AMERICAN V. ENGLISH LOCOMOTIVES: CORRESPONDENCE, CRITICISM AND COMMENTARY RESPECTING THEIR RELATIVE MERITS

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LOCOMOTIVES.

CORRESPONDENCE,

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THEIR RELATIVE MERITS.

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AMERICAN AND ENGLISH LOCOMOTIVES

(Correspondence Respecting the Relative Merits of).

Presented to both Houses of the General Assembly by Command of His Excellency.

The AGENT-GENERAL, London, to the Hon. the COLONIAL SECRETARY, Wellington.

7, Westminster Chambers, London, S. W. 6th November, 1878.

Sir:—I have the honor to enclose, for the information of the Government, copy of a communication by Mr. R. M. Brereton* on the subject of the superior working results of American locomotives as compared with English railway experience, together with an extract from a letter written by Mr. W. W. Evans to Mr. Higinbotham, Engineer-in-Chief in Victoria, relating to American engines.

I have, &c.,

JULIUS VOGEL,

The Hon. the Colonial Secretary. *Agent-General.*

Mr. BRERETON to the AGENT-GENERAL, London.

Dear Sir: I have the pleasure to send you the following statements in reference to the superior working results obtained from American locomotives as compared with our English railway experience. I can guarantee the correctness of the statements, as they have been a source of careful observation and study by me during the past eight years.

During the past twenty-six years I have spent fourteen years

*Mr. Brereton was the Engineer-in-Chief of the Great India Peninsula Railway.

in India, in the construction and working of one of the principal guaranteed railways, besides four years in this country, and nearly eight in the United States, so that I am able to compare the working results in each country from the standpoint of experience. I have come to the conclusion that we can and ought to construct, equip, and work our railway system in India, in our several colonies, and in this country too, in a far more economical manner than past experience *here* has shown to be possible, or our consulting engineers, managing directors, and agents (who have not had the opportunity of studying the working of the 77,470 miles of railway of the United States) have hitherto believed to be possible.

In regard to locomotives, the Americans certainly obtain from 8,000 to 10,000 train-miles greater duty per annum than we can in this country or in India, and this too under the following drawbacks: Inferior roadbeds, steeper gradients, sharper curves, more severe climate, heavier loads hauled, and less speed in running.

The greater duty obtained cannot be due to better workmanship and superior materials, because it is well known that the English mechanic in skill of hand cannot be excelled, and the very best materials are employed by our English builders, and the hours of work in both countries are nearly the same. Hence, I argue that the greater duty done by the American motor is due to the better design and the better system of working the locomotives. The American builder excels in the system of framing and counterbalancing, and in the designs of the crank, axles, &c., so that the engine may run remarkably easily and without jar round sharp curves, and work not only the light roads, but also diminish the wear and tear on the solid roads, and, at the same time, increase the effective tractive force.

The English engine is a very heavy affair, and, in running, it not only wears and tears itself very rapidly, but also the roadway, and it greatly, by its unsteadiness and jar, fatigues the drivers and firemen. I have ridden hundreds of miles on engines in India, in England, in France, and in the United States, and I have always found the American engine most easy and comfortable, but I never did the English or the Continental engines. As an evidence of this unsteadiness in English-built engines, I may quote the following from the *Railway Service Gazette re* "Narrow-Gauge Engines in India:"—

"The speed on all narrow-gauge lines in India is restricted to fifteen miles an hour, and to run trains on our 3-ft. 3-in. gauge railways at a much higher speed is not safe, owing chiefly to the unsteadiness of the locomotives employed. The wheel-base is rigid, the whole engine is stiff, and, the weight not being equalized, through these and other causes they are very unsteady, the oscillation is very great, and the rigid wheel-base jars going round the sharp curves of the metre gauge. It is also almost impossible to give these engines their full hauling power, simply because the greater portion of the weight cannot be thrown on the driving-wheels."

Another point I have to make is the mistake we make in adhering so obstinately to our old-fashioned system of running the engine with only one crew. Every one who understands the construction and powers of the engine must see that it is capable of a far higher average annual duty than 16,000 to 20,000 train-miles. The engine should be kept in steam as long as possible, in order to avoid the wear and tear due to expansion and contraction which ensue under the present system of daily drawing the fires. The continuous running system would save considerably the present consumption of fuel in the daily getting up steam. They do not find in America that the double-crew system involves any greater cost in repairs and renewals; indeed the life of their engines compares most favorably with the life of engines in this country and on the Continent.

The duty of the driver is to run his engine and keep her in order on his daily trip from depôt to depôt; he has nothing to do with her in the stable or depôt; there she is cleaned, repaired, and got in steam by other hands employed for that purpose. When one crew have taken the engine over their daily stage, another crew run her on, and so they oscillate to and fro, the engine stopping only for repairs and to be washed out. Mr. Juland Danvers's report for 1876–77 shows (on page 11) the number of engines on the whole of the guaranteed railways in India to be 1,425, and (on page 31) that the train-miles were 21,609,411, which gives an average of only 15,164 miles per engine. Deducting say 33 per cent. from the days of the year for the monsoon season, and for repairing-days, there are then 240 days in which the engine should be capable of running 100 to 200 train-miles per 24 hours, or from 24,000 to 36,000 train-miles per annum. Mr. Danvers's report, however, shows that the average mileage per engine was only about 60 miles per 24 hours for, say, 240 days.

From the official returns of the Hudson River Railway, I find that thirteen of the engines in 1877 made a combined monthly average of 6,238 miles for the entire year; four of these ranging from 7,104 to 7,218 miles per month, while the average for the year of all the 97 engines in service was 38,422 miles per engine. One engine in 15 months averaged 7,858 miles per month, or over 255 miles daily for 461 consecutive days, including Sundays. The total life of these thirteen engines was 98½ years, which gives 39,948 miles per annum for each engine for their entire life. The cost of these engines in repairs per mile run was $2\frac{7}{10}$ cents, which is equal to less than $1\frac{4}{10}$ pence per mile. Mr. Ely, the Locomotive Superintendent of the Pennsylvania Railroad, gives the following data in reference to twenty of their engines on the heaviest portion of their system over the Alleghany Mountains for the year 1877:—Ten passenger engines' average annual mileage was 45,554½, and cost of repairs per mile run was 3.48 cents; ten goods engines' annual mileage was 32,574½ and cost of repairs per mile was 3.65 cents; general average of all twenty engines was 39,065½ miles per engine, and cost of repairs per mile run 3.56 cents. One of their passenger engines, No. 133, averaged 237½ miles daily for an entire year (1872). This engine ran, in 1869, 44,616 train-miles; in 1870, 42,900; in 1871, 54,139; in 1872, 86,724; in 1873, 41,979; and in nine years' run it averaged 47,528 per year. Another of their passenger engines, No. 914, ran, in 1874, 60,604 train-miles; in 1875, 58,344; in 1876, 57,225; in 1877, 49,257. A goods engine, No. 447, ran, in 1870, 41,184 train-miles; in 1871, 44,108; in 1872, 42,537; in 1873, 36,877; in 1874, 35,580; in 1875, 36,508; in 1876, 45,529; in 1877, 39,193. This makes an average of 40,189 miles for each of the eight years this engine has been running. On the Erie Railway, Mr. H. J. Jewett, in an official letter, dated 8th April, 1878, gives the following mileage of four engines built by the Rogers Locomotive Works, of Paterson, New Jersey:—

	Mileage.	Placed in Service.
Engine No. 201	635,169	9th June, 1854
Engine No. 202	632,548	26th June, 1854
Engine No. 203	658,548	15th July, 1854
Engine No. 204	539,186	29th July, 1854

These engines had new boilers in 1871, the original boilers running seventeen years. He reports these engines good for eight years' more service at least. He also reports two other Rogers engines, No. 313 and 327, as running with their original fire-boxes since 1865, or thirteen years. The above-mentioned mileage gives an average for the twenty-four years of 25,677 miles per engine. You will observe that these engines on the different railroads must have been well constructed in the first instance, that they could not have been long in the repairing shops, and that they must have been kept in good running order notwithstanding the high duty they actually performed. This is really very remarkable, when you consider the very severe winters of the Middle States, and how destructive snow is to machinery, as well as Jack Frost, when it breaks up in the spring.

In order to arrive at a fair comparison with the cost of repairs in England, there are a number of points which should be equated, such as cost of labor and materials, effects of climate, steeper gradients, sharper curves, and heavier loads hauled, as in all these the American engines labor under greater disadvantages than engines in this country or in India. The Americans economize far more than we do in the first cost, and in repairs and renewal, by adopting a system of interchangeability of parts as much as possible, and by limiting the number of types or classes of engines. It may be said that for all ordinary traffic requirements of any railway system three types are sufficient. The Americans have perfected the three classes known as C, D, and E. Class C is for passenger service, and for level lines, or where the gradients are easy; Class D, known as the "Mogul," for goods and for heavy gradients; Class E, known as the "Consolidation," for roads having exceptionally heavy gradients, or a very large traffic to be hauled. The passenger engine has a four-wheeled truck, which not only swivels, but can move laterally under the front end of the engine by means of a swinging bolster; it can adapt itself to the shortest curves in use on railways, and to the greatest inequalities in the road. The four driving-wheels are equalized together, as also are the four truck wheels. In the goods engine the same arrangement for swinging trucks is found. The truck is composed of only one pair of wheels. On the Lehigh Valley Road, where there is a heavy coal traffic, gauge 4-ft. 8½ in., Class E works over maximum grades of 126 feet per mile, with a maximum load of 329 gross tons of wagons and loading, and the usual load is 235 gross tons. On a gradient of 76 feet per mile, one of these engines draws a maximum load of 140 empty four-wheeled wagons (476 gross tons) at a speed of eight miles per hour. The usual train is 100 wagons (340 gross tons) on an incline three miles in length, with a gradient of 96 feet per mile, combined with frequent curves of 8 and 10 degrees radius, and with only two tangents, each less than a mile long. Engines of this class (E) take forty loaded four-wheeled wagons, which are hauled at a speed of twelve miles per hour. The wagons weigh each 3 gross tons 8 cwt., and carry each six gross tons of coal; so that these engines haul up the above incline a train weighing from 329 to 376 gross tons. They consume 3¾ tons of coal daily.

On the Denver and Rio Grande Railroad 3-ft. gauge, where the maximum gradients are 4 per cent. or 211 feet per mile, and the sharpest curves 30 degrees or 193 feet radius, and where the rise in 14.7 miles is 2,370 feet, and in 10.8 miles 1,136 feet, this class (E) of engines hauls one luggage-van and seven passenger carriages, containing 160 passengers, weighing 100 tons, stretched over a length of 360 feet.

On another narrow-gauge road where the maximum gradient is 140 feet per mile, 3 miles in length, combined with several curves of 574 and 478 feet radius, one of 338 feet, and several reverse curves of longer radius, the regular load of these engines (Class 10/24 E), at a speed of 12 miles an hour, is fifteen coal wagons, weighing 9,500 lbs. each, with passenger carriages weighing 18,000 lbs., making total load, exclusive of tender, of 81¼ tons. As regards train-mileage, the following comparative statement, showing working results on English, American, and Indian railroads for the year 1876–77, will prove interesting and instructive:

English.	*No of Engines.*	*Miles operated.*	*Train-miles per engine.*
Great Western	1,478	2,274	17,397
Great Eastern	505	907	20,600
Midland	1,326	1,588	18,219
London & North-Western	2,058	2,158	15,800
	5,367	6,927	4)72,016
	Average of all	....	18,004