NEW ZEALAND

GOVERNMENT GAZETTE,

(PROVINCE OF WELLINGTON.)

Published by Authority.

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J. WOODWARD,
ACTING PROVINCIAL SECRETARY.

VOL. IX.] SATURDAY, MAY 31, 1862. [No. 16

Provincial Secretary's Office,
Wellington, 16th May, 1862

THE following communications received by His Excellency the Governor are published for general information.

J. WOODWARD,
Acting Provincial Secretary.

London: 3 Bank Buildings, E.C.
25th February, 1862.

SIR,—I have the honour to enclose, for your Excellency's kind consideration, a letter from Mr. William Bridges Adams, C.E., so well known as the promoter of a cheap and efficient system of Roads, a subject which he has advocated, for the past 20 years.

Concurring in the remarks made by Mr. Adams, I venture, as a Merchant of this City, to state to your Excellency that I am prepared to carry out the suggestions of Mr. Adams, and to supply the requisite materials for any lines which may be needed—taking in payment either Cash or the Bonds of the Colony, upon such terms as might be agreed upon with the parties interested; or, I would arrange to place the Bonds in this country in such a way as to afford the desired accommodation and facilities to any of the Colonial Provinces.

I naturally feel the delicacy of addressing your Excellency upon a subject which is apparently one of so mercantile a character, yet, as it really is so intimately connected with the welfare and prosperity of a Colony, I do not hesitate to bring it before your notice.

With much respect,
I have the honour to be,
Sir,
Your Excellency's most obedient
humble servant,
H. GREEN.

To His Excellency
Sir George Grey, K. C. B.,
&c., &c., &c.,
Governor of New Zealand.

(Enclosure 1.)

Holly Mount, Hampstead, near
London, 25th February, 1862.

SIR,—I beg leave respectfully to call the attention of your Excellency to a fact belonging both to ancient and modern times, that an uncivilized or semi-civilized country can only be really subdued or civilized by the process of opening up same Roads. It was so that the old Romans did in ages before Britain began her career. It was by the same process that rebellion was finally extinguished in the Scottish Highlands, and there seems to be no reason why New Zealand should be exempt from the operation of the same law.

Viewing Roads as civilizers, I have for many years turned my studies to the process of cheapening their structure, and especially in our Colonies. The result I have arrived at is, that a simple light rail with a light Engine is the cheapest, the most easily constructed, and the cheapest and most easily worked road—being perfectly fitted for curving valley lines in mountainous countries. I therefore beg respectfully to offer to your attention the enclosed statement and plan, which was last year forwarded to Ceylon by the Secretary for the Colonial Office, and laid before the Government there. It was published in the "Columbo Overland Observer" in September, 1861, and was reprinted in similar terms, with his own name attached, by Mr. Fitzgibbon, the Engineer to the Dun Mountain Copper Company in New Zealand, without acknowledgment. I enclose a copy.

Should your Excellency deem it desirable to sanction this system in New Zealand, Ten miles of permanent way complete, with one light Locomotive and Twenty Vehicles can be delivered in England free on board, for the sum Thirteen thousand five hundred pounds, or £1,350 per mile.

Thoroughly responsible parties would undertake this under my superintendence here.

I have the honour to be,
Sir,
Your most obedient
Faithful Servant,
WILLIAM BRIDGES ADAMS.

To His Excellency
Sir George Grey, K. C. B.
&c., &c., &c.,
Governor of New Zealand.

(Circular—Enclosure 2.)

MR W. BRIDGES ADAMS, of London, the earliest advocate for the proportional adjustment of power and weight to the requirements of local traffic on railways, has produced a system of rails, engines, and trains, adapted for Branch lines and Colonies, at a very small comparative cost. The rail is five inches in depth, equal to that of the ordinary English standard, but weighing only from 25 to 28 pounds per yard. It is fished at the joints and secured by transverse trenails of hard wood between longitudinal timbers of small scantling, which give great vertical and horizontal stiffness, and is trenailed down to cross ties at intervals of nine feet. The guage of way is three feet 6 inches, but may be wider if preferred. The engine is on four coupled wheels, the total weight being eight tons, equally distributed. It is adapted for speeds of fifteen to twenty miles per hour, and carries fuel and water for that distance. It will be seen that the engine being only one fourth of the ordinary modern weight, will not crush the rails which are one-third the ordinary weight, while the bearing surface of the timber sleepers on the ground or ballast, is little less than the ordinary area. It may be laid where needful without ballast, will be perfectly efficient in dry weather, and will be little liable to disturbance in rain.

In economizing traction, it is important so to construct the vehicles that they may be convertible to various uses, as for example the conveyance both of cotton bales and passengers. It is also important that the weight of the vehicles should not exceed one half the weight of the load. The vehicles on this system weigh one ton and a quarter, and the load is two tons and a half. Moveable seats are provided so that the wagon becomes an open carriage, capable also of being covered in, and by a peculiar construction of springs, it will carry a few passengers as easily as a heavy load of goods, the power of the springs varying with the load, and saving the road from damage. The axles run loose in their boxes, and the wheels of the carriage run independently on their axles. One carriage will carry forty passengers. If required, first class bodies can be applied on the same frames.

The engine and train are adapted to work curves of three to four chains radius, and will ascend slopes of one in twenty, with a gross load of twenty tons, and one hundred and sixty tons on the level. There may occasionally be a need of passing up a steep slope, but with their trains adapted to sharp curves there is no difficulty in skirting hills, instead of ascending them pursuing the valley lines. Assuming a continuous gradient of one in one hundred, the gross load will be sixty-five tons. If merely short runs of one per hundred, the load may be taken at one hundred tons and the net or paying loads at sixty tons. The same rails may be used for horse traction, but in such case it will be needful to provide a good road for the horses feet. The engine, with its wheels set further apart, and increased in diameter, can be applied for the conveyance of passengers at thirty miles per hour.

The cost of laying down the rails must of course vary with circumstances and localities. In the plains of Australia and India it could scarcely exceed one to two hundred pounds per mile. Bridges are not included in the estimate, but as the heaviest portion of the train does not exceed ten cwt. per foot run, very light bridges —which may be exported—will suffice. The sides of ordinary roads may be taken advantage of.

The weight of ten miles of line, one engine, and twenty vehicles, including rails, sleepers and fastenings, will not exceed seven hundred and eighty tons—equal to the transit in one train of eight hundred passengers, or fifty tons nett of goods, so that the freight may be calculated.

The cost of this delivered in England will be at the present time £ ——

(Enclosure 3.)

DESCRIPTION OF IMPROVED RAILROAD, SUITABLE FOR THE COLONIES, AND FOR BRANCH LINES, OR FEEDERS TO MAIN TRUNK RAILROADS.

IT being very desirable that a system of Railroad be introduced, suitable for the requirements of a moderate traffic conveyed at a low rate of speed, and which may be constructed at a low cost within the means of our colonies, and of rural districts in Europe, the following description of improved Railroad is submitted, as being found to fulfil the conditions desired, and which has received the approval of many eminent engineers and capitalists.

In Railroad construction the weight of the locomotive engine intended to be used, and the speed proposed to be maintained, governs the strength and cost of structure.

The engines in use upon most European and American Railroads weigh from twenty-six to thirty-six tons, exclusive of the weight of the tender; and the running speed ranges from twenty-five to fifty miles an hour, with gross loads of from eighty to three hundred tons.

These weights and speeds involve the adoption of a permanent way (rails, sleepers, &c.) of great weight and solidity; the rails weighing from 65lbs. to 100lbs. per yard, and necessitating the construction of bridges and substructure of a correspondingly massive and expensive character.

It needs no argument to prove that a Railroad so constructed, and suitable for carrying the enormous traffic existing between the large European and American cities, is more than is demanded by the requirements of an ordinary traffic and a thin population, such as is generally to be found in our colonies and in our agricultural districts at home.

It is found that for the conveyance of a traffic beyond the capacity of ordinary macadamised roads, at a speed not exceeding twenty miles an hour, a locomotive engine, weighing not more than eight tons, running upon light rails, is sufficient.

Engines of this kind have, of late years, been patented by various inventors, such as Bloydell, Bray, Taylor, and others, whose traction engines are constructed for running on ordinary macadamised roads, and have been adopted by several ship-builders and others, and by Government for use in the national dockyards, and for service in India.

A locomotive engine, somewhat similar in principle to these, weighing eight tons, on four coupled wheels, with a gauge of 3ft. to 3ft. 6in., and capable of passing round curves of four to five chains radius, will draw upon a level Railroad, a gross load of 160 tons, at a speed of fifteen to twenty miles an hour; a gross load of sixty-five tons up an incline of one foot in 100, and of 35 tons up an incline of one foot in forty; and of twenty tons up an incline of one foot in twenty.

The weight of engine being reduced to about one-fourth that of ordinary locomotives, the weight and strength of bridges and permanent way can be reduced proportionably; so that, instead of having a rail weighing 65lbs. to 100lbs. to the yard, one of 30lbs. to the lineal yard is ample.

The width between the rails (or gauge) being only 3ft. to 3ft 6. in., curves of four to five chains radius being admissible, and gradients so steep as one foot in twenty employed, the natural surface of the ground can be the more readily followed; and heavy earthworks and viaducts being avoided, the formation of the road-bed, bridging, and all the work underneath the ballast usually denominated "the substructure," will be of an inexpensive character.

The road-bed, at formation level, need not be more than sixteen feet wide, including three feet on either side the ballasting for side drains.

For the light engines and trains used on these lines, the heaviest portions of which do not exceed 10cwt. per foot run, wire suspension bridges, at a very low cost, such as those used in America, will answer every purpose; these are very durable, and are made up to spans of one thousand feet or more.

The permanent way, occupying a width of only six feet, may be laid down along the sides of common roads, and the traffic worked by horses, where it is not sufficient to necessitate the use of locomotive engine power. The rail used is five inches in depth, and weighs 30lbs. per yard; it is fished at the joints, and secured between longitudinal timbers of hard wood which give great vertical and horizontal stiffness; it is trenailed down to cross sleepers placed at intervals of nine feet.

The locomotive engine, used as before described, is adapted for speeds of fifteen to twenty miles an hour, and carries fuel and water for that distance.

The engine, being about one-fourth the weight of ordinary locomotives, will not crush the rails, which are something over one-third the ordinary weight while the bearing surface of the timber sleepers upon the ballast is little less than the ordinary area.

The sleepers may be laid upon six inches in depth of ballast; and, by proper attention to the drainage, the permanent way can be kept in perfect order at a small expense, as compared with the cost of upkeep of that of an ordinary Railroad.

In economising traction it is important so to construct the vehicles that they may be convertible to various uses; as, for example, the conveyance of wool, cotton, passengers, &c.

It is also important that the weight of the vehicles should not exceed one-half the weight of the load.

The vehicles, on this system, weigh one ton and a quarter, and the load is two tons and a-half.

Moveable seats are provided, so that the wagon becomes an open carriage, capable also of being covered in, and, by a peculiar construction of springs, it will carry a few passengers as easily as a heavy load of goods, the power of the springs varying with the load, and saving the road from damage. The axles run loose in their boxes, and the wheels of the carriages run independently upon their axles. One carriage will carry forty passengers. If required, first-class bodies can be mounted on the same frames, with a three feet six inch guage; the carriage bodies are seven feet wide. The weight of ten miles of line, including one engine, twenty carriages, rails, sleepers, and fastenings, will not exceed 800 tons; equal to the transit, in one train of 800 passengers, or fifty tons nett of goods; so that the freight from England may be calculated—

Cost of Ten Miles of Line.

Rails, Sleepers, one Engine, and Twenty Vehicles, in England	14,000
Freight, Insurance Charges, Unloading and Stacking Rails and Sleepers, &c.	2,500
Ballasting and Boxing, £300 per mile..	3,000
Laying Permanent Way, including Haulage of Materials, &c.........	2,000
	£21,500

Or, say £2,200 per mile, including rolling stock complete, if laid down along the side of existing roads.

If laid down in a locality where there are no roads in existence, forming and levelling for a width of sixteen feet, and draining and bridging, fencing, &c., would be required, and the expense per mile added to the above estimate.

The trains being adapted to sharp curves of four to five chains radius, inclinations of one foot in twenty capable of being ascended, and the heaviest portion of the train not exceeding 10 cwt. per foot run, the substructure for the line will not, except in very exceptional cases, exceed £1,000 to £1,500 per mile, exclusive of purchase of land and fencing.

As compared with the cost of Ari ant-usal Railways (of £30,000 to £40,000 per mile), the foregoing estimate seems ridiculously low; yet the writer is able to state, from actual experience of Railway construction in Europe, America, Ceylon, and New Zealand, that a line of the description given can be constructed and equipped for the estimate mentioned.

The writer has been for some time engaged in the setting out, and in the construction of a Railroad (the route for which was selected by Mr. Doyne) for the Dun Mountain Copper Mining Company (limited), from the port of Nelson, New Zealand, to the Company's mines in the interior.

Eleven miles of this line are constructed through a most difficult country, the rise in that distance being about 2,800 feet. Five miles of the line have a gradient of one foot in eighteen, succeeded by four and a half miles having a gradient of one foot in twenty.

The curves range from one chain to ten chains radius; and of the eleven miles, not more than half a mile in the aggregate is straight.

The line is, at present, but six feet wide at formation level, and is cut out of the mountain, sides the entire way, which are very steep, having an average inclination to the horizon of thirty-three degrees.

About two thirds of the excavation is in rock, the remainder clay.

The gauge of the line is three feet, with a rail of 30lbs. to the yard, fished at the joints, supported by transverse sleepers of black birch timber, 8in. by 4½in., placed three feet apart.

The sleepers rest on eight inches in thickness of broken stone ballast, and the space between the sleepers is filled up with similar material, which, having two inches of gravel on top, forms a most excellent roadway for the horses which work the traffic.

The cost of this line, as it is, including permanent way, and rolling stock imported from England (say two wagons to the mile), has not exceeded £2,000 per mile.

Tenders have been received for widening the road bed of the line to ten feet, for £600 per mile; and if £400 per mile additional were expended in easing the curves, so that they should not be less than three chains radius, and £400 per mile in replacing the dry masonry in some of the culverts with rubble masonry in mortar, we should have, at a cost not exceeding £3,600 per mile, a very substantial and good line, up which a traction engine might work, or a team of two horses could take a nett load of two tons with ease; the nett load now taken up by such a team being one and a quarter tons, at two miles per hour.

Considering the results which have been attained under unusual difficulties, upon the Dun Mountain Railroad, with a country to traverse somewhat similar to the Semering Pass in Austria, the Bore Ghauts near Bombay, or to the Kandian range in Ceylon, and with ordinary labour at ten shillings for eight hours' work; it is assumed that an estimate which has been found sufficient for railroad construction at Nelson, will more than suffice for localities where the difficulties of country are not so great, nor the state of the labour market and other conditions so unfavourable and so exceptionable.

Wherever, after laying down the description of permanent way referred to, the traffic so increases as to necessitate the use of more powerful and heavier engines and vehicles, a heavier kind of permanent way can be substituted, and that taken up can be relaid in extension of the main line, and used as a feeder thereto, or for branch lines.

In many localities, where stone suitable for metalling ordinary roads, and timber for bridges are difficult to procure, and where labour and haulage is expensive, the improved railroad will be cheaper in first cost, and in after cost of upkeep, than a macadamised road.

It may further be remarked, that mineral and other regions, such, for instance, as that through which the Dun Mountain Railway passes, presenting such difficulties of country as to put the construction of ordinary Roads for any useful purpose out of the question, may be traversed, easily and inexpensively, by lines of Railroad made on the improved system described; and so districts abounding in mineral and other wealth may be opened up, which, otherwise, are practically inaccessible.

Moreover, the Railroad can be used in conveying material for forming, bridging, and metalling the macadamised road, wherever it may be desirable to construct such alongside the Railroad; the road being used for the purely local purposes required by an agricultural community, and the Railroad used for the through traffic between the various settlements upon its route.

American experience proves that many advantages are gained by having an ordinary road alongside a Railroad; while the inconveniences sometimes supposed to result from having locomotive engines running alongside ordinary roads traversed by horses and vehicles are found to be more imaginary than real.

One of the chief advantages, however, of the improved Railroad is, that it can be worked either by engine or horse power at pleasure, or by both.

A. C. FITZGIBBON, C.E.,
Engineer and Manager to the Dun Mountain Copper Mining Company, Nelson, New Zealand.

October, 1861.

Printed under the Authority of the Government of the Province of Wellington by Thomas McKenzie and James Muir, Printers for the time being to such Government.