

longitudinal lines. From Nelson to Greymouth a longitudinal line would have advantages over a transverse line. I think railways ought to be constructed on a gauge best suited to the natural features of the country, because the through traffic will be for a long time a subservient consideration for reasons previously stated; one uniform gauge is therefore not an immediate necessity.

To a question by the Honorable J. Hall, and some questions by Major Heaphy, V.C., Dr. Hector promised to append answers and send them to the Committee at its next meeting.

Dr. Hector retired.

Mr. Balfour attended, and made the following statement to the Committee:

My practice has been exclusively in hydraulic engineering: bridges, harbours, docks, and light-houses; consequently, my opinion on railway matters is not based on actual experience of such work. In this country the question seems to be: How can you, at the least cost, make the greatest length of line of a reasonably substantial character? Any reduction of gauge which will save £1,000, or even £500 per mile, and yet leave the works of such a character as to be able to carry a moderate traffic, at a moderate speed, deserves attention. Other engineers will be able to estimate the difference of cost between the different gauges in various lines of country. In considering the question of trunk lines, if a gauge is to be fixed, it should be fixed in reference to the most difficult; or at all events to the average country, and not to the easiest. It is to be remembered that, even if a narrow gauge be adopted, the construction of such a line would greatly facilitate operations in constructing heavier lines hereafter, and the question of reconstruction and widening the lines may properly be left to posterity. In America, that system of temporary construction was largely adopted for their canals (and is, I believe, adopted for railways also); the locks were, in many instances, made of timber, and it was found that the pre-existence of the canal greatly facilitated the reconstruction of the locks in stone at a later period, as all materials were carried to the work at a minimum cost. I conceive that an ordinary gauge, such as 4 feet 8½ inch, can be worked with improved plant on as sharp curves and as steep gradients as a narrower line, so that even were a narrow gauge adopted in the meantime the only important work involved in reconstruction would be the widening of bridges and earthworks, and increasing the dimensions of tunnels; but the bridges would probably require renewal at any rate before the increasing traffic rendered such reconstruction necessary. If the 4 feet 8½ inch gauge can be constructed at a moderate cost over the cost of a narrower gauge, I should recommend its adoption; but even a moderate saving would make me incline to adopt a narrower gauge, especially when it is remembered that the weight and cost of plant diminishes in a rapid ratio. The earthworks might, if required, be made to the width for the permanent gauge at first, and a lighter line laid *pro tem*. I am aware that there is a growing feeling in England that the 4 feet 8½ inch gauge is too narrow, and that it should be increased, but the amount of traffic there is so entirely out of proportion to what can be expected here, even fifty years hence, that that feeling should have but little weight. On the other hand I understand that the New South Wales railways do not pay running expenses* (I say this subject to correction, and only as the hazy recollection of, I think, a newspaper paragraph), and this seems an additional argument for keeping down first cost. Of course, in all such questions, cost of working must be considered along with prime cost, or the interest on prime cost, and that railway is the best which will result in these two items—interest on capital outlay, and annual working expenses—being a minimum, and it seems to me on this point that the evidence of engineers more experienced in railway works should be taken, and that a direct answer should, if possible, by any means be obtained.

JAMES M. BALFOUR, Mem. Inst. CE.,
Colonial Marine Engineer.

Mr. Balfour made the following verbal statement to the Committee:—

"I admit that the cost of widening embankments and tunnels lined with masonry at a future period is much greater in proportion than the extra cost of constructing the full width at first; but it is a question whether even that extra cost may not properly be borne by posterity. It is desirable that if a trunk line were constructed it should come out as near Port Underwood as possible."

Mr. Balfour retired.

Mr. Marchant, C.E., appeared to give evidence, but in order to save time some written questions were handed to him, to which he promised to append written answers, and send in to-morrow before the meeting of the Committee.

The Chairman read the following letter to the Committee:—

GENTLEMEN,—

Wellington, 19th September, 1867.

Will you kindly permit me to say a few words relative to Railway Gauge. My acquaintance with railways in England, and with the principal engineers—the Nagin's, the Stephenson's, Pen, Ravenhill, &c., enable me to say, and I know I am only reflecting the opinion of those engineers in support of my own,—

1. That there can be no doubt of the desirability of a country adopting one uniform width of gauge.
2. That the gauge of 4 feet 8½ inches is the best possible width that can be relied on for safety, accommodation of passengers and merchandise, and also for speed.
3. That 4 feet 8½ inches is the gauge used throughout England, with the exception of the Great Western, and even on this an extra rail is laid for the 4 feet 8½ inch gauge trains to run on.
4. That the adoption of the narrow gauge of England of 4 feet 8½ inches has many and great advantages—namely, when the company lay down their permanent way of course, they would have new locomotives, carriages, and luggage trains. But here again is an advantage in adopting the uniform gauge of England of 4 feet 8½ inches, for at Leeds, Sheffield, Manchester, &c., there will be found ready to hand and procurable for much less cost, locomotives, &c., than those made to order, but if a different gauge be adopted, the whole expense will be greatly increased.

If the country should fall into so fatal an error as adopting a fancy gauge, it will end in numerous

* I am informed by Mr. Weaver that they more than pay working expenses, but do not pay interest on outlay.