poles are only occasionally connected as in electric telegraphs. Certain peculiarites respecting the ratio of intensity to quantity when a series of cells is used, have been observed, which differ from those remarked in other batteries.—Mr. Kukla, on directing his attention to the best means of making a small portable battery for physiological purposes has found very small and flat Cruikshank batteries, excited by weak phosphoric acid (one of glacial phosphoric acid to twenty of water,) to be the best, phosphoric acid being very deliquescent, and forming with the zinc during the galvanic action, an acid phosphate of zinc. A battery of this description does not decrease in power very materially until it has been three hours in action.

Robert Stephenson, M.P.

(*Continued from page* 100.)

In company with Mr. G. P. Bidder, (now General Superintendent of the Grand Trunk Railway of Canada,) Mr. Robert Stephenson visited Norway in 1816, for the purpose of examining that country, with a view to the Construction of a Railway between Christiana and the Myosin Lake, a distance of about forty miles. To mark his appreciation of Mr. Stephenson's services on this work, the King of Norway and Sweden confered upon him the Grand Cross of the Order of St. Oliff. We are not in a position to describe the nature of the works on the forty miles of Railway, but either the Order of St Oliff must be of cheap acquirement:—or if honorary rewards are there distributed in the same ratio to merit as they are in England and America, the works on this Norwegian line must have been of tremendous difficulty.

In England, Mr. Stephenson took an active part in the "War of the Guages," which in 1845-6 created so much excitement in the Railway world, and determined the future connections and distances of the Railways of Great Britain. In this contest as to the relative merits of wide and narrow ways, Mr. Stephenson took the lead in supporting the interests of the narrow Guage. The Railway Guage of Canada has been settled, apparently to the satisfaction of every one, unless, the proprietors of the Great Western are an exception; and this once momentous question, has therefore, little interest here; it may not be amiss however, considering the prominent position occupied in the contest by the subject of this Notice, to examine briefly the arguments by which he supported his views of that question, and those of his principal opponent.

As will readily be surmised, the Gauge of 4 feet 8½ inches, the narrow Gauge of Europe and North America, was not originally adopted from any inherent advantages offered by that fractional measure, but like many other empirical proportions, owes its origin to some Cart-wheelwright in the neighbourhood of Newcastle upon Tyne, where Tram Roads had their birth, and at a time when half an inch more or less, possessed less value in the eyes of a Mechanic, than at the present moment; gradually Railways developed themselves in the same section of country, and their width was ruled not by the convenience of this age, but by the rolling stock of the old Tram Roads; hence, as Robert Stephenson says in his evidence, speaking of the 4 feet 8½ inches Gauge of the Manchester and Liverpool Railway;—"It was not proposed by my Father. it was the original Guage of the Railways about Newcastle, on Tyne, and *therefore* he adopted that Guage." And so of the Grand Junction Railway, and the Manchester and Leeds Railway, he says, "After the Liverpool and Manchester line had been established, it was quite apparent that all the lines in that neighbourhood must work into it, in order to get to the port of Liverpool, and it was considered imperative in fact, that the Guages should be all the same." Then of the North Midland, of which he himself was the Engineer and proposed the Guage, he says, "There was a part of the line common to both the Manchester and Leeds, and North Midland: and the Manchester and Leeds, having been fixed with a view of eventually working into the Manchester and Liverpool, of course, it became equally a matter of consequence, that the North Midland should be of the same Guage." Again, the Derby Junction line, being "in point of fact a continuation of the North Midland to Birmingham; it was made of necessity of the same Guage as the North Midland:" the London and Birmingham, with a view to connect with the Grand Junction, was next fixed with the same Guage, and "Uniformity was the principal reason for its adoption." For similar reasons, the narrow Guage was adopted as the Railway system was extended, and it daily became of more importance to proprietors that it should not be changed.

Thus, reasons originally of no value, gradually acquired force; until in 1846, they were almost irresistable, and though a period did arrive, when it became evident to Mr. Stephenson as an Engine Builder, that a few more inches of space between the wheels would have been of great value; yet he considers that "since that time, the improved arrangements in the Mechanism of the Locomotive Engine, have rendered that increase altogether unnecessary; at present with the inside cylinders; which is the class of engine requiring the most room between the rails; and the cranked axles with four eccentrics, we have ample space and even space to spare." These improvements he describes:—"in the arrangement of the Machinery, which is the main question, having reference to the width; the working gear has been much simplified, and the communications in the most recent engines, between the eccentric and the slide valve, have been made direct communications: whereas it was made formerly through the intervention of a series of Levers which occupied the width." * * "Then with reference to the increase of power, the size of the Boiler is in point of fact, the only limit to the power, and we have increased them in length on the narrow Guage, because we have always made the boiler as wide as the narrow Guage would admit of; but we have increased the power by increasing the length, both in the fire-box and in the tubes; we have obtained economy I conceive by lengthening the tubes, and we have obtained an increased power, by increasing the size of the fire-box; in fact the power of the engine, supposing the power to be absorbed, may be taken to be directly as the area of the fire-grate, or the quantity of fuel contained in the fire-box." * * I conceive the steadiness of the Engine to be very much increased by increasing the length, for the unevenness of the road is met by that, by increasing the length of the base, you increase thereby the steadiness," * * "as you increase the length, that is, the distance between the fore and hind axle, they are less liable to get off the rails in consequence of moving more steadily than the short engines on four wheels, where the base is the same width, by about 7, 8, and 9 feet, originally they were about 7, and 7 feet 6 inches, and 8 feet. The large weight hanging over the axle behind was exceedingly liable to make the engine oscillate with great violence, whenever it came to an inequality. I have known engines of that class actually lift the front wheels off the rail, one accident might be referred to that, though there may be a difference of opinion as to the actual cause of the accident, but in several cases I have attributed accidents to the engine, in the case of a slight imperfection of the road, being