What I mean to say is that per unit of excavation it would be 25 per cent. more expensive to drive the Otira Tunnel than to drive a 72-yard double-track tunnel, apart from the difference in the rate of wages.

33. That is as compared with the convenience of a double-track and a single-track tunnel?—Yes.

34. You think 25 per cent. is sufficient?—Yes. I have not exaggerated it.

35. *Hon. Mr. R. McKenzie.*] Can you tell us the total expenditure on the Arthur's Pass Tunnel to date?—No, I cannot.

36. *Mr. Reed.*] From the experience you have had, what do you estimate would be the cost per lineal yard to complete the Otira Tunnel?—About £77.

37. You look upon it then that the Otira Tunnel, comparatively speaking, would be a cheaper tunnel than the Bosruck Tunnel?—Yes.

38. And cheaper than most of the tunnels mentioned?—Yes, cheaper than any of them.

39. *Mr. Davey.*] Following on your answer that it would cost £77 per lineal yard to complete the Otira Tunnel, is it your opinion that the contract was taken at too low a price?—Yes, it is.

40. That it could not be done fairly at the price it was taken at?—Yes.

41. *Hon. Mr. R. McKenzie.*] You referred to the Lyttelton Tunnel?—Yes.

42. You put the cost of that down at £68 per lineal yard?—Yes.

43. Can you give us the quantity on which you base that?—I cannot give you any particulars at present.

44. How did you arrive at the cost of £68?—I have a number of records compiled by a man who wrote a book on the subject. It is too voluminous to carry about, and I extracted the amount of £68 from the items he gave.

45. Will you give us your authority?—Drinker.

46. Do you consider him a competent authority?—I suppose he is as good as any other authority. I suppose he got his information from the then Engineer in Chief.

47. From your own knowledge you do not know the quantity of excavation and lining?—No, I do not. I should say the quantity of excavation of the Lyttelton Tunnel will not greatly exceed the Otira Tunnel. The Otira Tunnel is larger than the New Zealand tunnels have been.

48. *Mr. McLean.*] To what do you attribute the main causes of our not getting along as fast with the work of the tunnel as was anticipated—our not making sufficient progress to bring it to a payable state?—I think the principal reason is the shortage of labour. We have never had since I have been there so many men that we could not put more on advantageously. Of course, the shortage of labour acts in two or three ways. You do not get the work done because the men are not there, and you cannot have discipline to the same extent as if you had plenty of men.

49. You mean to say the shortage of labour reduces the efficiency?—Yes, it does.

50. That is, the efficiency of the men you have at the work?—Yes.

51. Because you cannot discharge or dismiss a man when he is not doing a fair day's work?—Exactly.

52. Do you think if we had the required number of men there right from the start that we could have carried out the work and finished it for the amount of the tender?—No, I do not think so.

53. But it would have considerably reduced our loss?—Oh, yes, decidedly.

54. Would you describe to the Committee the efforts that were made by us in providing bonuses and increased wages in order to obtain men?—Yes. The first bonus that was given was a bonus on the driving of the bottom heading, a bonus per foot run of £1 a foot over a chain a week, or for all over 2 chains a fortnight. That bonus was given in the first place to encourage the best and get the men to move along, in order to get a little more money out of it for themselves and every one else. It would encourage the men to go along, because there was a chance of making more money. Later on that bonus was altered to a more liberal scale. The bonus that is now paid in the bottom heading commences after they have driven 100 ft. in a fortnight. For 100 ft. nothing extra is paid; for 110 ft. every man gets 3d. per day extra for the period in addition to his wages: for 120 ft., 6d.; 130 ft., 10d.; 140 ft., 1s. 3d.; 150 ft., 1s. 9d.; 160 ft., 2s. 4d.; 170 ft., 3s.; 180 ft., 3s. 9d.; and 200 ft., 5s. 6d. a day extra. The rate increases as the number increases. When they have driven a total of 100 ft. in two weeks their bonus is zero, but when they have driven a total of 110 ft. in two weeks the bonus is 3d. per day for each man. The scale is so arranged that the cost to the contractor or the man who is paying them remains the same—it does not increase or decrease. He assumes he is going to pay so-much for this heading, and everything above that the men get.

55. *Mr. Okey.*] It is based on the estimate of driving the 100 ft.?—Yes, it is based on our previous cost. The 200 ft. has never been driven in our tunnel, but we have driven 164 ft. The 200 ft. has been doubled and trebled in the American tunnels. In the Elizabeth Tunnel they drove between 300 ft. and 400 ft. in a month, and in the Simplon Tunnel they drove for