results were higher than experiments proved that this particular class of ropes would justify, and then Mr. Carruthers and myself put it down out of the standard books, which gave the results on this particular sort of ropes, from some experiments by an American engineer, named Roebling, made upon ropes of various diameters.

85. Do iron-wire ropes stand a greater strain per square inch than iron bars?—Iron-wire rope will stand a higher strain than iron bars of the same diameter. At the same time, iron-wire rope would not stand the same strain as an equal diameter of rope made of wires all in direct tension. Assuming it as such would give too high a result.

86. Do you know the weight of the chain from pier to pier?—Yes.

87. If you know the weight and length of it, you can tell what the section is in square inches?—One could deduce it, bearing in mind these experiments and everything upon it.

88. Do you remember the weight of the chains?—I think the weight of the two chains is 14 tons —31,360 lbs. for the two chains.

89. How do you obtain the weight?—We weighed each of the ropes.

90. Of a certain length?—We weighed several feet of them.

91. And from that you computed the total weight of the chain between the piers?—Yes.

92. And that weight was how many tons?—Fourteen tons nearly.

93. Is that for the two chains?—Yes.

94. So that each chain weighed about 7 tons?—Yes, about that.

95. From computations we have had made, we found the weight of each chain ought to be about 15,893 lbs.?—I make it 15,680 lbs.

96. So that the actual weight agrees very nearly with the computations we made?—Yes; they are very close.

97. And that we found gave a sectional area of 16·78 square inches?—The sectional area of the cable, as a whole, was 12 x 2, but of course there were small spaces between the ropes which would not count.

98. *Mr. FitzGerald.*] The computation of the strains on the cable takes into account the rolling weight?—Yes.

99. In taking the strain on the chain, did you take into consideration not only the rolling weight and the permanent weight, but the weight of the chain itself?—Oh, certainly.

100. Do you know what the section of the suspension rods is?—It is an inch in diameter.

101. *Dr. Knight.*] From computations we made, we found that the sectional area should have been 1·03 square inches, which would give a diameter of 1·14 square inches.

102. *Mr. FitzGerald.*] What weight are your suspension rods subject to?—Between 4¼ and 4½ tons.

103. That is, there should be a greater number of suspension rods?—It is the only way in which the weight on each could be reduced if it were necessary to reduce it. Four and a quarter tons is the weight that might occasionally come upon each suspension rod.

104. *Dr. Knight.*] Navier, a French engineer, is of opinion that a suspension rod, with a section of 1 inch square, should not be subjected to a heavier weight than 3 tons.

105. *Mr. FitzGerald.*] Is there a special modulus given in these tables of Roebling for wire rope?—No; he gives simply the breaking strain of a given diameter of rope in a table as ascertained by experiments.

106. How many of these wire bridges are there constructed, to your knowledge, in New Zealand. You said there were a good many?—I spoke about Westland. There is one large bridge, consisting of one 100-feet span and two 60-feet spans over the Arahura, and there are a large number of foot bridges reaching up to 180-feet span.

107. Is there any other bridge built to your knowledge anchored in the same way as the Grey Gorge Bridge?—No, I do not know of one exactly the same.

108. With iron anchors, I mean?—Oh, there are bridges with iron anchors, but the exact method of attachment is not the same.

109. There are bridges with cast-iron anchor-plates—I mean in New Zealand?—Not in New Zealand that I know of, but there are in England.

110. You constructed the bridge over the Arahura?—Yes.

111. Did you make the plans for it?—Yes.

112. How is it anchored?—It is anchored to piles driven into the ground.

113. *Dr. Knight.*] What was the span of that bridge?—There was one span of 100 feet, and the other two were 60 feet.

114. Speaking of iron, I understand that iron-wire rope is the strongest of all the forms in which iron is used in the construction of bridges?—Yes.

115. Do you know what the comparative strength of iron-wire rope is when compared with bar iron, for instance?—About as 7 to 5. The strength of wire is as 7 to 5 as compared with wrought iron.

116. Is it usual in the casting for anchor-plates to use common pig iron, without any mixture of better iron with it? Do you know whether engineers generally take any trouble in the matter, and whether they are anxious to have a good sound casting?—Of course they are anxious to have a good sound casting. I never had charge of a bridge of the same description before, where cast-iron anchor plates were used. I have seen cast iron used in many cases at Home. I have had charge of works where castings have been used, and no special steps have been taken to secure their being more than ordinary marketable iron.

117. Is it not the practice at Home, when an order is given for a number of cast-iron beams or bars, to make it a part of the contract that they should be strong enough to bear a certain amount of weight without fracture?—I have never seen it done.

118. How do the engineers at Home secure a good casting?—It really depends, as a great many things of the sort depend, on the reputation of the person who supplies it. They go to a foundry where they have got a reputation at stake; they pay them a reasonable price, and they undertake to give a good article.