1877.

NEW ZEALAND.

NEW ZEALAND COAL AS FUEL FOR LOCOMOTIVES

(CORRESPONDENCE RELATIVE TO THE TRIAL OF).

Laid on the Table by the Hon. Mr. Sheehan with leave of the House.

No. 1.

Mr. WASON, M.H.R., to the Hon. the MINISTER for PUBLIC WORKS.

DEAR SIR,— Kowai, South Rakaia.

I shall be glad to learn when the promised trial of the Malvern coal will take place. I think the best place to try it would be on the short branch line from White Cliff Junction to Surveyor's Gully. Coal is there in abundance; and Mr. McIlraith, the manager of the mine, would afford every assistance to your engineers.

I have, &c.,
J. CATHCART WASON.

The Hon. E. Richardson, Christchurch.

No. 2.

Mr. WERRY to Mr. WARNER, Railway Engineer, Christchurch.

MR. WARNER,— 30th December, 1876.

The Hon. Mr. Richardson would feel obliged by your supplying the information, to enable him to reply to the first part of this letter.

N. W. WERRY.

No. 3.

The RAILWAY ENGINEER, Christchurch, to the Hon. the MINISTER for PUBLIC WORKS.

Railway Engineer's Office, Christchurch,
HON. E. RICHARDSON,— 9th January, 1877.

I have taken the opportunity of seeing Mr. McIlraith, and arranging with him for a suitable quantity of his coal being supplied, to enable me to properly test it.

I have two other kinds of coal for trial besides this, and I purpose making trial of them at once.

J. G. WARNER,
Railway Engineer.

No. 4.

Mr. WERRY to Mr. WASON, M.H.R.

SIR,— Public Works Office, Christchurch, 9th January, 1877.

I am directed to acknowledge receipt of your undated letter, requesting information with regard to the proposed trial of Malvern coal, and, in reply, to state that the Railway Engineer has arranged with Mr. McIlraith for a suitable quantity being supplied, to enable him to properly test it. He has also obtained two other kinds of coal, and purposes at once making a trial of the various samples.

I have, &c.,
N. W. WERRY.

J. C. Wason, Esq., M.H.R., &c., Christchurch.

No. 5.

J. C. Wason, Esq., M.H.R., to the Hon. the Minister for Public Works.

Sir,— Christchurch Club, Canterbury, New Zealand, 4th April, 1877.

During the last session of Parliament I had the honor to move for a Select Committee to inquire as to the expediency of using brown coal upon the Canterbury Railways. The Committee reported that it was most desirable this brown coal should be used whenever practicable. Mr. Richardson gave a very distinct promise that at any rate the Government would make trial of it. I have already suggested to Mr. Richardson the expediency of making trial of this coal upon that part of the Canterbury Branch Railways from Horndon, or late White Cliffs Junction, to White Cliffs, and, although I have received repeated assurances that a fair trial would be made of this coal, as yet nothing has been done. I have further to direct your attention to the assurance given by Mr. Richardson that the terminal charge for loading and unloading coal would be assimilated to those at present prevailing in Otago.

I have, &c.,
J. Cathcart Wason.

J. D. Ormond, Esq.

No. 6.

The Hon. the Minister for Public Works to the Engineer-in-Chief.

Sir,— 9th April, 1877.

I communicated with Mr. Richardson on the subjects Mr. Wason writes about, and find he did make the promises stated. Please instruct that parties wishing to have the Malvern coal tried can do so by sending five tons to the nearest railway, that public notice might be given to this effect, so that it may be generally known by the coal-owners. When tried, the coal should be reported on. Please note what you advise as to terminal charges on coal.

I have, &c.,
J. D. Ormond.

The Engineer-in-Chief.

No. 7.

The Under Secretary, Public Works, to Mr. J. C. Wason, M.H.R.

Sir,— Public Works Office, Wellington, 23rd April, 1877.

I am directed by the Hon. the Minister for Public Works to inform you, in reply to your letter of the 4th instant, that instructions have been given to the General Manager of the Canterbury Railways to notify to pit-owners the willingness of the Government to test such samples of local coal of five tons and upwards as may be sent to the Manager for that purpose, so soon as the alterations in the locomotives (which the experiments will necessitate) have been made.

I enclose a copy of the last *New Zealand Gazette*, from which you will perceive that your request in reference to the terminal charges on minerals has been also attended to.

I have, &c.,
John Knowles,
Under Secretary for Public Works.

J. C. Wason, Esq., M.H.R.,
South Rakaia, Canterbury.

Enclosure in No. 7.

[No. 34. Supplement to *New Zealand Gazette* of Thursday, 12th April, 1877.]

Rates for Storage and Delivery of Grain at the Gladstone Pier and Lyttelton Railway Sheds, and for Conveyance of Minerals—Amberley to Moeraki Railway, and Branches thereof.

In accordance with the By-laws for the New Zealand Railways, fixed by Order in Council dated the 17th day of April, 1877, the following rates for the storage and delivery of grain, and for the conveyance, loading, and unloading of minerals, are hereby declared to be fixed, and shall be paid by persons using the railways from this date forward, until altered, on that portion of the railway from Amberley to the Bluff situated between Amberley and Moeraki, and on the branch lines in connection therewith, in substitution of all previous rates for storage and delivery of grain, and for conveyance, loading, and unloading of minerals, except for the conveyance, loading, and unloading of minerals on the Lyttelton branch.

Table of Rates for Storage and Delivery of Grain for Lyttelton Station and the Gladstone Pier.

	£	s.	d.
For grain not taken delivery of by the consignee within five (5) working hours after arrival (to be kept in the railway wagons or stored at the risk of the consignees or owners, and at the option of the General Manager), for receiving and delivering to the ship, at per ton	0	2	6
after which, for each week or fraction of a week, a charge for storage will be made, at per ton or fraction of a ton, of	0	0	6
and after three (3) weeks, provided that the consignees or owners, upon demand, fail or neglect to take delivery when required by the General Manager, from the date of such demand a charge will be made per ton or fraction thereof per day or fraction thereof, of	0	0	2
Demurrage for each truck not unloaded by a consignee or owner of the grain under contract to do so, within eight (8) working hours after arrival, will be charged at the rate of per truck per day or fraction thereof	1	0	0
Haulage from private store to wharves, at per ton or fraction of a ton	0	0	6

TABLE OF RATES FOR THE STORAGE AND DELIVERY OF GRAIN AT ALL OTHER STATIONS EXCEPT LYTTELTON STATION.

	£	s.	d.
For grain brought by rail not taken delivery of by the consignees or owners within twelve (12) working hours after arrival, at per ton or fraction of a ton per day or fraction of a day ...	0	2	0
Demurrage for each truck not unloaded by a consignee or owner of the grain under contract to do so, within twelve (12) working hours after arrival, per day or fraction of a day	1	0	0

TABLE OF RATES FOR CARRIAGE, LOADING, AND UNLOADING OF MINERALS (CARRIED AT OWNER'S RISK).

	£	s.	d.
Minimum charge	0	6	0
For distances not exceeding fifty miles, at per ton per mile	0	0	2
After the first fifty miles, at per ton per mile	0	0	1½

Full trucks charged for, owner loads and unloads. For each loading or unloading done by the railway, 6s. 3d. additional per truck will be charged.

Includes:	Bones		Includes:	Iron ore	
	Bricks			Limestone	
	Clay			Lime, in bulk	
	Coal, minimum per ton	0 2 6		Manures, animal	
	Coal, dross			Marble, in rough blocks	
	Coke, double rates			Pyrites	
	Copper ore			Quartz and quartz tailings	
	Drain pipes and tiles			Road metal	
	Flagging			Sand	
	Granite, rough			Ships' ballast	
	Gravel			Stone, rough.	

Any of the above in lots of less than two tons, if in bags or packages, to be as Class B.
Fraction of ton as a ton. Fraction of mile as a mile.

Dated this 18th day of April, 1877.

J. D. ORMOND,
Minister for Public Works.

No. 8.

The UNDER SECRETARY, Public Works, to the SUPERINTENDING ENGINEER, Christchurch.

(Telegram.) Wellington, 6th August, 1877.

INQUIRIES are being made as to whether you have tried the Canterbury coals, about which Mr. Maxwell sent you a memorandum on 16th April. If so please report, and if not, please enable Minister to explain delay.

JOHN KNOWLES,
Under Secretary for Public Works.

W. Conyers, Christchurch.

No. 9.

The SUPERINTENDING ENGINEER, Christchurch, to the UNDER SECRETARY, Public Works.

(Telegram.) Christchurch, 7th August, 1877.

Re trial of coal. Instructions were issued to locomotive engineer in April to have the trial made as early as practicable, as the engine selected for the purpose would require several alterations and a special chimney made and fitted. She was taken into the shop for repairs, and would then go out in thorough working order, and would give a more satisfactory trial. Engine now being painted, will be ready this week and the trial made at once, and the result communicated to you.

J. Knowles, Esq., Wellington. W. CONYERS.

No. 10.

The ENGINEER-IN-CHIEF to the Hon. the MINISTER for PUBLIC WORKS.

19th August, 1877.

I SHOULD like to send ten tons of Sheath's coal to Auckland to be tested there. Will you please authorise £20 for the purpose?

The Hon. the Minister for Public Works. J. CARRUTHERS.

Approved for the Minister.—J. KNOWLES.—11/10/77.

No. 11.

The ENGINEER-IN-CHIEF to the SUPERINTENDING ENGINEER, Christchurch.

(Telegram.) Wellington, 11th September, 1877.

Re trial of native coal. Wire Engineer-in-Chief results up to date. Please send information before 12 to-day if possible. Matter very urgent.

C. T. BENZONI,
(For Engineer-in-Chief.)

W. Conyers, Esq., Christchurch.

No. 12.

The SUPERINTENDING ENGINEER, Christchurch, to the ENGINEER-IN-CHIEF.

(Telegram). Christchurch, 11th September, 1877.

Re native coal trial, Mr. Conyers absent on duty. Have requested Mr. Smith to furnish particulars at once. Will wire you as soon as received.

JNO. MENZIES,
(For Superintending Engineer.)

The Engineer-in-Chief.

No. 13.

The ENGINEER-IN-CHIEF to the Hon. the MINISTER for PUBLIC WORKS.

Order Paper of 11th September, 1877.

11th September, 1877.

In re Trial of Native Coal on Canterbury Railways.

No. 1, Mr. Wason's question:

The engine was stated to be ready, all but a little painting, on the 8th August. Sufficient time has hardly elapsed to give correct results yet.

In reply to Mr. Wason's question, it might be stated that the Locomotive Engineer has altered the engine, and that reports on the trials are expected early.

The Hon. the Minister for Public Works. JOHN CARRUTHERS.

No. 14.

The SUPERINTENDING ENGINEER, Christchurch, to the ENGINEER-IN-CHIEF.

(Telegram). Christchurch, 11th September, 1877.

Re trial of native coal. Mean consumption of native coal per mile, 83·17. Mean cost per mile, 8·54. Mean for Newcastle coal, 24·8 and 3·97. Analysis by first post.

The Engineer-in-Chief. J. MENZIES.

No. 15.

The SUPERINTENDING ENGINEER, Christchurch, to the ENGINEER-IN-CHIEF.

Public Works Office, Christchurch (Constructed Railways Branch),
12th September, 1877.

I HAVE the honor to forward herewith particulars of five trials made by the Locomotive Engineer of the Christchurch Section New Zealand Railways, with a view to testing the economical qualities of the native coal as a fuel for locomotives.

The experiments, as will be seen by the table attached, are very unsatisfactory, the mean result being—cost of native coal, 8½d. per mile, against 4d. for Newcastle.

The engines in use here are, in my opinion, quite unfitted for the burning of native coal, the grates being very limited in area, and the blast proportionately strong.

As the question is one of great colonial importance, I would respectfully urge upon the Government the desirability of importing a locomotive built specially for testing the qualities of the native coals. The difference in cost between the special engine and the ordinary one now in use would be trifling, and I believe the result would be satisfactory.

I attach herewith a copy of a table of experiments made on the Bluff Harbour and Invercargill Railway on the 5th of June, 1868, with coal from the Nightcap, the result comparing favourably with that shown by Mr. Smith.

I have, &c.,
W. CONYERS,
Superintending Engineer.

The Engineer-in-Chief, Wellington.

Enclosure 1 in No. 15.

The LOCOMOTIVE ENGINEER, Christchurch, to the SUPERINTENDING ENGINEER, Christchurch.

SIR,— 11th September, 1877.

I have the honor to forward you herewith a statement of trials made on native coal as a fuel for the locomotives on the Christchurch Section of the New Zealand Railways. The five trials are not the only ones we have had, but are selected as having been made on engines specially altered to suit the draught required.

The results have, to my mind, been very unsatisfactory, and a comparison of cost with that of Newcastle coal shows that it would not be economical to use it. No doubt if our engines were specially designed to burn lignite coal, and if the firemen were carefully trained to its use, we should be able to show better results.

We have also tried this coal in the workshops' engine, but the result there shows that we require nearly twice the quantity. I cannot see how native coal can pretend to compete with the present low rate at which we are supplied with Newcastle coal.

In conclusion, I must apologize for the delay in rendering this return, and plead as an excuse the great variety and amount of other subjects which have been receiving my attention.

I have, &c.,
ALLISON D. SMITH.

The Superintending Engineer, Christchurch.

Sub-Enclosure to Enclosure 1 in No. 15.

ANALYSIS of COST and CONSUMPTION of NATIVE COAL compared with that from Newcastle, N.S.W., as shown by Experiment on the Christchurch Section of the New Zealand Railways.

No. of Trial.	Name of Owner.	Situation of Colliery.	Cost per Ton in Christchurch.	Quantity Experimented.	No. of Engine.	Weight of Train.	Steam Pressure per Square Inch.	Condition of Road.	State of Weather.	Time-Sheet Delays (if any).	Quantity of Coal per Mile.	Cost of Coal per Mile.	Quantity of Newcastle Coal per Mile.	Cost of Newcastle Coal per Mile.	Remarks.
				Tons.		Tons.					lbs.	d.	lbs.	d.	
1	Mr. Jebson ...	Sheffield ...	20/6	10	G. 52	105	Started with 115 lbs., but had to stop continually to blow up fire and supply boiler	Wet ...	Raining	Lost 3 hours in 70 miles' run	92·84	10·21	21·0	3.36	Engine in first-class order, but unsuited, as it was necessary to carry coal in a truck. These tank engines can never carry a proper supply of native coal.
2	„ ...	„ ...	20/6	10	J. 20	225	Started with 120 lbs.; had to stop every 4 miles to blow up fire and supply boiler	Dry ...	Fine ...	Lost 3 hours and 15 minutes in a run of 36 miles	82·0	9·02	25·0	4·0	The grate bars of engine were altered to suit this coal, but the result was entirely unsatisfactory.
3	Mr. Parker ...	Springfield ...	23/6	10	J. 20	217	120 lbs.	„ ...	„ ...	None	57·0	6·38	23·0	3·68	Kept time very well, but considerable time and labour wasted at stations cleaning fires.
4	Mr. Sheath ...	Malvern ...	15/	10	J. 20	100	Started with 120-lb. pressure, but could not be maintained	„ ...	„ ...	Lost 10 minutes in 106 miles	59·0	4·72	21·0	3·36	With a heavy load it was found impossible to maintain steam.
5	Mr. McIlwraith ...	Glentunnel ...	18/6	10	J. 20	235	Started at 120 lbs.; had to stop continually to raise pressure and supply boiler	Wet ...	Boisterous wind	Lost 40 minutes in 53 miles	125·0	12·37	34·0	5·44	Found impossible to maintain pressure in boiler.
	Mean ...	...	19/7·2	...	...	176·4	...	...	...	...	83·17	8·54	24·8	3·97	

ALLISON D. SMITH,
Locomotive Engineer.

Enclosure 2 in No. 15.

EXPERIMENTS made on the Bluff Harbour and Invercargill Railway with Coal from the Nightcap, 5th June, 1868.

—	Newcastle Coal.	Thompson's Coal.	Capt. Howell's Coal.
Mean temperature of water during experiment... ...	57°	47°	50°
Economic value, or lbs. of water evaporated by 1 lb. of coal	8·38	3·87	4·67
Rate of combustion, or lbs. of coal burned per hour, per square foot of fire grate	39·01	87·26	101·23
Rate of evaporation per square foot of fire grate per hour, in cubic feet of water.	5·24	5·42	7·59

W. CONYERS,
Permanent Way and Locomotive Manager.

No. 16.

The DISTRICT ENGINEER, Wellington, to the ENGINEER-IN-CHIEF.

SIR,— 17th September, 1877.

I would suggest having a more complete report, giving alterations to engines, for comparison with Auckland results, and grades on which trials were made, without which it is of no use trying to make a reliable comparison. In event of more promising results from further trials, the Canterbury owners must be prepared to guarantee supplies at a lower rate than the majority are prepared to supply for, if the use of native coals is to be economical.

I have, &c.,
J. P. MAXWELL.

The Engineer-in-Chief.

No. 17.

The SUPERINTENDING ENGINEER, Christchurch, to the ENGINEER-IN-CHIEF.

(Telegram.) Christchurch, 18th September, 1877.

Re coal trial, Class G, 10½-inch cylinder, four wheels coupled, double bogie; Class G, 14-inch cylinder. The funnel was altered to the tracing supplied for the first experiment, but engine was found to steam better with the straight one, so that form was adopted in the succeeding experiments; the air-spaces in fire-bars were contracted to ⅜ inch, but some trials were made with the bars rather wider; the road was practically level for the purpose of this experiment, the ruling grade on the main line being 1 in 100, and in the branch 1 in 107.

The Engineer-in-Chief. W. CONYERS.

No. 18.

The SUPERINTENDING ENGINEER, Christchurch, to the ENGINEER-IN-CHIEF.

(Telegram.) 21st September, 1877.

THE result of a preliminary trial of Shag Point coal, made yesterday with 14-inch cylinder tender engine is so far very satisfactory. Plenty of steam, no clinkers, and consumption much lower than in previous experiments. Will report fully after further trials.

The Engineer-in-Chief. W. CONYERS.

No. 19.

Mr. R. J. UNDERDOWN to the RAILWAY MANAGER, Auckland.

Trial of Christchurch Coal at Auckland.

SIR,— Wellington, 13th October, 1877.

I am directed to inform you that ten tons of native Christchurch coal will be sent you, and that it is desired you should give it a careful trial under the same conditions as the Waikato coal, in order to test the relative values, and when you have done so to furnish the Engineer-in-Chief with a detailed statement of the results obtained.

Mr. Macdonald, Auckland. R. J. UNDERDOWN.

No. 20.

The SUPERINTENDING ENGINEER, Christchurch, to the ENGINEER-IN-CHIEF.

(Telegram.) Engineer-in-Chief's Office, 15th October, 1877.

Re Malvern coal. Have given instructions to forward ten tons Parker, Springfield coal, to address of Storekeeper, C.R., Auckland.

JOHN MENZIES,
(For Superintending Engineer.)

The Engineer-in-Chief.

No. 21.

The SUPERINTENDING ENGINEER, Christchurch, to the ENGINEER-IN-CHIEF.

(Telegram.) 15th October, 1877.

Re Malvern coal. Since despatch of my telegram of this date, written authority has been received for £20 for purchase of ten tons of Sheath's coal. Locomotive Engineer reports Parker as the best. Please instruct me which to send.

JOHN MENZIES,
(For Superintending Engineer.)

The Engineer-in-Chief.

No. 22.

The SUPERINTENDING ENGINEER, Christchurch, to the ENGINEER-IN-CHIEF.

(Telegram). 24th October, 1877.

Re coal from Auckland. Obtained from Parker, Springfield pit.

The Engineer-in-Chief. W. CONYERS.

No. 23.

MEMORANDUM FOR ENGINEER-IN-CHIEF.

In re Canterbury Coal.

I RECEIVED the Canterbury coal on November 1st. It was served out to two engines on the 2nd, the Fairlie and a 6-wheels coupled. On Sunday, 4th, two trials were made from Auckland to Newcastle. The 9-inch cylinder Fairlie, with a train of two sets of rail trollies (timber trucks), seven high-sided wagons of sleepers, and van; total weight, 80 tons 8 cwts. Left Auckland 7.50 a.m., arrived at Newcastle 12.41 p.m.

The other train was taken by a 6-wheels coupled 10½-inch cylinder class F engine. Three sets of rail trollies, one high-sided wagon of fastenings, and van; total weight, 59 tons 19 cwts. Left Auckland 8.20 a.m., arrived at Newcastle 1.6 p.m.

I attach tracings of the line as far as Mercer, showing grades, but beyond Mercer, not having a section, I have merely given the distances. In comparing these results with the previous ones sent you of Waikato coal, trial plotted on same section, it must be borne in mind that the class F engine, with Waikato coal, is shown with 10-lb. pressure light. I was incorrectly informed in starting that the gauge was wrong. You have, therefore, to add 10 lbs. to each pressure given with class F engine in Waikato coal trial.

The trial of both kinds of coal was made with the same Fairlie, but with different class F engines.

The Fairlie had a fine day for the Waikato coal, and 83¾ tons distributed on a few vehicles, being iron; but for Canterbury coal a wet misty day, 3 tons less, but more vehicles, having a lot of sleeper wagons. She slipped badly in the bank going out of Auckland yard, the rails being very greasy, and also slipped on the long bank at 26 miles.

The class F had same load within 1 cwt., distributed in same manner in both trials; only slipped in bank at 26 miles.

The Fairlie made the trip train—83 tons 15 cwts., with 20 cwts. Waikato; 80 tons 8 cwts., with 22 cwts. Canterbury.

The class F made the trip train—60 tons, with 12 cwts. Waikato; 59 tons 19 cwts., with 10½ cwts. Canterbury. Total distance, 73½ miles.

WEIGHT OF COAL.

Canterbury, 1 cubic yard	1,433 lbs.
Waikato, 1 „	1,209 „
Difference	224 „

ASH IN SMOKE-BOX.

	lbs.	oz.
Equal quantities, Canterbury	4	13
„ „ Waikato	2	12
Difference	2	1

Its appearance seems to be between our own contract coal, Taupiri Coal Company, and Foote's Miranda coal. It is more lasting than the Waikato, appears to have less smoke; is heavier, especially the ash. Has more clinker than the Taupiri, about the same as Miranda. The Taupiri, in fact, has seldom any. The Fairlie had about four shovelsfull of clinker in each fire-box.

The class F about five shovelsfull; scarcely any ash in either ash-pan. From this I am led to believe that the Canterbury coal could be burnt with ordinary fire-bars, and perhaps without spark-catchers. Having one old-style chimney left, I purpose, after the approaching holidays, to replace it on one of the engines, and, with fire-bars separated, by taking out some of them, to have a trial up the bank with a heavy load at night, to see whether many sparks are thrown out.

Auckland, 6th November, 1877. A. V. MACDONALD.

No. 24.

MEMORANDUM for the ENGINEER-IN-CHIEF.

In re Canterbury Coal.

YESTERDAY and to-day trials have been made with Canterbury coal to see whether it could be burnt without a spark-catcher and with fire-bars farther apart than with Waikato coal; the result proved that bars $\frac{3}{8}$ in. apart could be used, but that spark-catcher and cooling apparatus was necessary.

In putting on spark-catchers it has to be remembered that they lessen the steaming capabilities, and therefore that the blast should be sharpened a little; our blasts have an $\frac{1}{8}$-in. ring on them.

Our engines steam well with the Canterbury coal.

Auckland, 20th November, 1877. A. V. MACDONALD.

No. 25.

The ENGINEER-IN-CHIEF to the Hon. the MINISTER for PUBLIC WORKS.

In re Canterbury Brown Coal.

(Memorandum.)

THE experiments made in Canterbury to ascertain whether the native brown coal could be burned in the locomotives in use on that line were so unexpectedly adverse to the coal that I had ten tons sent to Auckland to be tried there by Mr. Macdonald, who has now had considerable experience in the use of a similar quantity of brown coal in the locomotives of the Auckland and Newcastle Railway. The result is contained in the two reports herewith, dated 6th and 20th November.

Mr. Macdonald finds no difficulty in using the coal or in keeping up steam with it on very much heavier gradients than obtain on the Canterbury lines. He finds it somewhat better than the Waikato coal, which is the only coal in use on the Auckland Railway.

The result of a year's working shows that the class of engine (6-wheeled coupled, $10\frac{1}{2}$-in. cylinder) burns 23 lbs. of Waikato coal per mile; the same engines burn 15 lbs. of Newcastle coal per mile. Roughly speaking, 1 ton of Newcastle coal is equal for steaming purposes to $1\frac{1}{2}$ tons of Waikato; but, as the men get more accustomed to the brown coal, the apparent difference will decrease, the management of the fire being of more importance with the inferior coal.

The same class of engine burned only 16 lbs. of Canterbury coal per mile during Mr. Macdonald's experiment against 18 lbs. of Waikato. The heavy Fairlie engine burnt $33\frac{1}{2}$ lbs. of Canterbury against $30\frac{1}{2}$ lbs. of Waikato, but the weather was against the Canterbury coal in the trial, as the rails were greasy and the wheels slipped badly, thus wasting steam.

On the whole I consider the result of Mr. Macdonald's experiments so satisfactory that I think Canterbury coal should be brought into use on the railway wherever it can be procured at a cost not greater than from 55 to 60 per cent. of the cost of Newcastle. This must be done gradually, as it takes time to teach the firemen the proper way of using the coal, and to overcome their conservative prejudices against it.

The locomotives were furnished with large fire-grates for the express purpose of using an inferior coal, and no alteration is necessary beyond that of furnishing a spark-bonnet and putting the fire-bars at a proper distance apart. The cooling apparatus fitted by Mr. Passmore to the ash-pans should also be used. The cost of the alterations would be about £35 per engine.

Public Works Office, Wellington, JOHN CARRUTHERS.
30th November, 1877.

By Authority: GEORGE DIDSBURY, Government Printer, Wellington.—1877.

Price 6d.]