

77. *Mr. Hales.*] One of the witnesses said here that the reason why that sole-plate below the bottom of the struts could not be put down below the brickwork of the invert was because the ground was so hard that it would be great labour to get it out?—Perhaps he stated so; I did not see.

78. Another witness said the ground there was so soft that he was sure it would not stand; and you also say that they could not do without that sole-plate?—Yes.

79. But was the ground so hard that it was difficult to excavate?—In one or two cases where they came on a boulder. There were boulders that required blasting; but that was not the general character of the country they were going through. I cannot say that there was any particular spot that required blasting out, although there was an occasional boulder that required it.

80. Still, the ground that required blasting out was quite hard?—Yes, it would be.

81. That was the only suggestion about those struts—that if the ground was so hard that they could not sink there was no necessity to put in the sill?—Certainly not.

82. For instance, in your tunnels at the Manawatu you did not put in sole-plates like that?—At the Palmerston end of the second tunnel we put down sole-plates.

83. It was in clay there?—No; in rotten material—a kind of rotten soil.

84. Was there an invert there?—No; we did not put in an invert there, we increased the footings.

85. With regard to what is called the minor sill, the minor sill as a rule is put in to support the longitudinal bars till they are properly propped?—Yes.

86. You place the lower bars so that they will form a bottom to the arch?—Yes.

87. Then you strut up the crown bar, and it gets tighter and tighter as it goes?—Yes.

88. Then, when all that is done, you form a timber arch?—Yes; according to the nature of the ground.

89. Then your poling-bars are worked in?—Yes.

90. Then, suppose you removed that sill—the minor sill—and the props, ought not that arch of bars to be competent to support the ground?—No, I do not think so, except in certain places.

91. Do you know that it is done?—Yes; I believe it is done sometimes. I know that it can be taken out. But in that particular ground the bars were having as much as ever they could carry—in fact, they were bending down with the weight—and it was not safe to carry anything more. I have seen ground borne down so much that the men were afraid of working under it.

92. Why is it insisted by the engineers that the timber should be taken out?—I think it would be better in all cases that the timber should be taken out.

93. But do you know why it should be taken out, especially as the timber is not of much value?—Well, I suppose the timber rots in time. I should certainly have the timber taken out if it could be done.

94. Is there not a reason for timbering being taken out beside what you have mentioned?—There is less excavation if you do not have to take out all the bars.

95. And less brickwork?—Yes.

96. Were these sole-plates below the brickwork in the work you supervised?—Not in all cases below the brickwork—about two rings from the top of the invert. In some cases they were down below, and in others not down below. It depends on the thickness of the levels probably.

97. I think you said that in some cases you took out these minor sills?—In this tunnel we took out all the sills and bars; but the ground was strong.

98. But you did not need very many bars if the ground would stand alone?—Yes; but by putting in false bars under your arch you can take them out when there is room. It has to be done time after time.

99. *Mr. McKenzie* (turning to the diagrams on the wall).] Will you have a look at this sketch for a minute. You have been in charge of Government railways. As a practical man, which of those sills on that plan do you call the minor sill?—[The witness indicated the upper one.]

100. And that extends to both sides of the excavation?—Yes.

101. It is invariably wedged up at each end to keep it in position?—Yes.

102. Suppose this sill had been cut off inside the lining, would you consider that timber to be safe?—No; not unless there was other provision there.

103. Now, of course this has all been explained before, but I want you to explain it to the Committee, as you were a practical man in charge of the work. First of all, there is provision made for removing the sill in two pieces. Is there any reason in heavy ground that the brickwork should not be built past and the sill left?—I do not see any reason, because in all cases where sills have been left in they have been bricked up, and the work has stood. I know of no case where it has broken down.

104. Would you consider it dangerous to remove that sill in all grounds?—I would consider that in very heavy ground it should be left in.

105. You do not consider it should be taken out?—No, I do not.

106. What do you call this [pointing to the lower part of the diagram]?—A lower sill, or a foot-block. In two pieces a foot-block; in one long piece I call it a sill.

107. Of course, if this sill were away there would be nothing on the legs?—No; it is better to leave it in and brick over it.

108. As a Government inspector of long experience, you consider it better to leave that in and build over it?—Yes.

109. You do not consider it detrimental to the work?—No; but if the Engineer had objected to it I should have had to take it out.

110. According to your own judgment, it is not at all detrimental to the work to leave half the block, or lower sill, in?—No.

111. The reason why I am asking is because Mr. Blow laid great stress on this block being left in. Do you attribute the breakdown of the Makarau Tunnel to the fact of the contractor being compelled to take out all these sills?—I do not know anything about it.