the principal and best roads, like the New York Central, have cost only £9,000 per mile, and their narrow-gauge roads, 3 feet to 3½ feet gauge, £4,000 to £6,000 per mile. In this country we know that the cost has been £37,433 per mile, and in India, £15,760; the East Indian cost £20,365, and the G.I.P. £18,000 per mile.

In the future construction of railways through villages and plains, where alluvial soil exists, in which the common plough will operate, and where horses, mules, and bullocks are available, an immense economy in cost of earthwork may be effected by the use of the American "Wauchope," and the "Sleessor" earth-excavating and moving machines, and also with the Chicago self-revolving scraper, all of which are very largely employed in the United States. I have used them myself on very large works in California, and with labour at 12s. per diem, and horses on hire at 6s. to 8s. per pair, I have moved earth into embankments at the rate of 1,000 cubic yards a day with the "Wauchope," and at the cost of under 1d. per cubic yard.

Many people are inclined to believe that labour is cheap in India, because they get into the way of comparing it with English and European labour; but in reality it is not cheap for India, when the limited wants and frugal fare and habits of the people are considered, as well as the vast amount of earthwork yet to be done in that country in railroads, canals, &c., and the very limited capital at the disposal of the Government.

Another great economy effected in railroad construction in America is in the adoption of the "Whipple" truss bridge. The English engineers of the railways in Canada have gone to the United States for their large-span iron bridges, because they have found that they could not get as good for the money elsewhere, notwithstanding that the American iron is charged 17½ per cent. duty in entering Canada. Messrs. Clarke, Reeves, and Co., of Philadelphia, have built and erected over three miles in length of their "Whipple" truss bridge on the Canadian Railway, besides nearly nine miles of similar bridges in the States and in South America. The iron they use is made from the ore found on their own premises, and this iron has always shown a much greater tensile strength than the best classes of English iron in the market, and may safely be taken at 30 tons per square inch for tension, whilst their patented Phœnix columns have been proved to have a resistance to compression which has never been obtained before.

The facility and rapidity with which these bridges are erected appears almost incredible to the English engineer, who is practised only in the English rivetted girder work. I have known spans of 150 feet erected in a single day of eight or nine hours. As a rule, the rivetted work takes just as many weeks to erect as the pin-connected work takes days. The advantage of the pin-connection, besides being the most scientific and proper, is that all the skilled work is done in the shops, and none on the scaffolding during erection, so that the work of erection goes on with a facility and rapidity utterly impossible in a rivetted structure.

The pin-connected work is also cheaper than the rivetted, because there is less metal in it. In proportioning the different parts, the strength of each part is increased in proportion to its nearness to its work, so that, in carrying out the principle of "uniformity of strains," the American structure is of the strongest combined with the lightest, and thus there is no useless weight of iron to be paid for. They have been proved for years under the heaviest railway traffic, and found thoroughly safe and efficient. All the parts, being made by machinery, are of exact uniform dimensions in similar spans, and are therefore perfectly interchangeable. This greatly facilitates the erection and the rebuilding of these bridges.

I believe that these American bridges, of spans not under 150 feet, can be laid down and erected in India and in our colonies considerably cheaper than English bridges.

I have, &c.,
R. M. Brereton.

Sir Julius Vogel, K.C.M.G., &c.

Enclosure 2 in No. 1.

Extract from a Letter of Mr. W. W. Evans to Mr. Thomas Higinbotham, Engineer-in-Chief of the Victorian Railways, Australia, dated 3rd March, 1878.

Locomotives.

I note what you say about them, and that those I sent were doing good work. I was much pleased to find that you were running them on heavy work. I ought to have sent with them two sets of valves. I think we could arrange a set of valves for those engines that would save when working on heavy traffic another two pounds of fuel per train-mile. There is another engine invention come out, which will work wonders if all that is claimed for it is true. I will send you a circular. A Mr. Bonta drives his fires with a blower, the blower of a steam cylinder. The gases in the engine are kept under pressure 1½ to 2 pounds per inch. The cinders are received in a box under the engine; the exhaust pipes are left open full size to prevent any back pressure in cylinders. The exhaust heat is used only to heat the feed water. The inventor, a modest man, says he has been running an engine with his invention in it for six months, and that it has beat the other engines on same road in New England 25 per cent. in the fuel account. He does not claim 25 per cent. saving, but wishes to have the thing thoroughly examined by experts. I have long thought of the merits that would result from keeping the gases under pressure in an engine if it was for only one second longer, so as to get more time for chemical reaction.

You say there is a prevailing impression that the American engines will not last over five to seven years. I propose to give you a few figures on this matter to show to those interested in such things. I some years since saw in an English paper, the *Railway News*, a statement of the mileage of engines in England. I was so astonished at the small figures that I sent and got some data of English