ed that the experiment had proved a complete success.

Mr. Gumberland supposed that the blocks would depreciate in the same per centage as iron rails. He meant to say that whilst, perhaps, three or four blocks might last three years the next block might not last one year.

Mr. Foster.—The wood might be chosen so as to make the track as uniform as iron.

Mr. Cumberland said, even in iron rails, from the same rolling mill, there was a difference. It was impossible to get a track perfectly uniform. In the system of Mr. Foster, the blocks were united so as to form a continuous line, and were kept firm by pins. If it were found necessary to remove an unsound block, and replace it with a sound one, he wished to know if it would not be an expensive operation?

Mr. Foster said there was very little expense attending such an operation. The pin could be bored out. In fact, in many instances it would be found necessary to bore it out, as he had found it to be the case in repairing the Industry and Lanora Road. The pins were found to be as solid as the wood itself.

The Chairman.—You have seen the Clifton Railway. What is your opinion of the results of that line?

Mr. Foster replied that the results were most extraordinary. The grades on that line were the steepest in the world, and yet no difficulty had been found in ascending them. The system which he now submitted would produce even greater results, for it was obvious that his line was more adhesive than the horizontal line. The gain would be about one-fourth more. He did not believe it was necessary to have the blocks cut a great length of time before laying them, because even though they should shrink, the pitch would work into the interstices and keep the blocks close. He thought a line conducted on the system now submitted, would last about six years. The cost per mile per annum for keeping it in repair would not be much, because the men employed on the line would manage it. A carpenter could make all the repairs needed. He did not consider it any disadvantage to have the blocks narrow. It added very little to the cost of laying them, the boring being done by machinery. The curvatures and longitudinals were cut before laying them. The points were made of flat steel. All the work excepting the points, was laid on wood. There was no doubt that an iron rail was better. The object of the wooden railway was simply to give a cheap line where an iron rail could not be laid. Not only was the wooden rail cheaper than the iron, but the grading cost less. That should be borne in mind, for the grading was the great item in constructing a road.

Mr. Cumberland wished to know if the cost of a strap rail of iron on the horozontal wooden rail would greatly exceed the cost of the block wooded rail.

Mr. Foster said that experiment had been tried and it was found that the iron strap alone cost within a trifle of $1 per yard, or nearly the same as the entire cost of his system. The strip rail in the case mentioned was an inch thick and two and a half in breadth. It was found that a thinner strip would not stand the traffic. It curved up and broke in a short time, and was found to be useless.

The chairman wished to refer to a pamphlet issued in 1845 on this question, in which it was stated that the "bite" of the wooden rail (Croziers' system) was double that of the iron rail.

Mr. J. B. Hulbert, who is now building the Quebec and Gosford Railway, was next called. He produced the models,—one on a simple strait rail, fastened at the ends like the ordinary iron rail; the other was a compound rail, with the end of each rail overlapping the next. The wood was hard maple, and the cost of the superstructure and ballast per mile would amount to about $1,200. The cost of the manufacture of the rails, ties and wedges was about $600 per mile. The ties which he found best were tamarack and hemlock. The gauge he spoke of was four feet eight and a half inches. To increase the gauge to five feet six inches would add about twenty per cent. to the cost. He did not approve of a narrow-gauge, for the embankment was not likely to stand. He found the four feet eight inches in all cases the best suited to this country. Taking the average of the whole road he believed a wooden rail would last for about five years. The average speed on such a road was about ten miles per hour, but it could be increased to thirty miles. He had used an engine 23 tons weight on such a road. He did not believe a wooden rail was equal to an iron rail. The Gosford wooden railway now in course of construction would be completed in the spring. The highest grade on the Clifton Railway was three hundred and thirty feet. The whole secret of keeping those railways was to keep them in a good state of preservation. The cost of keeping up the road was about $250 per year. A good sound maple rail would stand any ordinary traffic for four years. The ties were laid about sixteen inches apart, and the flat on the side touching the ground, and round on the upper side. The advantage of the compound rails prevented them from wearing at the ends. He found too it kept the rails more smooth. The additional cost of the compound rail was about two hundred dollars, which was principally caused by the iron bolts used in joining. A wooden road had an equal capacity for trains with an iron road. He offered to construct one in Missouri, which would carry 2,000 tons per day. He found some difficulty from snow and ice in winter, but no greater than if the rails were iron. He believed there was no greater difference between the five ton car and the ten ton car, in fact the advantage lay with the latter in carrying lumber, for the weight was distributed over a greater space. He calculated the average load to a train at two tons to two and a half per pair of wheels. After the road was built, he considered, that running eight trains over it per day, it required one man per two miles. On the Clifton road it required one man per mile, but the road was constructed at the beginning for a ten ton engine; but they are now using engines weighing twenty tons. The country through which the Gosford road was to run was smoother than the country through which the Clifton road runs. The Gosford line would cost about $4,000 per mile. This included the grading track, water tanks, turn-tables and switches. He did not consider the wooden road any more liable to accidents than the iron. He had never seen an accident on one. He generally loaded a train heavier with lumber than with ore, for it was not such a dead weight. He did not consider it advisable to use an iron strap on the rail. Where the experiment has been tried on ordinary grades it had not proved successful. At curves it might be an advantage, but at such places he believed it would be better to lay the rails oftener. The wooden railways with which he had been connected had paid the companies to which he belonged. He related his experience of the Clifton Railway, with which he had been connected. When he constructed that line, the shares sold at $2; and when he left they had sold at $14. Since he had left it, however, it had been handed over to inexperienced persons, and it was not paying so well. Another Wooden Railway was in course of construction from Carthage, to intersect the Clifton line. His experience in building car wheels was to make them large. When he commenced he made small wheels, weighing 125 pounds, but experience proved to him that larger wheels were better, and he now used wheels three feet in diameter, weighing 450 pounds, and he found they could carry twenty per cent. more freight. The rolling stock of the wooden railway could be made available to an iron track. He did not find the curves cut by the running of the trains. He had improved the wheels by placing a piece of rubber in the flange. The largest locomotive on the Clifton cost $9,500, American currency, in Erie. The 18 feet, platform, four-wheeled car, cost $225; the same car with eight wheels would cost about $600.

Mr. Tulley, C.E. said he had examined the models of Mr. Foster and Mr. Hulbert, and the plans accompanying them. As far as his opinion went, the compound rail of Hulbert was the cheapest and best. The plan of Mr. Foster was too complicated. The blocks were liable to wear and become uneven, and a great deal of expense would be attached to keeping it in repair. Of the two rails of Mr. Hulburt, the compound rail was the better, but the more difficult to repair. If the other, simple horizontal rail, were bolted down instead of being wedged, he would be inclined to consider it the best system of all. It could be more cheaply and easily repaired. A dowel to join the ends of the rails would be likely to weaken the timber. He had read descriptions of wooden railways, and had descriptions of them from persons who had inspected them personally, and he was inclined to believe they would yet become a most important system of roads for the opening up of the back countries. He believed, that, like the narrow gauge railways, they would be generally adopted in the Province. He believed if these railways could be constructed entirely of wood, without using iron in any shape, it would be better, for there would be no difficulty, and very little expense involved in repairs. If the compound rails could be kept in place by bolts at the ends, that system was the best. Of course, if bolts were required at the middle of the rail as well, it would greatly increase the cost of constructing the line. The cost of placing half-inch bolts at the ends of the rails was estimated at $200 per mile, and if bolts were placed at the middle of the rails as well, it would nearly double the cost. He had read the evidence of Mr. Hulbert, and he was satisfied that the statements and estimates of that gentleman were reliable. If a line could be constructed for $4,000 per mile, it was a very low rate indeed. He understood, of course, that sum included grading and everything, but the stations and rolling stock. The cost of grading must be very little, for, according to the statements made by Mr. Hulbert, the line could almost follow the surface of the ground. He approved of the 4 feet 8 inch gauge, and considered it unfortunate that it was not the gauge universally adopted. It was the gauge mostly used in the United States, although some gauges were as broad as six feet.

Mr. Cumberland objected to the bolts being driven into the top of the rail. He wished Mr. Hulbert to give his opinion of placing a sub-sill under the rail, he believed there was danger of dilapidation in the compound rail.

Mr. Hulbert said there was no danger of dilapidation. The cost of the bolts was obviated in a measure by the saving of the timber in the sawing of the compound rail. He considered the single rail the stronger, but it would give way sooner, as the joints were not so firmly fixed as in the compound rail, which was fastened by bolts driven through the rail and secured by a nut beneath. There was no danger of the top of the bolt being broken off. It would be driven down by the weight of the trains passing over it. Of course they might become loose; but the men on the line could tighten the nuts on the screw, and keep the rail tight as easily as by wedges. However, there was very little danger of the bolts becoming loose.

Mr. Cumberland suggested putting wooden fish plates at the sides of the joints, and driving the bolts through the sides, instead of the top of the rail. That would remove the danger of injury to the bolts.

Mr. Hurlbert said it would increase the cost.

Mr. Cumberland said things might be cheapened.

Mr. Barber said it might interfere with the flanges of the wheels. Besides the wet remaining between the fish plates and the rails would rot the wood. He believed the single rail was the best, as well as the cheapest.

Mr. Cumberland believed there was a danger of the under rail, in the overlapping track, rotting at the joints of the upper rails.