367.

Govt. of 18 Madras.

PUBLIC WORKS.

Encl.

G.O. 20th Jany 90 No. 101 R.

...venue New Minor Works.

...ter from the Govt of I...
... the introduction in
... Mt & S I Rys: from 1st January 1890
... the Rule to assimilate
... procedure as regards
... with that which is
... promulgated for State Rys.
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GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Railway.

Read the following papers :—

G.O., dated 11th October 1889, No. 1095 R., Public Works.

Read—the following letter from Major M. C. BRACKENBURY, R.E., Under-Secretary to the Government of India, Public Works Department (Railway—Traffic), to the Joint Secretary to the Government of Madras, Public Works Department, Railway Branch, dated Simla, 23rd September 1889, No. 511 R.T. :—

It has been brought to the notice of the Government of India that owing to the recent rise in the price of English coal the subject of utilising country coal has been under consideration by the companies having their terminus at Bombay, and arrangements are contemplated between Messrs. Hoare Miller and Company of Calcutta and the Bombay-Baroda and Central India Railway Company for the conveyance of Bengal coal by sea from Calcutta to Bombay for use on the Bombay-Baroda and Central India Railway.

2. From the information at the disposal of the Government of India it appears that the Madras and South Indian Railway Companies use, on part of their systems, coal and patent fuel obtained from England; and, as Madras is nearer to the sources of Bengal coal than Bombay, I am directed to suggest that the use of Bengal coal in Madras might be considered, unless it has been established that Singareni coal is certainly cheaper than coal imported from Bengal.

3. I am to add that the Government of India will be glad to learn the results of any investigations which the Government of Madras may make on this subject.

Order—dated 11th October 1889, No. 1095 R., Public Works.

Communicated to the Consulting Engineer for Railways for report.

(True Extract.)

(Signed) C. J. SMITH, Colonel, R.E.,
Joint Secy. to Govt., P.W.D.,
Railway Branch.

From the Consulting Engineer for Railways, dated Madras, 26th November 1889, No. 476.

From the Agent and Manager, Madras Railway Company, to the Consulting Engineer for Railways, dated Madras, 22nd November 1889, No. 4512/1299.

With reference to your letter No. 875, dated 21st October 1889, forwarding a copy of Government of India letter No. 511 R.T., dated 23rd September 1889, suggesting for the consideration of Railway Companies that Bengal coal might be used in

the place of patent fuel or other coal while English coal and patent fuel remain at their present prices, I have the honor to quote, for the information of Government, the following extract from a report which has been made by the Acting Locomotive Superintendent on Singareni coal as compared with patent fuel and wood :—

"I have pleasure in enclosing herewith a statement giving, in tabular form, the result of the trials with the Singareni coal.

"Three separate series of trials have been conducted as under :—

A Series.—Singareni coal burnt at Madras in engines working passenger and mail trains.
a Series.—Star patent fuel do. do. do. do.
B Series.—Singareni coal burnt at Madras in engines working heavy goods trains.
b Series.—Star patent fuel. do. do. do.
C Series.—Singareni coal burnt at Raichur in engines working mail trains.
c Series.—Firewood do. do. do.

"In each series two engines have been employed, each of which engines has burnt each of the two kinds of fuel for half the total time of the trial, the final results quoted in the statement being therefore the averages of the work of two separate engines and men. Special Inspectors have travelled on the engines throughout the trials for the purpose of recording the several results, and the greatest care has been taken to ensure that the conditions under which the experiments have been conducted should be kept as nearly as possible similar.

"Taking the series *A a* it will be noticed that the consumption per train mile of the two fuels was 42·92 lb. for Singareni coal and 25·73 lb. for patent fuel, the consumption per ton mile being ·195 lb. and ·117 lb. respectively. The latter figures show that the consumption of Singareni coal was in this case 66 per cent. heavier than that of the patent fuel.

"In the *B b* series the figures are, for Singareni coal, consumption per train mile 55·74 lb. and per ton mile ·13 lb., and for patent fuel, consumption per train mile 37·75 lb. and per ton mile ·08 lb., the consumption of the former fuel being therefore still higher by 62 per cent. than that of patent fuel.

"Again comparing the trials *C* and *a*, the work done and the class of engines in these two cases being very similar, the consumption per ton mile of the Singareni coal works out to 70·9 per cent. heavier than that of patent fuel.

"A further comparison of the present trials with those conducted in 1879 and referred to in G.O., No. 113 R., dated 3rd February 1881, shows that the consumption per ton mile of the Godávari coal in the latter case was ·196 lb. against ·195 lb. the consumption in the present *A* series in which the coal was being burnt on the same piece of line and by the same engines as in 1879.

"The average evaporation of water per lb. of fuel in the present trials works out to Singareni coal 5·39 lb., patent fuel 8·28 lb., wood 3·05 lb., while the 1879 experiments give Godávari coal 8·67 lb., patent fuel 10·79 lb

"These figures in both cases include all water lost by leakage, &c., and can therefore be only considered to be approximate, but, while the evaporation of water per lb. of patent fuel in the present trials is about 23 per cent. less than in 1879, the evaporative power of the present lot of Singareni coal seems to be 37 per cent. less than that of the Godávari sample.

"The close coincidence of the figures showing consumption per ton mile under such varying circumstances is remarkable, and goes far to prove the general accuracy of the results arrived at.

"On examining the figures of series *C c*, it will be observed that, as was only to be expected, the Singareni coal has the advantage in point of quantity consumed over the wood with which it is being compared, the consumption per ton mile being ·2 lb. of coal against ·356 lb. of wood, the consumption of wood being in this case 78 per cent. heavier than that of coal.

"Expressed in another way then, the experiments seem to show that—

For light fast trains 1 ton patent fuel is equal to 3,733 lb. Singareni coal,
For heavy goods 1 ton patent fuel is equal to 3,640 lb. Singareni coal,

while, as compared with wood, 1 ton of wood is equal to 1,258 lb. of Singareni coal.

"The coal is reported to burn brightly and well and to give no difficulty in steaming, provided sufficient care is taken. It is very dirty, and during long trips, such as that from Madras to Jalárpet, 132 miles, the fire-bars become covered, in some cases, 18" deep in clinker and ashes; when this was the case, of course some difficulty was found in keeping steam, but taking it on the whole, especially for short trips of 80 to 100 miles, the coal burnt satisfactorily and well.

"The whole matter is really therefore a question of price, and, calculating upon the results of the experiments now under review, the facts appear, after allowing for haulage charges in all cases, to be as follows :—

	RS.	A.	P.
At Madras, Singareni coal to be equal to patent fuel must be delivered at per ton	18	6	0
as compared with its actual price of	23	13	0
At Raichur, Singareni coal to be equal to wood must be delivered at per ton	13	5	0
as compared with its actual price of	16	6	5
At Raichur, Singareni coal to be equal to patent fuel must be delivered at per ton	22	12	0
as compared with its actual price at that station of	16	6	5

"At Cuddapah the Singareni coal would be about on equal terms, at its present price, with patent fuel, as the cost, including loss by exchange, of a ton of patent fuel at Madras is Rs. 30-10-11 and the haulage charges upon it from Madras to Cuddapah would be Rs. 3-6-0, making the actual cost of a ton of patent fuel at that station Rs. 34-0-11. The cost at Raichur of 3,733 lb. of Singareni coal, which may be taken as the equivalent of one ton of patent fuel, is Rs. 27-5-4 and the haulage charges upon this quantity from Raichur to Cuddapah would be Rs. 6-7-11, making the cost of the 3,733 lb. of Singareni coal at Cuddapah Rs. 33-13-3, which is practically equal to that of the one ton of patent fuel, but, as we have hitherto been able to obtain wood on that district at Rs. 5-8-0 per ton or Rs. 2 less than the cost at Raichur, and as all engines there burn wood exclusively, the coal would be really at greater disadvantage at Cuddapah than at Raichur."

2. I beg to forward a copy of the tabular statement alluded to by the Acting Locomotive Superintendent, giving the result of the trials with Singareni coal, and may add that so long as we are able to obtain a sufficient supply of wood for the Cuddapah and Raichur Locomotive Depôts at the present rate, Singareni coal—the nearest country coal obtainable—will at its present cost be unable to compete with the wood fuel.

3. As regards the fuel used at Madras, I may state that I have made an offer to a Calcutta firm for 2,000 tons of Borakar coal as arranged at the official meeting held in my office last month, and have also communicated with Messrs. Hoare Miller and Company of Calcutta to ascertain at what price they can land Bengal coal of good quality in Madras.

ENCLOSURE.

MADRAS RAILWAY—LOCOMOTIVE DEPARTMENT.

RESULTS of experiments to ascertain the comparative value of various descriptions of fuel for Locomotive purposes.

Trial.	Kind of fuel.	Date when the trials were made.	CONDITION OF TRIAL.							FUEL.			WATER.		ASHES.					
			Total miles run during the trials.	Total time standing in steam during the trials.	Average length of each trip.	Average speed per hour.	Average number of vehicles.	Average gross weight of trains including engine and tender.	Average pressure in boiler per square inch.	Total consumption.	Consumption per train mile.	Consumption per ton mile.	Total consumption.	Evaporation per lb. of fuel burnt.	From smoke-box.	From ash-pan.	Total weight in lb.	Per cent. on weight of fuel consumed.	Cost of fuel per ton at fuelling station.	Cost of fuel per 100 miles run.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
			MLS.	HOURS.	MLS.	MLS.	NO.	TONS.	LB.	LB.	LB.	LB.	GALLONS.	LB.	LB.	LB.	LB.	LB.	RS. A. P.	RS. A. P.
A	Singareni coal ..	August 1889.	3,584	237	112	24·34	16·5	220·58	115	153,832	42·92	·195	82,940·0	5·39	7,634	51,345	38,979	25·34	23 13 0	45 10 1
a	Star patent fuel ..		3,584	242	112	24·34	16·5	219·94	118	92,232	25·73	·117	76,462·8	8·29	6,894	10,296	17,190	18·64	30 10 11	35 4 0
B	Singareni coal ..	October 1889.	1,724	181	86	16·95	34·0	429·97	119	96,096	55·74	·13	52,488·2	5·46	3,621	21,879	25,500	26·54	23 13 0	59 4 1
b	Star patent fuel ..		1,718	183	86	17·24	36·5	469·02	120	64,848	37·75	·08	53,630·0	8·27	3,048	8,617	11,665	17·99	30 10 11	51 11 3
C	Singareni coal ..	Sept. 1889.	2,632	197	94	26·18	14·0	201·81	119	106,036	40·29	·2	56,386·2	5·32	5,934	19,516	25,450	24·00	16 6 5	29 8 0
c	Wood ..		2,604	196	93	26·04	14·0	198·05	118	183,500	70·47	·356	56,012·0	3·05	2,134	3,884	6,018	3·28	7 8 0	23 9 6

A Series.—Singareni coal burnt in S C class engines (4 coupled 5—9 wheels, cylinder 17 and 22) working mail and passenger trains between Madras and Jálarpet and Madras and Rénigunta.
a Series.—Star patent fuel *ex* "Hartington" burnt in do. do. do. do. do. do.
B Series.—Singareni coal burnt in K B-2 class engines (4 coupled 5—6 wheels, cylinder 18 × 24) working heavy goods trains between Madras and Katpadi and Madras and Rénigunta.
b Series.—Star patent fuel *ex* "Amoor" burnt in do. do. do. do. do.
C Series.—Singareni coal burnt in S B-1 class engines (4 coupled 5—0 wheels, cylinder 17 × 22) working mail trains between Raichur and Gooty.
c Series.—Wood fuel burnt in do. do. do. do. do.

NOTE.—At Madras, coal to be equal to patent fuel must be delivered at per ton .. .. RS. A. P. 18 6 0
as compared with its actual price of 23 13 0
At Raichur, coal to be equal to wood must be delivered at per ton 13 5 0
as compared with its actual price of 16 6 5
At Raichur, coal to be equal to patent fuel must be delivered at per ton 22 12 0
as compared with its actual price at that station of 16 6 5

PERAMBUR WORKS,
9th November 1889.

(Signed) C. E. PHIPPS,
Ag. Locomotive Superintendent

From the Agent, South Indian Railway, to the Consulting Engineer for Railways, dated Trichinopoly, 23rd October 1889, No. 1356.

Your letter No. 952 of the 21st instant. The question of utilizing Indian coal on this railway has, from time to time for some years past, been under our consideration. I attach hereto a statement giving the result of some recent trials of English, Australian and Indian coal, from which you will see that the Singareni and the Bengal coal show to much disadvantage when compared with the cost per train mile of English and Australian coal.

ENCLOSURE.

SOUTH INDIAN RAILWAY—LOCOMOTIVE DEPARTMENT.

Cambrian Patent Fuel per S.S. "Manitoba" from Gosman and Smith.

Six trials made with mail trains from Madras to Cuddalore, 128 miles.

A	B	C	D	E	F	Coal consumed.				K	L	M	N	O	P	
Month and date.	No. of engine.	No. of vehicles.	No. of miles.	Gross weight of train.	Weight of load.	G For journey.	H For lighting.	I Total.	J Per mile, column I.	Weight of ashes.	Ash per 100 miles of coal consumed, column I.	Average pressure of steam per square inch.	Water consumed in gallons.	Water consumed in pounds.	Pounds of water evaporated per lb. of coal, column G.	State of weather.
1889.				TONS. CWT. QRS. LB.	TONS. CWT. QRS. LB.	LB.	LB.	LB.		LB	LB.	LB.		LB.	LB.	
January, 21 ..	106	20	128	97 18 0 0	27 10 0 0	2,016	112	2,128	16·62	262	12·31	115	1,750	17,500	8·68	Fair weather.
Do. 23 ..	91	20	128	103 17 0 0	29 9 0 0	2,240	112	2,352	18·38	242	10·28	105	1,765	17,650	7·88	Do.
Do. 26 ..	106	20	128	105 10 0 0	30 17 0 0	1,904	112	2,016	15·75	263	13·05	115	1,760	17,600	9·24	Do.
Do. 28 ..	91	20	128	103 2 2 0	29 3 0 0	1,960	112	2,072	16·19	255	12·31	110	1,760	17,600	8·98	Fair up to Villupuram. Head wind from Vm. to Cud.
Do. 31 ..	106	20	128	103 19 3 0	31 19 0 0	1,904	112	2,016	15·75	266	13·19	110	1,780	17,800	9·35	Fair weather.
February, 2 ..	91	20	128	104 2 3 0	29 19 0 0	2,128	112	2,240	17·50	235	10·49	110	1,830	18,300	8·59	Do.
Total ..	6	120	..	618 10 0 0	178 17 0 0	12,152	672	12,824	100·19	1,523	71·63	665	10,645	106,450	52·72	
Average ..	..	20	128	103 1 2 18·66	29 16 0 18·66	2,025·33	112·00	2,137·33	16·70	253·83	11·94	110·83	1,774·16	17,741·66	8·79	

Llay Hall Brymbo Main Steam Coal per S.S. "Eastern Prince" from Howard Houlder & Co.

Three trials made with mail trains from Madras to Cuddalore, 128 miles.

January, 22 ..	106	21	128	105 18 2 0	28 17 0 0	2,464	56	2,520	19·69	343	13·61	110	1,880	18,809	7·63	Strong wind blowing from north-east.
Do. 24 ..	91	20	128	105 8 0 0	27 11 0 0	2,800	112	2,912	22·75	337	11·57	105	2,065	20,650	7·37	Strong side head winds.
Do. 27 ..	106	19	128	100 11 2 0	27 11 0 0	2,464	56	2,520	19·69	409	16·23	110	1,920	19,200	7·79	Do winds.
Total ..	3	60	..	311 18 0 0	83 19 0 0	7,728	224	7,952	62·13	1,089	41·41	325	5,865	58,650	22·79	
Average ..	..	20	128	103 19 1 9·33	27 19 2 18·66	2,576·00	74·66	2,650·66	20·71	363·00	13·80	108·33	1,955·00	19,550·00	7·59	

Singareni Coal received from Messrs. Parry & Co. of Madras.

Four trials made with trains from Madras to Cuddalore, 128 miles.

February, 5 ..	106	19	128	98 5 2 0	27 11 0 0	2,912	112	3,024	23·63	708	23·41	110	1,980	19,800	6·80	Fair weather.
Do. 10 ..	106	20	128	103 8 3 0	28 15 0 0	2,800	112	2,912	22·75	610	20·95	110	1,870	18,700	6·68	Do.
Do. 15 ..	106	20	128	99 4 1 0	26 5 0 0	2,912	112	3,024	23·63	600	19·84	110	1,900	19,000	6·52	Do.
Do. 21 ..	98	20	128	106 4 3 0	29 13 0 0	3,024	112	3,136	24·50	513	16·36	120	1,880	18,800	6·22	Do.
Total ..	4	79	..	407 3 1 0	112 4 0 0	11,648	448	12,096	94·51	2,431	80·56	450	7,630	76,300	26·22	
Average ..	..	19·75	128	101 15 3 7·00	28 1 0 0	2,912·00	112·00	3,024·00	23·63	607·75	20·14	112·50	1,907·50	19,075·00	6·55	

Bersham Wraxham North Wales Steam Coal per S.S. "Macgregor" from Gosman and Smith.

Three trials made with mail trains from Madras to Cuddalore, 128 miles.

February, 7 ..	91	20	128	106 14 3 0	27 3 0 0	2,352	112	2,464	19·25	254	10·31	110	1,830	18,300	7·78	Fair weather.
Do. 12 ..	91	20	128	104 6 1 0	28 19 0 0	2,240	112	2,352	18·38	253	10·76	110	1,850	18,500	8·26	Do.
Do. 17 ..	91	20	128	103 9 3 0	29 19 0 0	2,240	112	2,352	18·38	259	17·01	110	1,780	17,800	7·94	Do.
Total ..	3	60	..	314 10 3 0	86 1 0 0	6,832	336	7,168	56·01	766	32·08	330	5,460	54,600	23·98	
Average ..	..	20·00	128	104 16 3 18·66	28 13 2 18·66	2,277 33	112·00	2,389·33	18·67	255·33	10·69	110·00	1,820·00	18,200·00	7·99	

West Hartley Main large Steam Coal per S.S. "Ticerton" from Howard Houlder & Co.

Four trials made with mail trains from Madras to Cuddalore, 128 miles.

March, 27 ..	106	20	128	105 3 0 0	28 7 0 0	2,352	112	2,464	19·25	336	13·64	110	1,930	19,300	8·20	Strong side winds.
Do. 28 ..	106	22	128	115 3 0 0	28 8 0 0	2,128	56	2,184	17·06	295	13·50	110	1,920	19,200	9·02	Fair weather.
Do. 28 ..	98	20	128	105 3 0 0	28 7 0 0	2,404	112	2,516	19·66	251	9·98	110	1,800	18,000	7·49	Strong head & side winds.
Do. 29 ..	98	20	128	104 18 0 0	28 3 0 0	2,432	112	2,544	19·87	201	7·90	110	1,810	18,100	7·44	Fair weather.
Total ..	4	82	..	430 7 0 0	113 5 0 0	9,316	392	9,708	75·84	1,083	45·02	440	7,460	74,600	32·15	
Average ..	..	21·00	128	107 11 3 0	28 6 1 0	2,329·00	98·00	2,427·00	18·96	270·75	11·25	110·00	1,865·00	18,650·00	8·04	

Hastings Hartley Steam Coal per S.S. "Starthblane."

Six trials made with mail trains between Madras and Cuddalore, 128 miles.

April, 16 ..	106	20	128	103 2 1 0	31 3 0 0	2,352	112	2,464	19·25	220	8·92	110	1,820	18,200	7·73	Strong head & side winds.
Do. 17 ..	106	20	128	102 14 2 0	31 3 0 0	2,128	56	2,184	17·06	223	10·21	110	1,770	17,700	8·31	Do.
Do. 17 ..	98	19	128	99 16 3 0	31 11 0 0	2,464	112	2,576	20·12	275	10·67	110	1,750	17,500	7·10	Fair weather.
Do. 18 ..	98	20	128	105 11 0 0	32 7 0 0	2,464	..	2,464	19·25	204	8·28	110	1,700	17,000	6·90	Do.
Do. 18 ..	92	19	128	95 19 0 0	28 11 0 0	2,240	112	2,352	18·37	134	5·69	110	1,720	17,200	7·67	Do.
Do. 19 ..	92	18	128	95 4 2 0	29 3 0 0	2,352	..	2,352	18·37	192	8·16	110	1,810	18,100	7·69	Do.
Total ..	6	116	..	602 8 0 0	183 18 0 0	14,000	392	14,392	112·42	1,248	51·93	660	10,570	105,700	45·40	
Average ..	..	19·33	128	100 8 0 0	30 13 0 0	2,333·33	65·33	2,398·66	18·74	208·00	8·65	110·00	1,761·66	17,616·66	7·56	

South Bulli Coal per S.S. "Cloncurry."

Four trials made with mail trains between Madras and Cuddalore, 128 miles.

May, 7 ..	98	20	128	103 10 2 0	31 3 0 0	2,352	112	2,464	19·25	391	15·86	110	1,950	19,500	14·42	Fair weather.
Do. 8 ..	99	19	128	99 7 0 0	31 11 0 0	2,240	..	2,240	17·50	286	12·76	110	1,750	17,500	7·81	Do.
Do. 8 ..	92	20	128	103 16 0 0	33 3 0 0	2,464	112	2,576	20·12	409	15·87	110	1,990	19,900	8·07	Do.
Do. 9 ..	92	20	128	104 5 2 0	33 3 0 0	2,240	..	2,240	17·50	364	16·25	110	1,970	19,700	8·79	Do.
Total ..	4	79	..	410 19 0 0	129 0 0 0	9,296	224	9,520	73·47	1,450	60·74	440	7,660	76,600	39·09	
Average ..	..	19·75	128	102 14 3 0	32 5 0 0	2,324·00	56·00	2,380·00	18·37	362·50	15·18	110·00	1,915·00	19,150·00	9·77	

Bengal Coal per "S.S. Umballa."

Five trials made with mail trains between Madras and Cuddalore, 128 miles.

A	B	C	D	E	F	Coal consumed.					State of weather.
Month and date.	No. of engine.	No. of vehicles.	No. of miles.	Gross weight of train.	Weight of load.	G For journey.	H For lighting.	I Total.	J Per mile, column I.	K Weight of ashes.	L Ash per 100 miles of coal consumed, column I.	M Average pressure of steam per square inch.	N Water consumed in gallons.	O Water consumed in pounds.	P Pounds of water evaporated per lb. of coal, column G.	
1889.				TONS. CWT. QRS. LB.	TONS. CWT. QRS. LB.	LB.	LB.	LB.	LB.	LB.	LB.	LB.				
June, 5 ..	106	20	128	103 8 0 0	30 7 0 0	2,800	112	2,912	22·75	753	25·85	60	2,200	22,000	7·85	Strong side winds.
Do. 6 ..	98	20	128	106 9 3 0	36 1 0 0	3,136	112	3,248	25·37	857	26·38	110	2,000	20,000	6·38	Fair weather.
Do. 7 ..	98	20	128	102 19 2 0	29 3 0 0	3,136	..	3,136	24·50	847	27·00	110	1,850	18,500	5·89	Do.
Do. 7 ..	92	20	128	103 12 2 0	33 3 0 0	3,360	112	3,472	27·12	874	25·17	110	2,200	22,000	6·55	Do.
Do. 8 ..	92	20	128	103 10 1 0	31 3 0 0	3,360	..	3,360	26·25	698	20·77	110	2,130	21,300	6·34	Do.
Total ..	5	100	..	520 0 0 0	159 17 0 0	15,792	336	16,128	125·99	4,029	125·17	500	10,380	1,03,800	33·01	
Average ..	..	20·00	128	104 0 0 0	31 19 1 16·80	3,158·40	67·20	3,225·60	25·19	805·80	25·03	100·00	2,076·00	20,760·00	6·60	

Firewood.

Five trials made with mail trains between Madras and Cuddalore, 128 miles.

April, 3 ..	92	20	128	105 5 0 0	33 3 0 0	3,992	112	4,104	32·06	112	2·73	110	1,610	16,100	3·78	Strong side winds
Do. 6 ..	106	20	128	105 8 2 0	29 3 0 0	4,297	112	4,409	34·45	131	2·97	110	1,830	18,300	4·25	Strong head & side winds.
Do. 7 ..	98	20	128	105 10 2 0	33 3 0 0	4,403	112	4,515	35·27	220	4·87	110	1,750	17,500	3·97	Very heavy head and side winds.
Do. 8 ..	92	20	128	103 16 3 0	33 3 0 0	3,920	112	4,032	31·50	122	3·03	110	1,760	17,600	4·49	
Do. 11 ..	106	20	128	104 19 1 0	29 3 0 0	4,200	112	4,312	33·68	200	4·64	110	1,700	17,000	4·05	
Total ..	5	100	..	525 0 0 0	157 15 0 0	20,812	560	21,372	166·96	785	18·24	550	8,556	85,500	20·54	
Average ..	..	20·00	128	105 0 0 0	31 11 0 0	4,162·40	112·00	4,274·40	33·39	157·00	3·65	110·00	1,710·00	17,100·00	4·11	

Average result of trials made of Patent Fuel, South Bulli, Bersham Wraxham North Wales Steam, Hastings Hartley Steam, West Hartley Main large Steam, Llay Hall Brymbo Main Steam, Singareni, Bengal Coal and Firewood.

Between Madras and Cuddalore, 128 miles.

																Cost per mile.
																rs. A. P.
Patent Fuel ..	20·00	128	103 1 2 18·66	29 16 0 18·66	2,025·33	112·00	2,137·33	16·70	253·83	11·94	110·83	1,774·16	17,741·66	8·79	0 2 1·79
South Bulli Coal ..	19·75	128	102 14 3 0	32 5 0 0	2,324·00	56·00	2,380·00	18·37	362·50	15·18	110·00	1,915·00	19,150·00	9·77	..
Bersham Wraxham North Wales Steam Coal ..	20·00	128	104 16 3 18·66	28 13 2 18·66	2,277·33	112·00	2,389·33	18·62	255·33	10·69	110·00	1,820·00	18,200·00	7·99	0 2 7·15
Hastings Hartley Steam Coal ..	19·33	128	100 8 0 0	30 13 0 0	2,333·33	65·33	2,398·66	18·74	208·00	8·65	110·00	1,761·66	17,616·66	7·56	0 2 5·11
West Hartley Main large Steam Coal ..	21·00	128	107 11 3 0	28 6 1 0	2,329·00	98·00	2,427·00	18·96	270·75	11·25	110·00	1,865·00	18,650·00	8·04	0 2 6·42
Llay Hall Brymbo Main Steam Coal ..	20·00	128	103 19 1 9·33	27 19 2 18·66	2,576·00	74·66	2,650·66	20·71	363·00	13·80	108·33	1,955·00	19,550·00	7·59	0 2 4·51
Singareni Coal ..	19·75	128	101 15 3 7·00	28 1 0 0	2,912·00	112·00	3,024·00	23·63	607·75	20·14	112·50	1,907·50	19,075·00	6·55	0 3 2·47
Bengal Coal ..	20·00	128	104 0 0 0	31 19 1 16·80	3,158·40	67·20	3,225·60	25·19	805·80	25·03	100·00	2,076·00	20,760·00	6·60	0 2 10·56
Firewood ..	20·00	128	105 0 0 0	31 11 0 0	4,162·40	112·00	4,274·40	33·39	157·00	3·65	110·00	1,710·00	17,100·00	4·11	0 1 2·31

(Signed) C. E. CRIGHTON,
Locomotive and Carriage Superintendent.

NEGAPATAM,
19th July 1889.

Submitted for transmission to the Government of India with reference to its No. 511 R.T., dated 23rd September 1889, embodied in G.O., No. 1095 R., dated 11th October.

2. The Agent and Manager, Madras Railway, states that Singareni coal at its present price compares unfavorably with patent fuel received from England. He has arranged for a supply of 2,000 tons of Borakar coal, and is in communication with Calcutta on the subject of a supply of Bengal coal for experimental purposes.

3. The Agent, South Indian Railway, forwards the results of recent trials of English, Australian and Indian coal, showing—first, that Bengal coal is less expensive per mile than Singareni; second, that English coal is cheaper than Bengal or Singareni coal; third, that next to firewood, patent fuel is the cheapest for train use.

4. The following table summarises the results of the various experiments made in Madras with country coal in comparison with patent fuel or English coal :—

Name of Railway.	Date.	Nature of fuel.	Average weight of train.	Average speed.	Consumption of fuel per train mile.
			TONS.	MILES.	LB.
Madras	1879	Godávari coal	171·63	25·41	33·48
Do.	,,	Patent fuel	182·78	26·49	24·58
Do.	1889	Singareni coal	220·58	24·34	42·92
Do.	,,	Patent fuel	219 94	24·34	25·73
Do.	,,	Singareni coal	429 97	16·95	55·74
Do.	,,	Patent fuel	469·22	17·24	37·75
Do.	,,	Singareni coal	201·81	26·18	40·29
South Indian	,,	Patent fuel	103	Not given.	16·70
Do.	,,	North Wales coal	104	,,	18·62
Do.	,,	West Hartley coal	107	,,	18·96
Do.	,,	Singareni coal	101	,,	23·63
Do.	,,	Bengal	104	,,	25·19
His Highness the Nizam's ..	,,	Singareni coal	198·5	24·48	33·47

It will be noticed that the results of the trials of Singareni coal on His Highness the Nizam's State Railway do not agree very closely with the results recently obtained with the same coal on the Madras Railway with fast trains.

5. The Madras Railway find that with fast trains the consumption of Singareni coal is about 66 per cent. heavier than that of patent fuel. Whilst the figures given by His Highness the Nizam's State Railway tend to show, after correcting for difference of weight in the trains, that the consumption with Singareni coal is only 44·4 per cent. heavier than the consumption with patent fuel in the trains on the Madras Railway.

6. The results obtained on the South Indian Railway tend to show that the consumption with Singareni coal is about 41·5 per cent. heavier than with patent fuel and thus agree with the results obtained on His Highness the Nizam's State Railway.

7. It is noticeable also that the results of the latest trials of Singareni coal on the Madras Railway are not quite so favorable as those obtained in 1879 with Godávari coal.

8. The report of trials of Singareni coal on the Nizam's Guaranteed State Railway, kindly furnished by the Locomotive Superintendent of that line, is submitted for comparison with a request that it may be returned.

ORDER—dated 20th January 1890, No. 102 R., Public Works.

Ordered to be forwarded to the Government of India with reference to its letter No. 511 R.T., dated 23rd September 1889.

(Here enter No. 103 R., dated 20th January 1890.)

(True Extract.)

Colonel, R.E.,
Joint Secy. to Govt., P.W.D.,
Railway Branch.

To the Consulting Engineer for Railways.

Exd. J. Moses.

Spare Copies

RAILWAY.

Govt. of 1890 Madras.

PUBLIC WORKS.

Dated January, 20th.

Read. *Encl.*

G.O., 20th Jan. 1890, No. 102 R.

JANUARY.

Coal

Reports from Agents, Madras and South Indian Railways, of experiments made on different kinds of coal, patent fuel, &c., ordered to be forwarded to the Government of India.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Railway.

Read the following papers :—

G.O., dated 11th October 1889, No. 1095 R., Public Works.

Read—the following letter from Major M. C. BRACKENBURY, R.E., Under-Secretary to the Government of India, Public Works Department (Railway—Traffic), to the Joint Secretary to the Government of Madras, Public Works Department, Railway Branch, dated Simla, 23rd September 1889, No. 511 R.T. :—

It has been brought to the notice of the Government of India that owing to the recent rise in the price of English coal the subject of utilising country coal has been under consideration by the companies having their terminus at Bombay, and arrangements are contemplated between Messrs. Hoare Miller and Company of Calcutta and the Bombay-Baroda and Central India Railway Company for the conveyance of Bengal coal by sea from Calcutta to Bombay for use on the Bombay-Baroda and Central India Railway.

2. From the information at the disposal of the Government of India it appears that the Madras and South Indian Railway Companies use, on part of their systems, coal and patent fuel obtained from England ; and, as Madras is nearer to the sources of Bengal coal than Bombay, I am directed to suggest that the use of Bengal coal in Madras might be considered, unless it has been established that Singareni coal is certainly cheaper than coal imported from Bengal.

3. I am to add that the Government of India will be glad to learn the results of any investigations which the Government of Madras may make on this subject.

Order—dated 11th October 1889, No. 1095 R., Public Works.

Communicated to the Consulting Engineer for Railways for report.

(True Extract.)

(Signed) C. J. SMITH, Colonel, R.E.,
Joint Secy. to Govt., P.W.D.,
Railway Branch.

From the Consulting Engineer for Railways, dated Madras, 26th November 1889, No. 476.

From the Agent and Manager, Madras Railway Company, to the Consulting Engineer for Railways, dated Madras, 22nd November 1889, No. 4512/1299.

With reference to your letter No. 875, dated 21st October 1889, forwarding a copy of Government of India letter No. 511 R.T., dated 23rd September 1889, suggesting for the consideration of Railway Companies that Bengal coal might be used in

the place of patent fuel or other coal while English coal and patent fuel remain at their present prices, I have the honor to quote, for the information of Government, the following extract from a report which has been made by the Acting Locomotive Superintendent on Singareni coal as compared with patent fuel and wood :—

"I have pleasure in enclosing herewith a statement giving, in tabular form, the result of the trials with the Singareni coal.

"Three separate series of trials have been conducted as under :—

A Series.—Singareni coal burnt at Madras in engines working passenger and mail trains.
a Series.—Star patent fuel do. do. do. do.
B Series.—Singareni coal burnt at Madras in engines working heavy goods trains.
b Series.—Star patent fuel. do. do. do.
C Series.—Singareni coal burnt at Raichur in engines working mail trains.
c Series.—Firewood do. do. do.

"In each series two engines have been employed, each of which engines has burnt each of the two kinds of fuel for half the total time of the trial, the final results quoted in the statement being therefore the averages of the work of two separate engines and men. Special Inspectors have travelled on the engines throughout the trials for the purpose of recording the several results, and the greatest care has been taken to ensure that the conditions under which the experiments have been conducted should be kept as nearly as possible similar.

"Taking the series *A a* it will be noticed that the consumption per train mile of the two fuels was 42·92 lb. for Singareni coal and 25·73 lb. for patent fuel, the consumption per ton mile being ·195 lb. and ·117 lb. respectively. The latter figures show that the consumption of Singareni coal was in this case 66 per cent. heavier than that of the patent fuel.

"In the *B b* series the figures are, for Singareni coal, consumption per train mile 55·74 lb. and per ton mile ·13 lb., and for patent fuel, consumption per train mile 37·75 lb. and per ton mile ·08 lb., the consumption of the former fuel being therefore still higher by 62 per cent. than that of patent fuel.

"Again comparing the trials *C* and *a*, the work done and the class of engines in these two cases being very similar, the consumption per ton mile of the Singareni coal works out to 70·9 per cent. heavier than that of patent fuel.

"A further comparison of the present trials with those conducted in 1879 and referred to in G.O., No. 113 R., dated 3rd February 1881, shows that the consumption per ton mile of the Godávari coal in the latter case was ·196 lb. against ·195 lb. the consumption in the present *A* series in which the coal was being burnt on the same piece of line and by the same engines as in 1879.

"The average evaporation of water per lb. of fuel in the present trials works out to Singareni coal 5·39 lb., patent fuel 8·28 lb., wood 3·05 lb., while the 1879 experiments give Godávari coal 8·67 lb., patent fuel 10·79 lb

"These figures in both cases include all water lost by leakage, &c., and can therefore be only considered to be approximate, but, while the evaporation of water per lb. of patent fuel in the present trials is about 23 per cent. less than in 1879, the evaporative power of the present lot of Singareni coal seems to be 37 per cent. less than that of the Godávari sample.

"The close coincidence of the figures showing consumption per ton mile under such varying circumstances is remarkable, and goes far to prove the general accuracy of the results arrived at.

"On examining the figures of series *C c*, it will be observed that, as was only to be expected, the Singareni coal has the advantage in point of quantity consumed over the wood with which it is being compared, the consumption per ton mile being ·2 lb. of coal against ·356 lb. of wood, the consumption of wood being in this case 78 per cent. heavier than that of coal.

"Expressed in another way then, the experiments seem to show that—

For light fast trains 1 ton patent fuel is equal to 3,733 lb. Singareni coal,
For heavy goods 1 ton patent fuel is equal to 3,640 lb. Singareni coal,

while, as compared with wood, 1 ton of wood is equal to 1,258 lb. of Singareni coal.

"The coal is reported to burn brightly and well and to give no difficulty in steaming, provided sufficient care is taken. It is very dirty, and during long trips, such as that from Madras to Jalárpet, 132 miles, the fire-bars become covered, in some cases, 18″ deep in clinker and ashes; when this was the case, of course some difficulty was found in keeping steam, but taking it on the whole, especially for short trips of 80 to 100 miles, the coal burnt satisfactorily and well.

"The whole matter is really therefore a question of price, and, calculating upon the results of the experiments now under review, the facts appear, after allowing for haulage charges in all cases, to be as follows :—

	RS.	A.	P.
At Madras, Singareni coal to be equal to patent fuel must be delivered at per ton	18	6	0
as compared with its actual price of	23	13	0

	RS.	A.	P.
At Raichur, Singareni coal to be equal to wood must be delivered at per ton	13	5	0
as compared with its actual price of	16	6	5
At Raichur, Singareni coal to be equal to patent fuel must be delivered at per ton	22	12	0
as compared with its actual price at that station of	16	6	5

"At Cuddapah the Singareni coal would be about on equal terms, at its present price, with patent fuel, as the cost, including loss by exchange, of a ton of patent fuel at Madras is Rs. 30-10-11 and the haulage charges upon it from Madras to Cuddapah would be Rs. 3-6-0, making the actual cost of a ton of patent fuel at that station Rs. 34-0-11. The cost at Raichur of 3,733 lb. of Singareni coal, which may be taken as the equivalent of one ton of patent fuel, is Rs. 27-5-4 and the haulage charges upon this quantity from Raichur to Cuddapah would be Rs. 6-7-11, making the cost of the 3,733 lb. of Singareni coal at Cuddapah Rs. 33-13-3, which is practically equal to that of the one ton of patent fuel, but, as we have hitherto been able to obtain wood on that district at Rs. 5-8-0 per ton or Rs. 2 less than the cost at Raichur, and as all engines there burn wood exclusively, the coal would be really at greater disadvantage at Cuddapah than at Raichur."

2. I beg to forward a copy of the tabular statement alluded to by the Acting Locomotive Superintendent, giving the result of the trials with Singareni coal, and may add that so long as we are able to obtain a sufficient supply of wood for the Cuddapah and Raichur Locomotive Depôts at the present rate, Singareni coal—the nearest country coal obtainable—will at its present cost be unable to compete with the wood fuel.

3. As regards the fuel used at Madras, I may state that I have made an offer to a Calcutta firm for 2,000 tons of Borakar coal as arranged at the official meeting held in my office last month, and have also communicated with Messrs. Hoare Miller and Company of Calcutta to ascertain at what price they can land Bengal coal of good quality in Madras.

ENCLOSURE.

MADRAS RAILWAY—LOCOMOTIVE DEPARTMENT.

RESULTS of experiments to ascertain the comparative value of various descriptions of fuel for Locomotive purposes.

Trial.	Kind of fuel.	Date when the trials were made.	CONDITION OF TRIAL. Total miles run during the trials.	Total time standing in steam during the trials.	Average length of each trip.	Average speed per hour.	Average number of vehicles.	Average gross weight of trains including engine and tender.	Average pressure in boiler per square inch.	FUEL. Total consumption.	Consumption per train mile.	Consumption per ton mile.	WATER. Total consumption.	Evaporation per lb. of fuel burnt.	ASHES. From smoke-box.	From ash-pan.	Total weight in lb.	Per cent. on weight of fuel consumed.	Cost of fuel per ton at fuelling station.	Cost of fuel per 100 miles run.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
			MLS.	HOURS.	MLS.	MLS.	NO.	TONS.	LB.	LB.	LB.	LB.	GALLONS.	LB.	LB.	LB.	LB.		RS. A. P.	RS. A. P.
A	Singareni coal ..	August 1889.	3,584	237	112	24·34	16·5	220·58	115	153,832	42·92	·195	82,940·0	5·39	7,634	51,345	38,979	25·34	23 13 0	45 10 1
a	Star patent fuel ..		3,584	242	112	24·34	16·5	219·94	118	92,232	25·73	·117	76,462·8	8·29	6,894	10,296	17,190	18·64	30 10 11	35 4 0
B	Singareni coal ..	October 1889.	1,724	181	86	16·95	34·0	429·97	119	96,096	55·74	·13	52,488·2	5·46	3,621	21,879	25,500	26·54	23 13 0	59 4 1
b	Star patent fuel ..		1,718	183	86	17·24	36·5	469·02	120	64,848	37·75	·08	53,630·0	8·27	3,048	8,617	11,665	17·99	30 10 11	51 11 3
C	Singareni coal ..	Sept. 1889.	2,632	197	94	26·18	14·0	201·81	119	106,036	40·29	·2	56,386·2	5·32	5,934	19,516	25,450	24·00	16 6 5	29 8 0
c	Wood ..		2,604	196	93	26·04	14·0	198·05	118	183,500	70·47	·356	56,012·0	3·05	2,134	3,884	6,018	3·28	7 8 0	23 9 6

A Series.—Singareni coal burnt in S C class engines (4 coupled 5—9 wheels, cylinder 17 and 22) working mail and passenger trains between Madras and Jólarpet and Madras and Rénigunta.
a Series.—Star patent fuel *ex* "Hartington" burnt in do. do. do. do. do. do.
B Series.—Singareni coal burnt in K B-2 class engines (4 coupled 5—6 wheels, cylinder 18 × 24) working heavy goods trains between Madras and Katpadi and Madras and Rénigunta.
b Series.—Star patent fuel *ex* "Amoor" burnt in do. do. do. do. do.
C Series.—Singareni coal burnt in S B-1 class engines (4 coupled 5—0 wheels, cylinder 17 × 22) working mail trains between Raichur and Gooty.
c Series.—Wood fuel burnt in do. do. do. do.

NOTE.—At Madras, coal to be equal to patent fuel must be delivered at per ton .. .. RS. A. P. 18 6 0
as compared with its actual price of 23 13 0
At Raichur, coal to be equal to wood must be delivered at per ton 13 5 0
as compared with its actual price of 16 6 5
At Raichur, coal to be equal to patent fuel must be delivered at per ton 22 12 0
as compared with its actual price at that station of 16 6 5

PERAMBUR WORKS,
9th November 1889.

(Signed) C. E. PHIPPS,
Ag. Locomotive Superintendent

From the Agent, South Indian Railway, to the Consulting Engineer for Railways, dated Trichinopoly, 23rd October 1889, No. 1356.

Your letter No. 952 of the 21st instant. The question of utilizing Indian coal on this railway has, from time to time for some years past, been under our consideration. I attach hereto a statement giving the result of some recent trials of English, Australian and Indian coal, from which you will see that the Singareni and the Bengal coal show to much disadvantage when compared with the cost per train mile of English and Australian coal.

ENCLOSURE.

SOUTH INDIAN RAILWAY—LOCOMOTIVE DEPARTMENT.

Cambrian Patent Fuel per S.S. "Manitoba" from Gosman and Smith.

Six trials made with mail trains from Madras to Cuddalore, 128 miles.

A	B	C	D	E	F	Coal consumed.				K	L	M	N	O	P	
Month and date.	No. of engine.	No. of vehicles.	No. of miles.	Gross weight of train.	Weight of load.	G For journey.	H For lighting.	I Total.	J Per mile, column I.	Weight of ashes.	Ash per 100 miles of coal consumed, column I.	Average pressure of steam per square inch.	Water consumed in gallons.	Water consumed in pounds.	Pounds of water evaporated per lb. of coal, column G.	State of weather.
1889.				TONS. CWT. QRS. LB.	TONS. CWT. QRS. LB.	LB.	LB.	LB.		LB.	LB.	LB.		LB.	LB.	
January, 21 ..	106	20	128	97 18 0 0	27 10 0 0	2,016	112	2,128	16·62	262	12·31	115	1,750	17,500	8·68	Fair weather.
Do. 23 ..	91	20	128	103 17 0 0	29 9 0 0	2,240	112	2,352	18·38	242	10·28	105	1,765	17,650	7·88	Do.
Do. 26 ..	106	20	128	105 10 0 0	30 17 0 0	1,904	112	2,016	15·75	263	13·05	115	1,760	17,600	9·24	Do.
Do. 28 ..	91	20	128	103 2 2 0	29 3 0 0	1,960	112	2,072	16·19	255	12·31	110	1,760	17,600	8·98	Fair up to Villupuram. Head wind from Vm. to Cud.
Do. 31 ..	106	20	128	103 19 3 0	31 19 0 0	1,904	112	2,016	15·75	266	13·19	110	1,780	17,800	9·35	Fair weather.
February, 2 ..	91	20	128	104 2 3 0	29 19 0 0	2,128	112	2,240	17·50	235	10·49	110	1,830	18,300	8·59	Do.
Total ..	6	120	..	618 10 0 0	178 17 0 0	12,152	672	12,824	100·19	1,523	71·63	665	10,645	106,450	52·72	
Average ..	..	20	128	103 1 2 18·66	29 16 0 18·66	2,025·33	112·00	2,137·33	16·70	253·83	11·94	110·83	1,774·16	17,741·66	8·79	

Llay Hall Brymbo Main Steam Coal per S.S. "Eastern Prince" from Howard Houlder & Co.

Three trials made with mail trains from Madras to Cuddalore, 128 miles.

January, 22 ..	106	21	128	105 18 2 0	28 17 0 0	2,464	56	2,520	19·69	343	13·61	110	1,880	18,800	7·63	Strong wind blowing from north-east.
Do. 24 ..	91	20	128	105 8 0 0	27 11 0 0	2,800	112	2,912	22·75	337	11·57	105	2,065	20,650	7·37	Strong side head winds.
Do. 27 ..	106	19	128	100 11 2 0	27 11 0 0	2,464	56	2,520	19·69	409	16·23	110	1,920	19,200	7·79	Do. winds.
Total ..	3	60	..	311 18 0 0	83 19 0 0	7,728	224	7,952	62·13	1,089	41·41	325	5,865	58,650	22·79	
Average ..	..	20	128	103 19 1 9·33	27 19 2 18·66	2,576·00	74·66	2,650·66	20·71	363·00	13·80	108·33	1,955·00	19,550·00	7·59	

Singareni Coal received from Messrs. Parry & Co. of Madras.

Four trials made with trains from Madras to Cuddalore, 128 miles.

February, 5 ..	106	19	128	98 5 2 0	27 11 0 0	2,912	112	3,024	23·63	708	23·41	110	1,980	19,800	6·80	Fair weather.
Do. 10 ..	106	20	128	103 8 3 0	28 15 0 0	2,800	112	2,912	22·75	610	20·95	110	1,870	18,700	6·68	Do.
Do. 15 ..	106	20	128	99 4 1 0	26 5 0 0	2,912	112	3,024	23·63	600	19·84	110	1,900	19,000	6·52	Do.
Do. 21 ..	98	20	128	106 4 3 0	29 13 0 0	3,024	112	3,136	24·50	513	16·36	120	1,880	18,800	6·22	Do.
Total ..	4	79	..	407 3 1 0	112 4 0 0	11,648	448	12,096	94·51	2,431	80·56	450	7,630	76,300	26·22	
Average ..	..	19·75	128	101 15 3 7·00	28 1 0 0	2,912·00	112·00	3,024·00	23·63	607·75	20·14	112·50	1,907·50	19,075·00	6·55	

Bersham Wraxham North Wales Steam Coal per S.S. "Macgreger" from Gosman and Smith.

Three trials made with mail trains from Madras to Cuddalore, 128 miles.

February, 7 ..	91	20	128	106 14 3 0	27 3 0 0	2,352	112	2,464	19·25	254	10·31	110	1,830	18,300	7·78	Fair weather.
Do. 12 ..	91	20	128	104 6 1 0	28 19 0 0	2,240	112	2,352	18·38	253	10·76	110	1,850	18,500	8·26	Do.
Do. 17 ..	91	20	128	103 9 3 0	29 19 0 0	2,240	112	2,352	18·38	259	11·01	110	1,780	17,800	7·94	Do.
Total ..	3	60	..	314 10 3 0	86 1 0 0	6,832	336	7,168	56·01	766	32·08	330	5,460	54,600	23·98	
Average ..	..	20·00	128	104 16 3 18·66	28 13 2 18·66	2,277·33	112·00	2,389·33	18·67	255·33	10·69	110·00	1,820·00	18,200·00	7·99	

West Hartley Main large Steam Coal per S.S. "Tiverton" from Howard Houlder & Co.

Four trials made with mail trains from Madras to Cuddalore, 128 miles.

March, 27 ..	106	20	128	105 3 0 0	28 7 0 0	2,352	112	2,464	19·25	336	13·64	110	1,930	19,300	8·20	Strong side winds.
Do. 28 ..	106	22	128	115 3 0 0	28 8 0 0	2,128	56	2,184	17·06	295	13·50	110	1,920	19,200	9·02	Fair weather.
Do. 28 ..	98	20	128	105 3 0 0	28 7 0 0	2,404	112	2,516	19·66	251	9·98	110	1,800	18,000	7·49	Strong head & side winds.
Do. 29 ..	98	20	128	104 18 0 0	28 3 0 0	2,432	112	2,544	19·87	201	7·90	110	1,810	18,100	7·44	Fair weather.
Total ..	4	82	..	430 7 0 0	113 5 0 0	9,316	392	9,708	75·84	1,083	45·02	440	7,460	74,600	32·15	
Average ..	..	21·00	128	107 11 3 0	28 6 1 0	2,329·00	98·00	2,427·00	18·96	270·75	11·25	110·00	1,865·00	18,650·00	8·04	

Hastings Hartley Steam Coal per S.S. "Starthblane."

Six trials made with mail trains between Madras and Cuddalore, 128 miles.

April, 16 ..	106	20	128	103 2 1 0	31 3 0 0	2,352	112	2,464	19·25	220	8·92	110	1,820	18,200	7·73	Strong head & side winds.
Do. 17 ..	106	20	128	102 14 2 0	31 3 0 0	2,128	56	2,184	17·06	223	10·21	110	1,770	17,700	8·31	Do.
Do. 17 ..	98	19	128	99 16 3 0	31 11 0 0	2,464	112	2,576	20·12	275	10·67	110	1,750	17,500	7·10	Fair weather.
Do. 18 ..	98	20	128	105 11 0 0	32 7 0 0	2,464	..	2,464	19·25	204	8·28	110	1,700	17,000	6·90	Do.
Do. 18 ..	92	19	128	95 19 0 0	28 11 0 0	2,240	112	2,352	18·37	134	5·69	110	1,720	17,200	7·67	Do.
Do. 19 ..	92	18	128	95 4 2 0	29 3 0 0	2,352	..	2,352	18·37	192	8·16	110	1,810	18,100	7·69	Do.
Total ..	6	116	..	602 8 0 0	183 18 0 0	14,000	392	14,392	112·42	1,248	51·93	660	10,570	105,700	45·40	
Average ..	..	19·33	128	100 8 0 0	30 13 0 0	2,333·33	65·33	2,398·66	18·74	208·00	8·65	110·00	1,761·66	17,616·66	7·56	

South Bulli Coal per S.S. "Cloncurry."

Four trials made with mail trains between Madras and Cuddalore, 128 miles.

May, 7 ..	98	20	128	103 10 2 0	31 3 0 0	2,352	112	2,464	19·25	391	15·86	110	1,950	19,500	14·42	Fair weather.
Do. 8 ..	99	19	128	99 7 0 0	31 11 0 0	2,240	..	2,240	17·50	286	12·76	110	1,750	17,500	7·81	Do.
Do. 8 ..	92	20	128	103 16 0 0	33 3 0 0	2,464	112	2,576	20·12	409	15·87	110	1,990	19,900	8·07	Do.
Do. 9 ..	92	20	128	104 5 2 0	33 3 0 0	2,240	..	2,240	17·50	364	16·25	110	1,970	19,700	8·79	Do.
Total ..	4	79	..	410 19 0 0	129 0 0 0	9,296	224	9,520	73·47	1,450	60·74	440	7,660	76,600	39·09	
Average ..	..	19·75	128	102 14 3 0	32 5 0 0	2,324·00	56·00	2,380·00	18·37	362·50	15·18	110·00	1,915·00	19,150·00	9·77	

Bengal Coal per "S.S. Umballa."

Five trials made with mail trains between Madras and Cuddalore, 128 miles.

A	B	C	D	E	F	COAL CONSUMED. G	H	I	J	K	L	M	N	O	P	State of weather.
Month and date.	No. of engine.	No. of vehicles.	No. of miles.	Gross weight of train.	Weight of load.	For journey.	For lighting.	Total.	Per mile, column I.	Weight of ashes.	Ash per 100 miles of coal consumed, column I.	Average pressure of steam per square inch.	Water consumed in gallons.	Water consumed in pounds.	Pounds of water evaporated per lb. of coal, column G.	
1889.				TONS. CWT. QRS. LB.	TONS. CWT. QRS. LB.	LB.	LB.	LB.	LB.	LB.	LB.	LB.				
June, 6 ..	106	20	128	103 8 0 0	30 7 0 0	2,800	112	2,912	22·75	753	25·85	60	2,200	22,000	7·85	Strong side winds.
Do. 6 ..	98	20	128	106 9 3 0	36 1 0 0	3,136	112	3,248	25·37	857	26·38	110	2,000	20,000	6·38	Fair weather.
Do. 7 ..	98	20	128	102 19 2 0	29 3 0 0	3,136	..	3,136	24·50	847	27·00	110	1,850	18,500	5·89	Do.
Do. 7 ..	92	20	128	103 12 2 0	33 3 0 0	3,360	112	3,472	27·12	874	25·17	110	2,200	22,000	6·55	Do.
Do. 8 ..	92	20	128	103 10 1 0	31 3 0 0	3,360	..	3,360	26·25	698	20·77	110	2,130	21,300	6·34	Do.
Total ..	5	100	..	520 0 0 0	159 17 0 0	15,792	336	16,128	125·99	4,029	125·17	500	10,380	1,03,800	33·01	
Average ..	..	20·00	128	104 0 0 0	31 19 1 16·80	3,158·40	67·20	3,225·60	25·19	805·80	25·03	100·00	2,076·00	20,760·00	6·60	

Firewood.

Five trials made with mail trains between Madras and Cuddalore, 128 miles.

April, 3 ..	92	20	128	105 6 0 0	33 3 0 0	3,992	112	4,104	32·06	112	2·73	110	1,610	15,100	3·78	Strong side winds
Do. 6 ..	106	20	128	105 8 2 0	29 3 0 0	4,397	112	4,509	34·45	131	2·97	110	1,830	18,300	4·25	Strong head & side winds.
Do. 7 ..	98	20	128	105 10 2 0	33 3 0 0	4,403	112	4,515	35·27	220	4·87	110	1,750	17,500	3·97	Very heavy head and side winds.
Do. 8 ..	92	20	128	103 16 3 0	33 3 0 0	3,920	112	4,032	31·50	122	3·03	110	1,760	17,600	4·49	
Do. 11 ..	106	20	128	104 19 1 0	29 3 0 0	4,200	112	4,312	33·68	200	4·64	110	1,700	17,000	4·05	
Total ..	5	100	..	525 0 0 0	157 15 0 0	20,812	560	21,372	166·96	785	18·24	550	8,560	85,500	20·54	
Average ..	..	20·00	128	105 0 0 0	31 11 0 0	4,162·40	112·00	4,274·40	33·39	157·00	3·65	110·00	1,710·00	17,100·00	4·11	

Average result of trials made of Patent Fuel, South Bulli, Bersham Wraxham North Wales Steam, Hastings Hartley Steam, West Hartley Main large Steam, Llay Hall Brymbo Main Steam, Singareni, Bengal Coal and Firewood.

Between Madras and Cuddalore, 128 miles.

									Cost per mile.	
									rs. A.	P.
Patent Fuel ..	20·00	128	103 1 2 18·66	29 16 0 18·66	2,025·33	112·00	2,137·33	16·70	0 2	1·79
South Bulli Coal ..	19·75	128	102 14 3 0	32 5 0 0	2,324·00	56·00	2,380·00	18·37	..	
Bersham Wraxham North Wales Steam Coal ..	20·00	128	104 16 3 18·66	28 13 2 18·66	2,277·33	112·00	2,389·33	18·62	0 2	7·15
Hastings Hartley Steam Coal ..	19·33	128	100 8 0 0	30 13 0 0	2,333·33	65·33	2,398·66	18·74	0 2	5·11
West Hartley Main large Steam Coal ..	21·00	128	107 11 3 0	28 6 1 0	2,329·00	98·00	2,427·00	18·96	0 2	6·42
Llay Hall Brymbo Main Steam Coal ..	20·00	128	103 19 1 9·33	27 19 2 18·66	2,676·00	74·66	2,650·66	20·71	0 2	4·61
Singareni Coal ..	19·75	128	101 15 3 7·00	28 1 0 0	2,912·00	112·00	3,024·00	23·63	0 3	2·47
Bengal Coal ..	20·00	128	104 0 0 0	31 19 1 16·80	3,158·40	67·20	3,225·60	25·19	0 2	10·56
Firewood ..	20·00	128	105 0 0 0	31 11 0 0	4,162·40	112·00	4,274·40	33·39	0 1	2·31

(Signed) C. E. CRIGHTON,
Locomotive and Carriage Superintendent.

NEGAPATAM,
19th July 1889.

Submitted for transmission to the Government of India with reference to its No. 511 R.T., dated 23rd September 1889, embodied in G.O., No. 1095 R., dated 11th October.

2. The Agent and Manager, Madras Railway, states that Singareni coal at its present price compares unfavorably with patent fuel received from England. He has arranged for a supply of 2,000 tons of Borakar coal, and is in communication with Calcutta on the subject of a supply of Bengal coal for experimental purposes.

3. The Agent, South Indian Railway, forwards the results of recent trials of English, Australian and Indian coal, showing—first, that Bengal coal is less expensive per mile than Singareni; second, that English coal is cheaper than Bengal or Singareni coal; third, that next to firewood, patent fuel is the cheapest for train use.

4. The following table summarises the results of the various experiments made in Madras with country coal in comparison with patent fuel or English coal:—

Name of Railway.	Date.	Nature of fuel.	Average weight of train.	Average speed.	Consumption of fuel per train mile.
			TONS.	MILES.	LB.
Madras	1879	Godávari coal	171·63	25·41	33·48
Do.	,,	Patent fuel	182·78	26·49	24·58
Do.	1889	Singareni coal	220·58	24·34	42·92
Do.	,,	Patent fuel	219 94	24·34	25·73
Do.	,,	Singareni coal	429 97	16·95	55·74
Do.	,,	Patent fuel	469·22	17·24	37·75
Do.	,,	Singareni coal	201·81	26·18	40·29
South Indian	,,	Patent fuel	103	Not given.	16·70
Do.	,,	North Wales coal	104	,,	18·62
Do.	,,	West Hartley coal ..	107	,,	18·96
Do.	,,	Singareni coal	101	,,	23·63
Do.	,,	Bengal	104	,,	25·19
His Highness the Nizam's ..	,,	Singareni coal	198·5	24·48	33·47

It will be noticed that the results of the trials of Singareni coal on His Highness the Nizam's State Railway do not agree very closely with the results recently obtained with the same coal on the Madras Railway with fast trains.

5. The Madras Railway find that with fast trains the consumption of Singareni coal is about 66 per cent. heavier than that of patent fuel. Whilst the figures given by His Highness the Nizam's State Railway tend to show, after correcting for difference of weight in the trains, that the consumption with Singareni coal is only 44·4 per cent. heavier than the consumption with patent fuel in the trains on the Madras Railway.

6. The results obtained on the South Indian Railway tend to show that the consumption with Singareni coal is about 41·5 per cent. heavier than with patent fuel and thus agree with the results obtained on His Highness the Nizam's State Railway.

7. It is noticeable also that the results of the latest trials of Singareni coal on the Madras Railway are not quite so favorable as those obtained in 1879 with Godávari coal.

8. The report of trials of Singareni coal on the Nizam's Guaranteed State Railway, kindly furnished by the Locomotive Superintendent of that line, is submitted for comparison with a request that it may be returned.

ORDER—dated 20th January 1890, No. 102 R., Public Works.

Ordered to be forwarded to the Government of India with reference to its letter No. 511 R.T., dated 23rd September 1889.

(Here enter No. 103 R., dated 20th January 1890.)

(True Extract.)

(Signed) C. J. SMITH, Colonel, R.E.,
Joint Secy. to Govt., P.W.D.,
Railway Branch.

To the Consulting Engineer for Railways.

ENDORSEMENT—dated 20th January 1890, No. 103 R., Public Works.

Forwarded.

(By Order.)

Colonel, R.E.,
Joint Secy. to Govt., P.W.D.,
Railway Branch.

Exd. J. Moses.
Spare Copies

RAILWAY.

Govt. of {1890} Madras.

PUBLIC WORKS.

Dated January, 20th.

Recd. *Encl.*

G.O., 20th Jan. 1890, Nos. 102 R., 103 R.

JANUARY.

Coal

Forwarding reports from Agents, Madras and South Indian Railways, of experiments made on different kinds of coal, patent fuel, &c.

All communications should be addressed to the Secretary.

No. 511 R. T.

GOVERNMENT OF INDIA.

PUBLIC WORKS DEPARTMENT.

RAILWAY *Traffic.*

To

The Joint Secretary to the Government of Madras (Railway Branch)
Public Works Department.

Simla, the 23rd September 1889

Sir,

It has been brought to the notice of the Government of India that owing to the recent rise in the price of English Coal the subject of utilising country Coal has been under consideration by the Companies having their terminus at Bombay, and arrangements are contemplated between Messrs Boare Miller and Company of Calcutta and the Bombay Baroda and Central India

India Railway Company for the conveyance of Bengal Coal by sea from Calcutta to Bombay, for use on the Bombay Baroda and Central India Railway.

2. From the information at the disposal of the Government of India it appears that the Madras and South Indian Railway Companies use, on part of their systems, Coal and patent fuel obtained from England; and as Madras is nearer to the sources of Bengal Coal than Bombay, I am directed to suggest that the use of Bengal Coal in Madras might be considered, unless it has been established that Singareni Coal is certainly cheaper than Coal imported from Bengal.

3. I am to add that the Government of India will be glad to learn the results of any investigations which the Government

of

of Madras may make on this subject.

Letter rec'd.

I have the honour to be,
Sir,
Your most obedient Servant

M.W. Mackenzie Major R.E.
Under Secretary

Document accompanying
- Nil.

WA.

B

No. 1095R d/ 11th October '89

G.O. 395 L d/ 5.9.77

Communicated to the Consulting Engineer for Railways for report_

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J.W. Cue 9141

Recd 30. 9. 89.

B

No. 1095R d/ 11th October '89.

To The Consg Engr for Rys.

Flw. 9.x.89

ER's copy taken 14/10/9.

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(No. I.)

No. 4512.

1299.

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Print

MADRAS RAILWAY.

4P

AGENT AND MANAGER'S OFFICE,

MADRAS, 22nd November 1889.

From

The Agent and Manager. M. R. Co.

To

The Consulting Engineer for Railways.

SIR,

With reference to your letter No 875 dated 21st October 1889, forwarding a copy of Government of India letter No 511 R. T. dated 25th September 1889, suggesting for the consideration of Railway Companies that Bengal Coal might be used in the place of Patent Fuel or other coal while English Coal and Patent Fuel remain at their present prices, I have the honour to quote for the information of Government the following extract from a report which has been made by the Acting Locomotive Superintendent on Singareni Coal as compared with Patent Fuel and Wood:-

"I have pleasure in enclosing herewith a statement giving, in tabular form, the result of the trials with the Singareni coal.

"Three separate series of trials have been conducted as under:-

S.P.

MADRAS RAILWAY.

From

The Agent and Manager.

To

The Consulting Engineer
for Railways.

Dated 188

Rcd.

No.

for Patent fuel, the consumptions per ton mile being
$\overset{\text{lbs}}{\cdot 195}$ and $\overset{\text{lbs}}{\cdot 117}$ respectively. The latter figures shew that
the consumption of Singareenie coal was in this
case 66% heavier than that of the Patent fuel.

"In the D.b. trials the figures are, for
Singareenie coal, consumptions per train mile $\overset{\text{lbs}}{55 \cdot 74}$
and per ton mile $\overset{\text{lbs}}{\cdot 18}$, and for Patent fuel, consumption
per train mile $\overset{\text{lbs}}{37 \cdot 75}$, and per ton mile $\overset{\text{lbs}}{\cdot 118}$, the
consumption of the former fuel being therefore
about higher by 52% than that of Patent fuel.

"Again comparing the trials C and A,
the work done and the class of engines in these
two cases being very similar, the consumption per
ton mile of the Singareenie coal works out to 70·9%
heavier than that of Patent fuel.

"A further comparison of the present
trials with those conducted in 1879 and referred
to in Government Order G.O. No 103 P. dated 8th February
1881 shews that the consumption per ton mile of the
Godavari coal in the latter case was $\overset{\text{lbs}}{\cdot 196}$ against
$\overset{\text{lbs}}{\cdot 195}$ the consumption in the present A series in
which the coal was being burnt on the same fire
of lime and by the same engines as in 1879.

"The average evaporation of water per lb
of fuel in the present trials works out to

7 S.P.

Singareni coal — 5·89 lbs

Patent fuel — 8·28 lbs

Wood — 3·15 lbs

while the 1879 experiments gave

Godavery coal — 8·67 lbs

Patent fuel — 10·79 lbs

These figures in both cases include all water lost by leakage &c. and can therefore be only considered to be approximate but, while the evaporation of water per lb. of Patent fuel in the present trials is about 23% less than in 1879, the evaporative power of the present lot of Singareni coal seems to be 37% less than that of the Godavery sample.

"The close coincidence of the figures showing consumption per ton mile under such varying circumstances is remarkable, and goes far to prove the general accuracy of the results arrived at.

"On examining the figures of series C.C., it will be observed that, as was only to be expected, the Singareni coal has the advantage in point of quantity consumed over the wood with which it is being compared, the consumption per ton mile being ·2 lbs of coal against ·356 lbs of wood, the consumption of wood being in this case 78% heavier than that of coal.

S.P.

MADRAS RAILWAY.

From The Agent and Manager.

To The Consulting Engineer for Railways.

Dated 188

Recd.

No.

MADRAS RAILWAY.

From The Agent and Manager.

To The Consulting Engineer for Railways.

Dated 188

Recd.

No.

8 S.P.

"Expressed in another way then, the experiments seem to shew that

For light fast trains 1 ton (2240 lbs) Patent fuel is equal to 3733 lbs Singareni coal.

For heavy goods — " — " — 3640 Singareni coal.

while, as compared with wood,

1 ton of wood is equal to 1258 lbs of Singareni coal.

"The coal is reported to burn brightly and well and to give no difficulty in steaming, provided sufficient care is taken. It is very dirty and during long trips such as that from Madras to Jalarpet, 132 miles, the fire bars become covered, in some cases, 18" deep in clinker and ashes, when this was the case, of course, some difficulty was found in keeping steam but taking it on the whole, especially for short trips of 80 to 100 miles, the coal burnt satisfactorily and well.

"The whole matter is really therefore a question of price and, calculating upon the results of the experiments now under review, the facts appear, after allowing for haulage charges in all cases, to be as follows:–

	Rs. as. P.
At Madras, Singareni coal to be equal to Patent fuel must be delivered at per ton	18.6.0
as compared with its actual price of	23.13.0

S.P.

MADRAS RAILWAY.

From

The Agent and Manager.

To

The Consulting Engineer

for Railways.

Dated 188

Recd.

No.

6

98

	Rs as p
at Raichur, Singareenie coal to be equal to wood must be delivered at per ton	13. 5. 0
as compared with the actual price of	16. 6. 5
at Raichur, Singareenie coal to be equal to Patent fuel must be delivered at per ton	22. 12. 0
as compared with the actual price, at the above stations, of	16. 6. 5

"at Coddapah the Singareenie coal would be about on equal terms, at the present price, with Patent fuel as the cost, including loss by exchange, of a ton of Patent fuel at Madras is Rs. 30. 12. 11 and the hauling charges upon it from Madras to Coddapah would be Rs. 3. 6. 0 making the actual cost of a ton of Patent fuel at that station Rs. 33. 6. 11. The cost at Raichur of 2733 lbs of Singareenie coal, which can be taken as the equivalent of one ton of Patent fuel, is Rs. 27. 5. 4 and the hauling charges upon this quantity from Raichur to Coddapah would be Rs. 6. 7. 11 making the cost of the 2733 lbs of Singareenie coal at Coddapah Rs. 33. 13. 3, which is practically equal to that of the one ton of Patent fuel there, as we have hitherto been able to obtain wood on that district

MADRAS RAILWAY.

From

The Agent and Manager.

To

The Consulting Engineer

for Railways.

Dated 188

Recd.

No.

7 108

at Rs. 5 & 2-0 per ton & Rs 3/- less than the cost at Raichur, and as all engines then burn wood exclusively, the coal would be really at greater disadvantage at Badalpur, than at Raichur.

2. I beg to forward a copy of the Tabular statement alluded to by the absent Locomotive Superintendent, giving the result of the trial with Singareni coal and may add that so long as we are able to obtain a sufficient supply of wood for the Badalpur and Raichur Locomotive Depots at the present rates, Singareni coal - the nearest country coal obtainable - will not be able to compete with the Wood Fuel.

3. As regards the fuel used at Madras, I may state that I have made an offer to a Calcutta Firm for 2000 tons of Raniganj coal as arranged at the official meeting held in my office last month, and have also communicated with others: Home Millers of Calcutta to ascertain at what prices they can land Bengal Coal of good quality in Madras.

I have the honour to be,
Sir,
Your most obedient Servt.

W. Mead
Agent & Manager.

To

REGISTER No. 1190 FILE No.

MADRAS RAILWAY.

From

The Agent and Manager.

To

The Consulting Engineer

for Railways.

Dated 22 Nov. 1889.

Recd. 25

No. 4512/1299

Forwarding report of experiments made upon the Empareni Coal as compared with Patent Fuel & Wood.

No 1356

South Indian Railway,

AGENT'S OFFICE,

TRICHINOPOLY, 23rd October 1889.

From

The AGENT,

SOUTH INDIAN RAILWAY,

To

The CONSULTING ENGINEER FOR RAILWAYS,

MADRAS.

Sir,

Your letter No 952 of the 21st instant. The question of utilizing Indian coal on this railway has from time to time for some years past been under our Consideration. I attach hereto a Statement giving the result of some recent trials of English, Australian and Indian Coal, from which you will see that the Singareni and the Bengal Coal show to much disadvantage when Compared with the Cost per train mile of English and Australian Coal.

I am,
Sir,
Your Most Obedient Servant.

William A Betts
Agent.

REGISTER
No. 1181
FILE
No.

Enc 1
Br. 11308
/89

REGISTER
No. 11[illegible]
FILE
No.

Enc 2
Br. 11308
/89

From

THE AGENT,

South Indian Railway,

Tri[illegible]

To

THE CONSULTING ENGINEER FOR

RAIL[illegible]

Dated 23rd October

Received 25th

No. 1356

ENCLOSURE —

[illegible]

We have had [illegible] before

[illegible] letter No. 1250 [illegible]

SOUTH INDIAN RAILWAY.

LOCOMOTIVE DEPARTMENT.

Cambrian Patent Fuel *per S. S. "Manitoba" from GOSMAN & SMITH.*

Six trials made with mail trains from Madras to Cuddalore 128 miles.

A	B	C	D	E				F				Coal Consumed. G	H	I	J	K	L	M	N	O	P	
Month and Date.	No. of Engine.	No. of Vehicles.	No. of Miles.	Gross weight of Train.				Weight of Load.				For Journey.	For Lighting.	Total.	Per mile column I.	Weight of ashes.	Ash per 100 miles of coal consumed column I.	Average pressure of steam per square inch.	Water consumed in gallons.	Water consumed in pounds.	Pounds of water evaporated per lb. of coal column G.	State of Weather.
1889.				Tons.	Cwt.	Qrs.	lbs.	Tons.	Cwt.	Qrs.	lbs.	lbs.	lbs.	lbs.		lbs.	lbs.	lbs.		lbs.	lbs.	
JANUARY.....	21	106	20	128	97	18	...	...	27	10	...	...	2016	112	2128	16·62	262	12·31	115	1750	17500	8·68	Fair weather.
"	23	91	20	128	103	17	...	...	29	9	...	...	2240	112	2352	18·38	242	10·28	105	1765	17650	7·88	Do.
"	26	106	20	128	105	10	...	...	30	17	...	...	1904	112	2016	15·75	263	13·05	115	1760	17600	9·24	Do.
"	28	91	20	128	103	2	2	...	29	3	...	...	1960	112	2072	16·19	255	12·31	110	1760	17600	8·98	Fair up to Villupuram. Head wind from Vm. to Cud.
"	31	106	20	128	103	19	3	...	31	19	...	...	1904	112	2016	15·75	266	13·19	110	1780	17800	9·35	Fair weather.
FEBRUARY.....	2	91	20	128	104	2	3	...	29	19	...	...	2128	112	2240	17·50	235	10·49	110	1830	18300	8·59	Do.
Total...		6	120	...	618	10	...	...	175	17	...	...	12152	672	12824	100·19	1523	71·63	665	10645	106,450	52·72	
Average...			20	128	103	1	2	18·66	29	16	...	18·66	2025·33	112·00	2137·33	16·70	253·83	11·94	110·83	1774·16	17741·66	8·79	

Llay Hall Brymbo Main steam *Coal per S. S. "Eastern Prince" from HOWARD HOULDER & CO.*

Three trials made with mail trains from Madras to Cuddalore 128 miles.

JANUARY.	22	106	21	128	105	18	2	...	28	17	...	...	2464	56	2520	19·69	343	13·61	110	1880	18800	7·63	Strong wind blowing from North East.
"	24	91	20	128	105	8	...	...	27	11	...	...	2800	112	2912	22·75	337	11·57	105	2065	20650	7·37	Strong side head winds.
"	27	106	19	128	100	11	2	...	27	11	...	...	2464	56	2520	19·69	409	16·23	110	1920	19200	7·79	" " winds.
Total...		3	60	...	311	18	...		83	13	...	...	7728	224	7952	62·13	1089	41·41	325	5865	58650	22·79	
Average...			20	128	103	19	1	9·33	27	19	2	18·66	2576·00	74·66	2650·66	20·71	363·00	13·80	108·33	1955·00	19550·00	7·59	

Singareni *Coal received from Messrs. PARRY & CO. of Madras.*

Four trials made with trains from Madras to Cuddalore 128 miles.

FEBRUARY.....	5	106	19	128	98	5	2	...	27	11	...	...	2912	112	3024	23·63	208	23·41	110	1980	19800	6·80	Fair weather.
"	10	106	20	128	103	8	3	...	28	15	...	...	2800	112	2912	22·75	610	20·95	110	1870	18700	6·68	Do.
"	15	106	20	128	99	4	1	...	26	5	...	...	2912	112	3024	23·63	600	19·84	110	1900	19000	6·52	Do.
"	21	98	20	128	106	4	3	...	29	13	...	...	3024	112	3136	24·50	513	16·36	120	1880	18800	6·22	Do.
Total...		4	79	...	407	3	1	...	112	4	...	...	11648	448	12096	94·51	2431	80·56	450	7630	76300	26·22	
Average...			19·75	128	101	15	3	7·00	28	1	...	...	2913·00	112·00	3024·00	23·63	607·75	20·14	112·50	1907·50	19075·00	6·55	

Bersham Wraxham North Wales steam *Coal per S. S. "Macgregor" from GOSMAM & SMITH.*

Three trials made with mail trains from Madras to Cuddalore 128 miles.

FEBRUARY.....	7	91	20	128	106	14	3	...	27	3	...	...	2352	112	2464	19·25	264	10·31	110	1830	18300	7·78	Fair weather.
"	12	91	20	128	104	6	1	...	28	19	...	...	2240	112	2352	18·38	233	10·76	110	1850	18500	8·26	Do.
"	17	91	20	128	103	9	3	...	29	19	...	...	2240	112	2352	18·38	259	11·01	110	1780	17800	7·94	Do.
Total...		3	60	...	314	10	3	...	86	1	...	...	6832	336	7168	56·01	756	32·08	330	5460	54600	23·98	
Average...			20·00	128	104	16	3	18·66	28	13	2	18·66	2277·33	112·00	2389·33	18·67	255·33	10·69	110·00	1820·00	18200·00	7·99	

West Hartley Main large steam *Coal per S. S. "Tiverton" from HOWARD HOULDER & CO.*

Four trials made with mail trains from Madras to Cuddalore 128 miles.

MARCH	27	106	20	128	105	3	...	...	28	7	...	...	2352	112	2464	19·25	336	13·64	110	1930	19300	8·29	Strong side winds.
"	28	106	22	128	115	3	...	...	28	8	...	...	2128	56	2184	17·06	295	13·50	110	1920	19200	9·02	Fair weather.
"	28	98	20	128	105	3	...	...	28	7	...	...	2404	112	2516	19·66	251	9·98	110	1800	18000	7·49	Strong head & side winds.
"	29	98	20	128	104	18	...	...	28	3	...	...	2432	112	2544	19·87	201	7·90	110	1810	18100	7·44	Fair weather.
Total...		4	82	...	430	7	...	...	113	5	...	...	9316	392	9708	75·84	1083	45·02	440	7460	74600	32·15	
Average...			21·00	128	107	11	3	...	28	6	1	...	2329·00	98·00	2427·00	18·96	270·75	11·25	110·00	1865·00	18650·00	8·04	

Hastings Hartley steam *Coal per S. S. "Starmblane."*

Six trials made with mail trains between Madras and Cuddalore 128 miles.

APRIL.....	16	106	20	128	103	2	1	...	31	3	...	...	2352	112	2464	19·25	220	8·92	110	1820	18200	7·73	Strong head & side winds.
"	17	106	20	128	102	14	2	...	31	3	...	...	2128	56	2184	17·06	223	10·21	110	1770	17700	8·31	Do.
"	17	98	19	128	99	16	3	...	31	11	...	...	2464	112	2576	20·12	275	10·67	110	1750	17500	7·10	Fair weather.
"	18	98	20	128	105	11	...	...	32	7	...	...	2464	...	2464	19·25	204	8·28	110	1700	17000	6·90	Do.
"	18	92	19	128	95	19	...	...	28	11	...	...	2240	112	2352	18·37	134	5·69	110	1720	17200	7·67	Do.
"	19	92	18	128	95	4	2	...	29	3	...	...	2352	...	2352	18·37	192	8·16	110	1810	18100	7·69	Do.
Total...		6	116	...	602	8	...	...	183	18	...	...	14000	392	14392	112·42	1248	51·93	660	10570	105,700	45·40	
Average...			19·33	128	100	8	...	...	30	13	...	...	2333·33	65·33	2398·66	18·74	208·00	8·65	110·00	1761·66	17616·66	7·56	

South Bulli *Coal per S. S. "Cloncurry."*

Four trials made with mail trains between Madras and Cuddalore 128 miles.

MAY.....	7	98	20	128	103	10	2	...	31	3	...	...	2352	112	2464	19·25	391	15·86	110	1950	19500	14·42	Fair weather.
"	8	99	19	128	99	7	...	...	31	11	...	...	2240	...	2240	17·50	286	12·76	110	1750	17500	7·81	Do.
"	8	92	20	128	103	16	...	...	33	3	...	...	2464	112	2576	20·12	409	15·87	110	1990	19900	8·07	Do.
"	9	92	20	128	104	5	2	...	33	3	...	...	2240	...	2240	17·50	364	16·25	110	1970	19700	8·79	Do.
Total...		4	79	...	410	19	...	...	129	...	...	...	9296	224	9520	73 47	1450	60·74	440	7660	76600	39·09	
Average...			19·75	128	102	14	3	...	32	5	...	...	2324·00	56·00	2380·00	18·37	362·50	15·18	110·00	1915·00	19150·00	9·77	

Bengal *Coal per S. S. "Umballa."*

Five trials made with mail trains between Madras and Cuddalore 128 miles.

JUNE	5	106	20	128	103	8	...	...	30	7	...	...	2800	112	2912	22·75	753	25·85	60	2200	22000	7·85	Strong side winds.
"	6	98	20	128	106	9	3	...	36	1	...	...	3136	112	3248	25·37	857	26·38	110	2000	20000	6·38	Fair weather.
"	7	98	20	128	102	19	2	...	29	3	...	...	3136	...	3136	24·50	847	27·00	110	1850	18500	5·89	Do.
"	7	92	20	128	103	12	2	...	33	3	...	...	3360	112	3472	27·12	874	25·17	110	2200	22000	6·55	Do.
"	8	92	20	128	103	10	1	...	31	3	...	...	3360	...	3360	26·25	698	20·77	110	2130	21300	6·34	Do.
Total...		5	100	...	520	...	...	...	159	17	...	...	15792	336	16128	125·99	4029	125·17	500	10380	103800	33·01	
Average...			20·00	128	104	...	...	...	31	19	1	16·80	3158·40	67·20	3225·60	25·19	805·80	25·03	100·00	2076·00	20760·00	6·60	

Firewood.

Five trials made with mail trains between Madras and Cuddalore 128 miles.

APRIL.....	3	92	20	128	105	5	...	...	33	3	...	...	3992	112	4104	32·06	112	2·73	110	1510	15100	3·78	Strong side winds.
"	6	106	20	128	105	8	2	...	29	3	...	...	4297	112	4409	34·45	131	2·97	110	1830	18300	4·25	" head and side winds.
"	7	98	20	128	105	10	2	...	33	3	...	...	4403	112	4515	35·27	220	4·87	110	1750	17500	3·97	Very heavy head & side winds.
"	8	92	20	128	103	16	3	...	33	3	...	...	3920	112	4032	31·50	122	3·03	110	1760	17600	4·49	Do.
"	11	106	20	128	104	19	1	...	29	3	...	...	4200	112	4312	33·68	200	4·64	110	1700	17000	4·05	Do.
Total...		5	100	...	525	...	...	...	157	15	...	...	20812	560	21372	166·96	785	18·24	550	8550	85500	20·54	
Average...			20·00	128	105	...	...	...	31	11	...	...	4162·40	112·00	4274·40	33·39	157·00	3·65	110·00	1710·00	17100·00	4·11	

Average result of trials made of **Patent Fuel, South Bulli, Berham Wroxham North Wales steam, Hastings Hartley steam, West Hartley Main large steam, Llay Hall Brymbo Main steam, Singareni, Bengal** *Coal and* **Firewood**

Between Madras and Cuddalore 128 miles.

																				Cost per mile. Rs.	As.	P.
Patent Fuel	20·00	128	103	1	2	18·66	29	16	...	18·66	2025·33	112·00	2137·33	16·70	253·83	11·94	110·83	1774·16	17741·66	8·79	0	2	1·79
South Bulli Coal.....	19·75	128	102	14	3	...	32	5	...	...	2324·00	56·00	2380·00	18·37	362·50	15·18	110·00	1915·00	19150·00	9·77	...	...	...
Bersham Wroxham North Wales Steam Coal	20·00	128	104	16	3	18·66	28	13	2	18·66	2277·33	112·00	2389·33	18·62	255·33	10·69	110·00	1820·00	18200·00	7·99	0	2	7·15
Hastings Hartley Steam Coal.	19·33	128	100	8	...	...	30	13	...	...	2333·33	65·33	2398·66	18·74	208·00	8·65	110 00	1761·66	17616·66	7·56	0	2	5·11
West Hartley Main large Steam Coal	21·00	128	107	11	3	...	28	6	1	...	2329·00	98·00	2427·00	18·96	270·75	11·25	110·00	1865·00	18650·00	8·04	0	2	6·42
Llay Hall Brymbo Main Steam Coal	20·00	128	103	19	1	9·33	27	19	2	18·66	2576·00	74·66	2650·66	20·71	363·00	13·80	108·33	1955·00	19550·00	7·59	0	2	4·51
Singareni Coal.....	19·75	128	101	15	3	7·00	28	1	...	...	2912·00	112·00	3024·00	23·63	607·75	20·14	112·50	1907·50	19075·00	6·55	0	3	2·47
Bengal Coal.....	20·00	128	104	...	...	...	31	19	1	16·80	3158·40	67·20	3225·60	25·19	805·80	25·03	100·00	2076·00	20760·00	6·60	0	2	10·56
Firewood	20·00	128	105	...	...	...	31	11	...	...	4162·40	112·00	4274·40	33·39	157·00	3·65	110·00	1710·00	17100·00	4·11	0	1	2·31

Loco. & Carr. Suptt.'s Office,
Negapatam, 19th July, 1889.

C. E. CRIGHTON,

Form No. 1.

PUBLIC WORKS DEPARTMENT.

OFFICE OF CONSULTING ENGINEER FOR RAILWAYS,

Madras, 26th November 1889.

Letter from the Agent and
manager, Madras Railway, No: 4512/1299 ng
dated 22nd November 1889 and ac-
companiments.

Letter from the Agent, South Indian
Railway, No: 1356, dated 23rd October
1889 and accompaniment.

No.

SUBMITTED for transmission to the Government of
India, with reference
to his No: 511 R. I. dated
23rd September 1889, and
bodied in G. O. No: 1095
R. dated 11th October

2. The Agent and
manager, Madras Rail-
way, states that Singa
reni coal at its pre-
sent price compares
unfavorably with
Patent

Palauk fuel received from England. She has arranged for a supply of 2,000 tons of Borakar coal, and is in communication with Calcutta on the subject of a supply of Bengal coal for experimental purposes.

3. The Agent South Indian Railway, forwards the results of recent trials of English, Australian, and Indian coal, showing 1st that Bengal coal is less expensive per mile than Singareni.

2nd that English coal is cheaper than Bengal or Singareni coal.

3rd that next to firewood, Palauk fuel is the cheapest for train use.

4. The following table summarises the results of the various experiments made in Madras with country coal in comparison with Palauk fuel or English coal.

Name of Railway	Year	Nature of Fuel	Average weight of train	Average speed	Consumption of fuel per train mile
			tons	miles	lbs
Madras	1879	Godavari Coal	171.63	25.41	33.48
"	"	Patent Fuel	182.78	26.49	24.58
"	1880	Singareni Coal	220.58	24.84	42.92
"	"	Patent Fuel	219.94	24.34	25.73
"	"	Singareni Coal	429.97	16.95	55.74
"	"	Patent Fuel	469.22	17.24	37.75
"	"	Singareni Coal	201.81	26.18	40.29
South Indian	"	Patent Fuel	103	not given	16.70
	"	North Wales coal	104	"	18.62
	"	West Hartley coal	107	"	18.96
	"	Singareni coal	101	"	23.63
	"	Bengal	104	"	25.19
H.H. the Nizam's	"	Singareni coal	198.5	24.48	33.47

It will be noticed that the results of the trials of Singareni Coal on His Highness the Nizam's State Railway do not agree very closely with the results

results recently obtained with the same coal on the Madras Railway with fast trains.

5. The Madras Railway find that with fast trains the consumption of Singareni Coal is about 66% heavier than that of Patent Fuel. Whilst the figures given by His Highness the Nizams State Railway tend to show, after correcting for difference of weight in the trains, that the consumption

consumption with Singareni coal is only 44·4 % heavier than the consumption with Patent Fuel in the trains on the Madras Railway.

6. The results obtained on the South Indian Railway tend to show that the consumption with Singareni coal is about 41·5 % heavier than with Patent Fuel and thus agree with the results obtained on His Highness the Nizam's State Railway.

7.

170

7. It is noticeable also that the results of the latest trials of Singareni coal on the Madras Railway are not quite so favorable as those obtained in 1879 with Godavari coal.

8. The report of trials of Singareni coal on the Nizam's Guaranteed State Railway, kindly furnished by the Locomotive Superintendent of that line is submitted for comparison with a request that it

it may be returned

Sidney Smith
Major
~~Col.~~ R.E.

for Comy. Engr. [illegible]

H.S.

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No. 1095 R of 11-10-89

Form No. 1 A

No. 103 R of 20th Jany /90.

H.C.W.
17 Jan

Ordered to be forwarded

for C. the Government of India

F.S. with reference to its letter

No. 511 R. T. dated 23rd

September 1889.

A. No. 103 R of 20th Jany 1890

Forwarded.

C.S.S.
15. 1. 90

R.

Recorded 30/1/91

To The Consg Engr for Rys:

From

THE CONSULTING ENGINEER

FOR RAILWAYS,

MADRAS,

No. 476

Dated 26th November 1889.
Received 27th

No. of Enclosures. 4

Subject.

Reports from the agents, Madras and South Indian Railways of experiments made on different kinds of coal, Patent fuel &c.

A No. 102-3 R of 20-Jany/90.