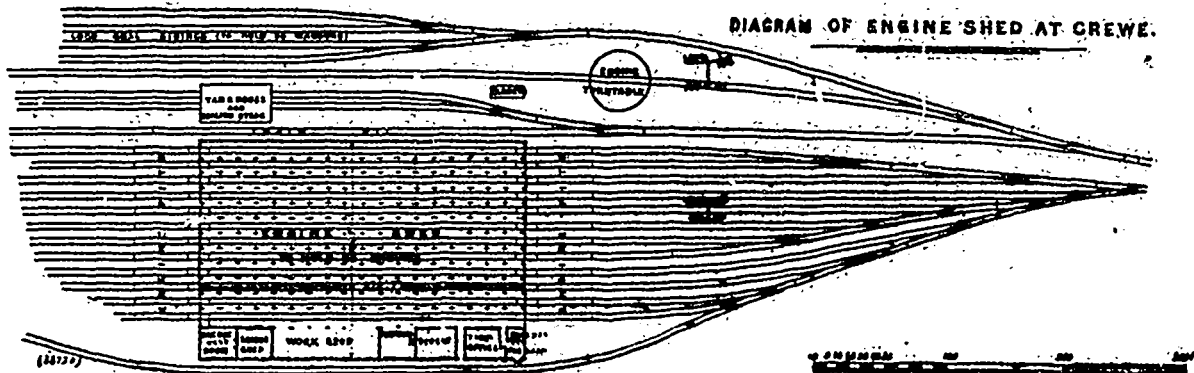


next work is the connecting of the rods and all the intricacies of the valve motion, and then all the internal and external fittings are completed. Before she is taken to the paint shop and polished up, she is sent out on her trial trip. As mentioned before, over 2,000 engines pass through these shops each year for overhauling and repair, and all the engines of the line consume about 3,500 tons of coal per day.

In the wheel shop some very fine machine tools are to be seen. Some of the lathes are capable of turning a wheel nine feet in diameter. One machine called a "roughing lathe," has seven tools all employed at once in taking a rough cut off the crank axle, tearing the steel away in huge bites and making the axle ready for the finishing tool. A "nibbling machine," with 160 cutting tools, eats its way into the solid forging of a crank and cuts out the "throw" or inner bend of the crank. The boiler shops, a view of which is here given, employ several hundred hands, and the noise of riveting is like the roar of a tropical hail storm.

A new engine shed has just been completed, after a design by F. Webb, the able superintendent, to hold 60 standard tender engines. It is a "through and through" shed, and will be used principally for the "turnback" engines arriving at Crewe with goods trains from either the north or south. These will pass into the shed at one end as they come off work, and

It pays over \$57,500 a year in light and harbor dues; its steamboat repairs cost over \$75,000 a year; its marine coal bill is over \$90,000 a year, and the manning of its fleet costs \$215,000 a year. Altogether it spends a trifle under five hundred thousand a year on its steamers. And its canals at Lancaster and Huddersfield cost over \$35,000 a year. During the same period it paid the Government \$75,000 as passenger duty, and its rates and taxes reached the enormous total of over \$750,000. Its telegraphing costs \$285,000 a year. To its superannuation fund, insurance, provident and pension societies and schools it gives \$225,000 a year. Curiously enough, it has among its directors one that is hereditary, as the Great Western has one in Sir Watkin Wynn. This is the Duke of Sutherland, whose father is still known in railway circles as "the real live duke," from an incident which occurred on a line contrasting very decidedly with the North-Western, being that in Sutherlandshire, in the Dunrobin and Helmsdale country, which his Grace practically paid for out of his own pocket. One day he was driving the express on this line as the train passed two navvies. 'There Bill,' said one of them, 'that's what I calls a real live dook; he's a-driving his own engine on his own line, and burning his own blessed coals!' He would be a rich man of whom that could be said on the North-Western."



after cleaning, will come out at the other end for the return journey. The length is 272 feet 7 inches, whilst the breadth is 184 feet 1 inch. All the ironwork is made to template and to standard patterns, so that any part will fit any similar shed, many of smaller dimensions having been erected at different points of the company's lines. The arrangement of tracks is shown in the diagram, which is reproduced from *Engineering*, of London.

To finish with a few more general statistics. The wages bill of the traffic department of the London and North-Western is \$8,455,000 a year; over \$2,000,000 a year is spent in fuel and light for the waiting rooms and cars; the uniforms for the men cost \$150,000 a year, and the printing and stationery amounts to over \$300,000, the actual weight of tickets sold being about 70 tons a year. The passenger trains run over twenty-one million miles a year, and the goods trains (freight) nearly as many, making a total of forty-one million miles. The receipts from passengers and freight make an annual total of over \$32,500,000, and the total weight of passengers and freight thus carried is estimated at 38,000,000 tons.

But, as Mr. Gordon says in the article previously quoted, "there is a North-Western afloat as well as a North-Western ashore; the company is not only a railroad owner, but a canal owner and a steamboat owner.

For THE CANADIAN ENGINEER.

RAILWAY ENGINEERING.*

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ARTICLE III.—TRAFFIC.

Wellington demonstrates that the traffic revenue increases with the (population per mile of railway)².

This is based on the rough assumption that the volume of traffic increases as the distance between two towns diminishes, or that the gross traffic receipts between two towns is nearly a constant, and thus if on a given line we have two traffic points and call traffic 1. Then with three traffic points the traffic = 1 + 2, and with n traffic points the traffic = $n \frac{(n-1)}{2}$, or when n is large we may neglect the second term and say that the traffic for n points = $\frac{n^2}{2}$. Now if we apply this to the individual as a unit, we may deduce the general statement given above. This assumption is not tenable when applied to a special commodity which originates at a fixed place, such as coal. Because the traffic is the same for two towns 150 miles or 15 miles from the coal pit, depending entirely on the demand for coal, on the other

* This series of papers will be issued in book form as soon as they have appeared in THE CANADIAN ENGINEER.