M.R.O. 1—77,000—4-8-41.

(1) Number of pages 182

(2) Date of repair 1946

(3) Initials of the Reference

MADRAS RECORD OFFICE.

Government of Madras.

Public Works DEPARTMENT.

G.O. No. 1213 Pres/Mis

Dated 30 4 1873

Not to be folded or roughly handled

INDEX.

Paras.		Pages.
1.	Forwarding Report. Objects stated.	1
2.	Officers and others from whom assistance was received. The Commissioner's Report. Returns from Consulting Engineer for Railways. District *Engineer*. Nilgiris. Messrs. Stanes and Rouse. Collector of Coimbatore	*ibid*
3.	Instructions of Government do not refer to the nature and cost of a Railway. Reason for entering into questions of cost. Captain Morant's report	*ibid*
4.	Sources available for information regarding Traffic, Railway Returns, Traffic Registers, Toll Contract Sales	2
5.	General description of the district—boundaries, area, character of country, climate, cultivation, population, value of exports and imports. Present lines of communication. Visitors	*ibid*
6.	Heads of Inquiry	3
7.	Existing traffic. Railway Returns—passengers, goods. Summary of traffic	4
8.	Toll-bar Traffic Registers. Basis of calculation. Abstract results	*ibid*
9.	Toll Contract Sales, to be mainly relied on referred to by Mr. Cockerell's Report. Sales of 1874-75—proportion due to Coonoor Ghaut	5
10.	Calculation of traffic. Circumstances to be considered. Pack-loads. Contractors' profits. Results of calculation on the basis of one-third of a ton per cart, at half a ton per cart. Final conclusion. .	6
11.	Traffic from Coonoor to Ootacamund—proportion to be allowed . .	*ibid*
12.	Passenger traffic. Railway Returns of 1873-74, the basis of calculation. Head-load traffic. Total number of passengers	*ibid*
13.	Live stock traffic	7
14.	Summary of existing traffic	*ibid*
15.	Prospective traffic. Inquiry based in past increase. Registers of 1862 and 1869. Comparison of results. Rate of increase . .	*ibid*
16.	Traffic of 1865. Estimates of traffic for Nilgiri branch of Madras Railway. Ghaut traffic of 1865—traffic of 1862 deduced from it	*ibid*
17.	Increase of passenger traffic. Good information of past traffic not obtainable. Effect of new ghaut. Passenger traffic of 1865, 1866, and 1867. Rate of increase. Mr. Cockerell's Report in error	8
18.	Sources of increasing traffic—tea cultivation, chinchona, Australian timber, and coffee. Past rate of increase. Cultivation in 1850. Cultivated and cultivable area. Traffic in manure and lime.	*ibid*
19.	Diversion of existing Hill traffic. Ouchterlony Valley not to be attracted to a railway. Rates of carriage by present and rail routes. Effect of proposed harbour at Madras. General effect of a Ghaut Railway	9

Paras.		Pages
20.	General considerations pointing to increased traffic. Facilities for reaching the Hills. Reduced cost of living. Breweries. Special advantages of the district	10
21.	Probable cost of a Ghaut Railway. Captain Morant's Report supports the Rigi system. Classes of Railway	*ibid*
22.	Disadvantages of ordinary Railways. Heavy engines. Flat gradients. Narrow gauge Railways in Norway. Carnatic Railway. Break of gauge an evil. Stationary engines and railways	11
23.	Central rail system. Further information required of results of working Fell and Rigi Railways. Relative cost. Advantages of the Fell Railway	*ibid*
24.	Comparative advantages of the Fell and Rigi systems	12
25.	Comparative cost of several systems on the Coonoor Ghaut. Statement. Data of estimate derived from works executed. Large allowance made for extra cost of ghaut line	*ibid*
26.	Relative economy of railway and other carriage. Comparison of cart traffic with existing railways. Circumstances of the native carriers. Cause of low charges	14
27.	Nature of inquiry necessary. Difficulty in obtaining information. Profits of carriers. Reduction of charges on the ghaut impossible.	*ibid*
28.	Cost of maintenance and working of a Ghaut Railway. Data derived from the Madras Railway Accounts. Statement showing cost of maintenance of Madras and Ghaut Railways	15
29.	Total annual charges and resulting rates. Statement showing the total annual charges on various Ghaut Railways applied to the Coonoor Ghaut	17
30.	Analysis of traffic and proposed rates of charge on Ghaut Railway.	*ibid*
31.	Analysis of present charges and carriers' profits. Variations in statements furnished. Statement of Messrs. Stanes and Rouse accepted for outlay. Causes militating against competition with a Railway. General opinion that competition is impracticable	18
32.	Present public outlay on Traffic Analysis of the operations of Messrs. Stanes' Agency for 1874. Average rate deduced. Total outlay by public on two Agencies. Summary of outlay for the whole traffic	*ibid*
33.	Alternative outlay for conveyance by Railway. Large reduction in expenditure. Advantageous financial position to be occupied by a Railway	20
34.	Comparison of 'hill' 'and low country' and market rates. Large traffic for native consumers. Competition introduced thereby. Statement showing increase per ton in price of food grains. Increase in articles of European consumption higher. Statement of bazaar prices of other articles of food. Increase in charges of labor and building materials	*ibid*
35.	Summary of conclusions. Evidence supporting assumed results unimpeachable	21

APPENDICES.

APPENDIX A.

Report of the President of the Local Fund Board.

Paras.		Pages.
1 & 2.	Estimates of traffic of the Nilgiri Branch Railway	23
3.	Ghaut Traffic of 1869	*ibid*
4.	Ghaut Traffic of 1874	*ibid*
5.	Toll Contract Sales for 1874-75	*ibid*
6—8.	Proportionate value of Toll-bars and Traffic computed from Receipts	24
9—11.	Head-loads and Passenger Traffic	*ibid*
12.	Luggage Traffic	*ibid*
13.	Beer Traffic	*ibid*
14.	Traffic to Military Cantonment	25
15 & 16.	Production of Coffee and Tea	*ibid*
17 & 18.	Ouchterlony Valley Coffee attracted to a Railway	*ibid*
19.	Traffic in Hardware	26
20.	Traffic in Manure	*ibid*
21.	Increased influx of labor	*ibid*
22.	Production of Chinchona and Traffic	*ibid*
23.	Wynaad Traffic	*ibid*
24—28.	Traffic in Grain Food	27
29.	Australian Timber Traffic	*ibid*
30.	Traffic in Vegetables	*ibid*
31.	Horses and Carriages	*ibid*
32.	Live Stock Importation	*ibid*
33.	Present Charges by Cart and Coolie	*ibid*
34.	Estimate of existing traffic	*ibid*
35.	Estimate of Traffic which a Railway would secure	*ibid*
36.	Additional Traffic from the Ouchterlony Valley	28
37.	Traffic in Butcher's Meat	*ibid*
38 & 39.	Present Annual Expenditure in Carriage	*ibid*
40 & 41.	Future prospects as regards traffic. Alteration in Waste Land Rules	*ibid*
42.	Extension of Tea planting	*ibid*
43.	Advantages conferred by a Railway	29
44.	Increase to number of visitors	*ibid*
45—47.	Benefit to the Government of a Railway, also to existing Madras line	*ibid*
48—52.	Coffee Cleaning Works at Mettapolliem. Effect of break of gauge on traffic	*ibid*

APPENDIX B.

Report of Captain J. L. L. Morant, R.E., District Engineer, Nilgiris.

1—3.	Inquiry limited to a Railway between Mettapolliem and Coonoor	31
4—7.	Effect of a Railway to increase traffic. Subject should be considered on a large basis. Division of the line into two sections	31&32

Paras.		Pages.
8.	Remarks on the continuation of the present line to Kullar. Cost Madras Railway Company to construct	32
12—15.	Causes of rejecting either of the present lines of ghaut road for formation of Railway	33&34
16.	Systems of Railway for consideration	34
17—22.	Railways on steep inclines worked in the ordinary way. Examples. Semmering incline	*ibid*
23.	Influence of curves on paying load	35
24 & 25.	Influence of gradient on consumption of fuel	*ibid*
26.	Influence of incline on locomotive. Objections to ordinary Railway on the Coonoor Ghaut	36
28—33.	Narrow gauge lines on gradients of about 1 — 50. Soudan Railway, Norway Railway, Festiniog Railway. Defects of narrow gauge Railways	36 & 37
34—40.	Break of gauge with Madras Railway. Results of break of gauge in other countries—Great Western Railway, Fell's Mont Cenis Railway, Indian Branch Railway, Conjeveram Railway.	37 & 38
41—43.	Dubious economy of narrow gauge	38 & 39
44—46.	Arguments in favor of preservation of Madras Railway gauge throughout	39
47.	Steep inclines worked by stationary engines. Examples. Objections to this system. Mr. DeClosets' proposal	*ibid*
49—53.	Central Rail Railways. Fell Railway. Descriptive results of trials. Cost on Mont Cenis. Applied on the Organ Mountains, Brazil. Defects of the system. Cost as applied to the Coonoor Ghaut ..	40—42
54—57.	Rigi ladder Railway. Description. Precautions for safety. Atmospheric break. Applied in other localities.	42 & 43
58.	Argument in favor of Rigi system for Coonoor Ghaut	43
59.	Details as laid on ghaut	44
60.	Estimate of cost	*ibid*
61.	Another estimate	*ibid*
62—65.	Circumstances not taken into account in estimates	45
66 & 67.	Capabilities of Rigi Railway in accommodating traffic. Train service proposed	45 & 46
68.	Description of rolling stock	46
69.	Examination of objections urged against the Rigi system	47
70.	Comparison of Fell and Rigi systems	48
71.	Summary of cost of communication proposed	*ibid*
72—74.	Recapitulation of points made good	48 & 49
	Three Appendices.	

APPENDIX C.

Table of weights of various loads carried on Coonoor Ghaut .. 53

APPENDIX D.

Calculation of traffic represented by Toll Contract Sales of 1874-75.. *ibid*

APPENDIX E.

Letter from Messrs. Stanes and Rouse, dated 3rd April 1875 .. 54

APPENDIX F.

Letter from Mr. Rohde, dated 22nd March 1875 55

APPENDIX G.

Pages.

Letter from Mr. A. Whiffin, dated 10th March 1875 .. .. *ibid*

APPENDIX H.

Letter from Mr. H. Wapshawe, dated 14th March 1875 56

APPENDIX H².

Detail of Expenditure on the New Coonoor Ghaut 57

APPENDIX J.

Letter from the Collector of Coimbatore, dated 11th March 1875 .. *ibid*

APPENDIX K.

Detail of the cost and profits of working 12 carts on the Coonoor Ghaut. 60

APPENDIX M.

Letter from the Collector of Coimbatore, dated the 10th April 1875 .. 61

APPENDIX N.

Statement of the traffic carriage by Messrs. Stanes and Rouse's Agency in 1874 62

APPENDIX O.

Statement showing the comparative prices of food grains in the Nilgiri and Coimbatore Districts .. .. *ibid*

APPENDIX P.

Comparative statement of the rates for labor, carriage, and materials in the Coimbatore and Nilgiri Districts in the year 1874 63

APPENDIX Q.

Note on communications in the Nilgiri District 65

APPENDIX R.

Letter from Messrs. Stanes and Rouse, dated the 23rd February 1875.. 66
Appendix to letter (R.) .. .. *ibid*

APPENDIX S.

Queries and replies by Messrs. Stanes and Rouse 67

APPENDIX T.

List of Estates sending Coffee to Mettapalliem .. .. *ibid*

Commissioners Office
Coimbatore 16 January 18

No 1

From

J. R. Sconce Esq
President Local Fund Board
Nilgiris.

To

The Secretary to Government
P. W. Department
Fort St George

Sir.

With reference to Minute dated 1st October 1844 No 459 from the Under Secretary to Government, in the Public Works Department requesting me to furnish the available information respecting the traffic on the Coonoor Ghaut in view to the construction of a railway on the Ghaut. I have the honor to submit the following observations.

2. The Statistics of traffic for the Nilgiri Branch Railway were derived from Statistics of existing traffic in 185

1865 through two toll bars on the road between Pattamore and the Nilgiri Hills. The informed the traffic was:—

Roads.	Tons.
1st Class Passengers	300.
2nd Class Passengers	1,000.
3rd Class Passengers	5,000.

3. I enclose a statement showing the traffic on the Count for 8 months in 1869. It reveals an annual number of traffic of 13,000 Tons. The traffic referred to in the statement is loaded traffic.

4. I enclose a statement showing the traffic between the 12th and 21st October last. It discloses a traffic at the rate of 13,000 Tons per annum.

5. But the toll contract for the current year reveals a higher traffic. There are

four tolls on the Nilgiri Hills. The Lawson Count toll, the Coonoor toll, the Kotagherry toll and the Kullumbe toll. These realised in the current official year at auction Rupees 1188-6-4 per month. Before the auction Contractors offered 2000 Rs more for the year for the tolls but the Local Fund Board could not accept the offer, as sale by auction is the form prescribed by order. At the auction the parties referred to and the other bidders combined to keep down the rate of the lease.

6. For the period between the 1st August 1871 and the 30th June 1873 the Kullumbe toll let for 105 Rupees per mensem, the Kotagherry toll for 63 Rupees per mensem, the Lexingmore toll for 269 Rupees per mensem and the Coonoor toll for 600 Rupees per month or the tolls let collectively

collectively for Rupees 18,444 per annum and the proportion of the sum of the tolls borne by the Toonoor toll was as 1 to 12.

For the year from 1st July 1873 to 30 June 1874 the tolls were leased for Rupees 13,514 - 2 - 0. In the current year as already stated the lease is Rupees 14,200 and it was considered worth 2000 Rupees more.

7. These leases show a gradual rise: The proportion borne by the Toonoor toll to the other tolls is at least 1 in 10. This proportion indicates that in the current year the estimate of the Contractors was 2283 Rupees for the Toonoor toll. Colonel Morgan, the Conservator of Forests informs me, the bandies which carry Government timber from Mudumulay to Potteamund take each 1/2 a ton. The toll

toll for a loaded bandy is 4 annas. This calculation makes the toll on a ton 8 annas and at this rate the toll Contractors calculated on a traffic of 1650 tons for the Toonoor toll in the current year at least, because they would not work without a profit. They really calculated on a much higher traffic because parties were willing to pay 1/2 of Rupees 2000 more than was actually paid for the Toonoor toll or say 1200 Rupees representing a further traffic of 2,400 tons. Thus the goods traffic on the Toonoor Ghaut at 8 annas per ton stands in 1874-75 at 1960 tons against 1,115 tons in 1865. In other words it has quadrupled in nine years.

8. I am not sure, however, that a bandy can be taken as carrying 1/2 a ton. Many of the bandies do and are drawn by

by 2 pairs of bullocks but bandies drawn by one pair of bullocks only carry 1/3 of a ton. If the tolls were calculated at 13 annas per ton; the existing traffic on the Chaut according to the toll leases would be between 12 and 13,000 tons. The calculation according to the amount of the lease does not include head loads which pay no toll.

9. There head loads as per statement A represented in 1869 a tonnage of 2866 tons as each Cooly carries 60 lbs and there was a monthly traffic of 10,700 coolies. The bringing up the goods traffic on the Chaut is 21836 tons according our calculation is 15866 tons according to the other.

10. There were in 1866 passing through the Pottanare toll

1st class Passengers 300
2nd class Passengers 700

600 first class Passengers visited Potteamund in the current year and returned to the plains. I calculate each such passenger brings with him two servants. Returns from the Conoor Hotels indicate the arrival of 300 first class Passengers in the year, each also with two servants or 2nd class Passengers. Thus the existing Passenger traffic on the Chaut is

1st class 1800
2nd class 3600

or the number of the former class is enhanced since 1865 no less than 6 times and the 2nd class traffic is 6 times greater.

11. Of course the construction of a railway would diminish the head load traffic because the rail would carry the goods but coolies bringing goods for sale at the weekly markets at Conoor and Potteamund would come up with their goods.

They

They would travel by rail and return the same day. Their members are according to Returns from the Municipal Officers

385 to Connor market.
500 to City market
885.

a total of 1770 per week going and returning or 92040 per annum against 6000 in 1864-65 passing the Pettaware toll gate. Of this number according to the proportion adopted above 4/5 out of 12, fifty three thousand six hundred and ninety (53,690) must be credited to the Connor Chaut. But the returns were compiled in the full season which now lasts 8 months on the Hills and a reduction must be made on account of the slack season when the attendance of Coolies at the market is probably half what it is at other times. This calculation would give

5

give the figures at an annual Cooly passenger traffic on the Chaut of 46,080. The above implies that half the Coolies or 23,040 would be loaded ~~with loaded~~ with loads of 50 lbs each or would carry 513 tons.

13. To this tonnage must be added the tonnage of luggage &c carried over the Chaut by Coolies and this luggage probably makes up the difference between 513 tons and the 2866 tons shown to be carried by Coolies in 1869 as per statement A. Accordingly 2866 tons must be added to the Chaut traffic of goods, exhibited in para 7, that is to say to 18960 tons or to 13000 tons (para 8) making the traffic in one case 21826 tons and in the other 15866 tons. To the above cooly traffic must be added the traffic of laboring Coolies for Estates. It is impossible to say what

what this would be, but it would include the Coolies for Connor and Maloney Estates and probably for most of the States elsewhere on the Hill plateau. This traffic would not be less than the export of 4,000 Coolies and each Cooly would make several trips per annum.

13. Of the traffic in goods above stated 120 tons per annum is the weight of Beer despatched by Mr Honeywell of Brin Eleant to the plains. Mr Honeywell calculates that under the new tenancy leases which will be made in the middle of this year and which will afford him free scope for the sale of his Beer, he will export 600 tons of Beer per annum.

14. There are at present 500 men cantoned in the Wellington Barracks. The unfinished barrack there is now being built and the depot will then hold 800 men

men. The present import of the depot is 610 tons. It will be approximately doubled if the full Complement of men is made up.

15. At present the coffee from only the Runnymede, Glenmore, Kubramode and Cleveland Estates aggregating an area of 800 acres passes the toll on the Connor Eleant. The rest of the coffee grown on the Hill plateau reaches the plains by bye-paths. This coffee is grown on properties aggregating in round numbers 9000 acres and at 4 cwt the acre, a low average, represents 1600 tons. A Rail would attract all this coffee.

16. There are 1400 acres under tea on the plateau. My information leads to the Conclusion that an average of 200 lbs an acre of made tea is low. Accordingly the

the present production of tea is 152 tons. Part of it goes down the Coonoor Ghaut. But the tea from Kotagiri passes the Kotagiri Ghaut. The Estates there are Extensive. Tea Estates are being increased in several directions. One planter now Exports 10 tons of tea per annum. He calculates on Exporting annually 25 tons within the next four years and so it is with other planters as their gardens are not yet in full bearing. One planter is opening 360 acres of tea this year.

14 In the Pushtenlong Valley there are 3634 acres under cultivation now paying tax and probably the difference between these figures and 5000 acres planted but not yet paying assessment. The annual Export of coffee from this land is from data in my possession at least 2000 tons. Fourteen hundred tons were grown on Dr Pushtenlong's Estates (consisting of 3000 acres) alone last year. Production is increasing. The coffee now goes to the West Coast at a cost for carriage of Rupees 60 per ton. But freight at Calicut is not always procurable. It averages £ 1 - 15 per ton. Whereas freight at Madras is certain and 3 - 15 per ton. Coffee cured on the East of the Hills is worth £ 2 per ton more than Coffee prepared on the other side of the Peninsula. I have these facts from Mr Hapshore the agent of Dr Pushtenlong. He tells me further that bandy hire from the Valley to Potacamund via the Goodalore Ghaut is 9 Rupees but that Competition would soon reduce it to seven.

18. From these figures it is apparent that it would be easy to attract the Valley Coffee to a rail-

last

Cost of bandy hire of a ton to Coty - 2 bandies at 7 Rs	Rs 14 - 0 - 0
Rail from Metupolliam to Madras 328 miles at one anna per mile the present Rail charge	20 - 8 - 0
	34 - 8 - 0

leaving a margin on Rupees 60 the present hire & Calicut of Rupees 15 - 8 - 0 for rail from Coteacamund & Metupolliam and if the rail charge was not greater than this, the planter would have saved Rs 30 per ton on his present charges for Coffee shipped from the Western coast as his Coffee would be worth 3 £ per ton mine and would be shipped at 1 £ per ton less. These figures appear to me very significant when the subject of the returns for a railway is under consideration. It would be necessary no doubt to assure this traffic & a rail to open a Chaut from Reddiarettum to the Valley. Mr Ouchterlony cut a trace over this line at a cost of 10,000 Rupees. It is nine miles long. It might be opened out into a good Chaut for 3000 Rupees per mile. It would be carried to the Hope Estate where it would join Mr Ouchterlony's road to Coodalore, which is a broad good road. The traffic between the Valley and Coteacamund now passes over this road. In case of the export of the Valley Coffee via Madras Mr Ouchterlony's curing works which are at Calicut would be moved to Metupolliam Dr Wapshare assures me, the cost of the change would be merely the cost of the transport of the plant as Dr Ouchterlony's buildings at Calicut would sell readily and the money realised would be available for erecting buildings at Metupolliam.

19. I learn from Mr Wapshare that, every 50 acres of opened land whether under coffee or tea imports yearly one ton of Hardware. This Hardware now arrives at the stores by almost every route but the Coonoor Ghaut. On the Hills and in the Valley there are 13000 acres of opened land representing a Hardware import of 260 tons. The hardware would come by a Coonoor Ghaut Rail to the stores on the plateau certainly and probably to the Valley as import. Carriage from Mysore is not less than 4,8 Rupees per ton. This will be demonstrated further on. The hardware for the Cinchona plantations of 2400 acres aggregating 48 tons must be added.

20. Lime is one of the most important manures

manures for every description of cultivation. There is no lime in the soil of the Nilgiris. Planters now use lime though it cost Rs 30 per ton in the Coimbatore Bazaar. Of course it is used very sparingly. They would use it in large quantities if a rail from the plains offered a cheap mode of transport. Two cwts per acre should be put into the land per annum or a large application of 2 tons per acre sufficient for 20 years should be employed. It has been already stated that there are 13000 acres of open tea and coffee land in the Nilgiris jurisdiction and the land requires 26000 cwts of lime per annum or 1300 tons. The price at Metupolliam is 5 Rupees per ton. These facts represent a large up traffic for a rail.

21. A planter of great experience informs

informs me that owing to the difficulty of procuring labor, each acre of open land only is what at present the labor of 1/2 a Cooly, that is to say an Estate of 100 acres only employs a standing body of 50 Coolies. The proper quantity of labor is one Cooly per acre. The full Complement would probably be procurable if there was a rail. There are facts indicating the accuracy of this presumption. A male cooly Emigrating from the Madras Presidency to Ceylon receives on the Estates in that island 22 s per month and his food costs him 16 s. His Savings are therefore 6 s per month. On these Hills he receives 4 Rupees per month and his food costs him 4 Rupees. He Saves therefore 3 Rupees or 6 s.

A woman Cooly in Ceylon receives 18 s per month and her food costs 12 s. She therefore Saves 6 s. A woman here gets 4 Rupees and her food costs 3 Rupees. Her Savings are 1 Rupee.

The Coolies go chiefly from the Southern Districts. It is probable that if access to the Hills were easy, Coolies on the ascent = Stances above stated would prefer working on the Hills to Emigrating to Ceylon and the full amount of labor required for the Hill Plantations would be easily procurable.

22. There are about 2400 acres under Cinchona on the Nilgiris. Mr McIvor estimates that the plantations will yield when in full bearing 3,600,000 lbs of dry bark or 1662 tons per annum. It is proposed to export from the Government Plantations 70,000 lbs or 31 tons in the Coming official year and this quantity may not

not improbably be increased by some 20 tons more. About 23 tons will be Exported from the private Estates of Ossington and Devi Cholah.

23. I have said nothing here of the Coffee and hardware traffic from S.B. Wynaad which on the same grounds as the Ouchterlony Valley traffic might be Expected to touch a rail.

24. I now come to an item of traffic for a rail, of great importance. The indigenous native Hill population Consists of 23,364 Souls and cultivates 32400 acres of land with food grains. The production is just sufficient for the support of the population and its increase. Other natives residing on the Hills must be fed with grains from the plains. It is worth while making an endeavour to show what their Consumption is and how the grain reaches the Hills.

Each native requires 2 lbs of grain per day.

25. There are 10,000 natives in Ootacamund. The grain for this population Comes chiefly from the Country around Seegoor. The whole consumption must be 32.58 tons per annum. The part now brought from the Seegoor side of the Hills would probably be brought via the Coonoor Ghaut from Cuttiamungalum and other Villages in the Coimbatore Country by rail.

26. The native population of Coonoor amounts to 3000 Souls. It is impossible to say how much of the grain by which it is now fed Comes up by other routes than the Coonoor Ghaut.

27. The grain for the Coolly Labourers in the Ouchterlony Valley would probably be brought up by a rail. Several planters in

in the Valley told me recently that grain for the Coolies which is now imported from Mysore cost 1½ Rupees the 200 lbs in Mysore and was retailed in the Valley for Rs 6-12-0 or in other words that transport cost 4½ Rupees per ton. There are at present 2500 Coolies always employed in the Valley and their consumption is 814 tons of grain per annum.

28. There are 8000 acres of tea and Coffee plantation on the Nilgiri plateau and 2400 acres of Cinchona employing in all 5200 Coolies. The consumption of grain of these Coolies must be, at 2 lbs per head per diem, about 1693 tons per annum. But for the major part of the grain now reaches the plantations by bullock carts and would probably come up by a railway.

29. There are at least 1000 acres of

of Government Eucalyptus Plantation on the plateau and many private proprietors have planted gums. A large export of timber may accordingly, in a few years, be anticipated by a railway.

30. I am given to understand there is a considerable export of vegetables from Bangalore to Madras by rail. A similar trade would grow up here if there was a railway on the former plan. The Hills could export a large quantity of carrots, cabbages &c as they do now of potatoes.

31. As far as can be gathered from the Municipal Returns visitors bring up annually about 100 horses and 30 carriages to Ootacamund.

32. During the season between 80 and 90 sheep and goats are killed in Ootacamund every day in the Municipal Slaughter Houses. Twenty thousand

(20,000) at least of these animals are slaughtered yearly. About 1600 beasts are slaughtered yearly in the Municipality. I have no returns of the quantity of beef and mutton killed in Coonoor.

33. Bandy hire from Mettupolliam to Ootacamund is now 10 Rupees and to Coonoor 7 Rupees. The Carrying companies tariff of transport to Ootacamund is about 1.8 Rupees per ton.

A Coolie to Coonoor receives 2 annas and to Ootacamund Rs 1-4-0.

31. My Estimate of the existing traffic on the Coonoor Chaut is

Goods at the lowest figure quoted in para 8 - Tons 13,000 + difference between 2866 tons (para 9) and 513 tons (para 11) or 2356 tons representing —	1535-6 tons
Luggage &c now carried by Coolies, which would come by rail —	
First class Passengers up & down	1800
2nd " "	3600.
3rd " " Loaded Coolies bringing 513 tons of goods (para 11)	46 080.
Estate Coolies say	16,000.
According to para 31 Carriages	60
" Horses	200.

35. My Estimate of the goods traffic a rail would immediately secure is:—

Goods as above	15356 tons
Ovr Honeywell's increased tonnage of Beer	480
Additional import to Wellington barracks if there are 800 men in depot say	600
Additional Coffee from Hills	1400.
Annually increasing in quantity to Sea now finding its way Chins by bye paths and Kotagiri Chaut say	50.
Hardware &c excluding Crockeries Valley (para 19)	208
Lime import (para 22)	1300
Cinchona bark annually increasing in amount say at present (para 22)	50.
	19,444

Carried over ——— 19414 tons

Grain for Ootacamund now brought from Seaport (para 28) Say } 1500 "

Grain for Coolies on Hill Stores excluding Anchterlony Valley (para 28) Say } 1500 "

23414

36. If the traffic from the Anchterlony Valley was attracted there would be an addition of

Coffee at least ——— 2000 tons
Grain for Coolies (para 27) — 214 "
Hardware (para 19) ——— 100 "

37. The rail would bring up the large quantity inferrible from the statement in para 32, of mutton and beef consumed on the Hills.

38. Taking the goods traffic at 18960 tons (para 7) carried at the rate of 20 Rupees per ton from Metupolium to Ootacamund, the present Expenditure for Carriage is 379,200 Rupees. Add the cooly load traffic of 2369 tons carried at a cost of Rupees 56 per ton or Rupees 160,496 (one Cooly to Ootacamund carrying 50 lbs is paid 1½ Rs) and in all the annual Expenditure in carriage is 539,696 Rupees or Say 5½ lacs.

But this is a low calculation. A Considerable part of the goods is brought up by the Carrying Companies at the rate of 48 Rupees per ton. The Madras Carrying Company carried 900 tons of goods at this rate last year and Messrs Stanes & Rose probably carried an equal amount. The charge for every dozen of wine is Rs 1-0-0.

39. Taking the lower calculation of goods traffic as 13,000 tons (para 8) and each ton transported at the rate of 30 Rs per ton, the Expenditure would be Rupees 390,000. plus cooly carriage Rs 160,496 as the total Expenditure on Carriage Rupees

550,496 that is to say this calculation would give nearly the same figures as the previous calculation.

The Carrying Companies charge first class passengers about one Rupee a mile for carrying them between Metupolliem and Ootacamund - Passengers for Ootacamund accordingly each Expend 33 Rupees and there are 1200 of them.

Similarly each passenger for Coonoor Spends 20 Rupees and there are 600 Such.

The outlay on this item at present is therefore -

Ootacamund Passengers - 39,600 Rs
Coonoor Passengers — 12000
51,600

making the total Spent in carriage 6 lacs of Rupees per annum -

40. These data are derived from the best Sources and are tolerably reliable. They err, if at all, on the right side. They refer

refer to certain traffic because a rail would entice the rail in the low country drive bandies and bullocks off the road in Consequence of the wear and tear of traversing the Ghaut on foot. A Rail would — secure the monopoly of the Ghaut traffic.

41. But the present traffic faintly shows the traffic of a rail and the advantages it would ensure to the country. The future traffic can only be estimated by a survey of the past. In 1850, in the Ouchterlony Valley, the S. E. Wynaad and on the Hill plateau together, cultivation of tea and Coffee Covered hardly 1000 acres. These districts have now not less than 20000 acres under these products and the Government have recently directed me to submit more liberal Waste land Rules than those at present in operation with a view to stimulate — occupancy. The Nilgiri district contains 800,000

300,000 acres more or less cultivable and — 60,000 acres only are taken up. The elevated parts of the Nilgiri plateau only require to be protected with belts of australian gums to be susceptible of producing tea and the trees can grow up with the tea.

42. Two years ago it was doubtful whether tea would pay on the plateau but this doubt has now been dispelled. There are three Estates near Ootacamund which in my knowledge yield good returns and Ootacamund has hitherto been thought too high for tea. The prospects of tea — have thus been altered by improved — cultivation. There is no reason why with improved Land Rules and improved means of access from the plains full advantage should not be taken of the fine climate of the Hills and every acre of available land

be

be occupied by planters within comparatively few years.

43. The modes in which a railway would prove advantageous are diverse. It would enable persons of small means now kept away by the high cost of living to settle at Ootacamund, as the price of provisions &c would fall with inexpensive transport. Horses would spring up on all sides if the cost of building was little — more than the cost of building in the low country. The difference of cost with the present transport is as 45 to 5, the price of a square in brick and mortar on the Hills being 45 Rupees against 10 Rupees in the low country. Many persons too poor to visit England would resort to the Hills climate and settle if not debarred by Expenses and Ootacamund would become

become a place of importance. Visitors would be attracted who are now deterred by the toil of the journey.

44. It must be borne in mind that the Nilgiri Branch line has done little to improve communication. It has shortened the journey by an hour and a half. The most harassing part of the road has still to be accomplished by carriage, by horses and by Tonjon and ladies with sick children may be presumed to be chary of exposing them to the latter fatiguing means of transport and must in many cases be driven to England with their ailing families when they would resort to the Hills if the obstacles to access were removed. A large addition to the number of visitors to the Hills may fairly be reckoned upon if a rail is established.

45. And the gain to Government by a rail would not be less than to the Public. Captain Durant, the District Engineer informs me that his department imports in goods, in Chunam, machinery &c. 500 tons per annum. Taking the cost of transport from Metupolliem at Rupees 30 per ton, on the assumption that a bandy only carries 1/20 ton and not half a ton; here is a large margin for savings and similarly with the tonnage imported for Wellington Barracks.

46. The Rail would improve the traffic on the Nelgiri Branch Rail and give this Rail which now runs into a cul de sac an outlet. The branch rail already, I understand, pays better than was anticipated. It is possible it would pay well if the Hills were tapped by a rail

rail up the Ghaut.

47. The subsequent advantages of a Ghaut Rail to Government would be that the troops at Wellington could be moved easily and that a saving would be made in the carriage of the Post and of treasure. The cost of conveying treasure to Putteamund is now 900 Rupees per annum. There would be further the saving of the upkeep of the New Coonoor Ghaut which is 600 Rupees per mile over 14 miles and of the annual sums spent in improving the Ghaut.

48. I believe Captain Prevost contemplates a Ghaut line of the standard guage, that is 5'6" of the guage of the Madras Rail. But if the Government determined on a narrower guage the question of break of guage would come in. I apprehend that in this case a Hill Rail would start from Metupolliem as the most convenient point from

from many respects.

49. Coffee cleaning works would flourish up at Matupolliem as it is the coffee cured there and not in a damp atmosphere like the atmosphere of Madras, which is worth more than coffee cured on the Plain Coast- and break of guage would accordingly not be felt at Matupolliem as regards coffee which is one of the chief products of the Hills

50. Break of guage at Matupolliem would equally affect lime and grain because both would be brought in carts to Matupolliem, the latter from Sattiamungalum and Coimbatore.

51. Break of guage at Matupolliem would be as detrimental to other goods as if it was at Kullar or elsewhere but much of these goods would bear shifting. They would be goods in lieu for European consumption and tea and cinchona bark

also

also in boxes.

52. No doubt Break of gauge would interfere with timber traffic, which as I have anticipated above will be large but this evil will not be obviated by the rail starting from any other point. Lastly there is the firewood traffic. I have not hitherto spoken of firewoods. The traffic might be considerable for the use of the Madras Railway.

I have the honorable
Sir
Your most obedt Servt
J. A. Cockerell
President.

P. W. 1875 Book No: 313

Mysore Local Fund Road.

Statement showing the Traffic on the Coorg Ghaut roads from the 13th to 21st October 74

(both days inclusive)

B.

Months and Date	Days	Laden Carts		Bullock Loads		Mes Loads		Head Loads		Remarks.
		That came up the Ghaut	That went down the Ghaut	That came up the Ghaut	That went down the Ghaut	That came up the Ghaut	That went down the Ghaut	That came up the Ghaut	That went down the Ghaut	
1874 October 13	Tuesday	72	"	796	"	170	"	584	"	
" 14	Wednesday	18	28	"	9	"	"	"	23	
" 15	Thursday	27	"	4	"	"	"	19	"	
" 16	Friday	43	"	29	"	"	"	17	"	
" 17	Saturday	22	"	16	"	"	"	34	"	
" 18	Sunday	33	"	2	"	35	"	70	"	
" 19	Monday	63	"	1	"	"	"	17	"	
" 20	Tuesday	35	"	668	"	180	"	623	"	
" 21	Wednesday	15	9	"	"	"	"	"	"	
	Total	328	37	1516	9	385	"	1364	23	

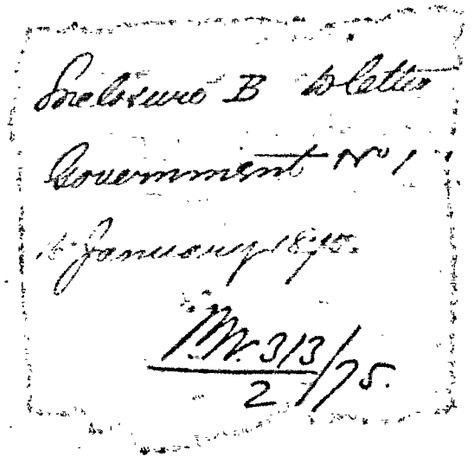
Commissioner's Office
Bangalore
16 January 1875

E. Corfield
President
Mysore Local Fund Board

Enclosure 2 in Mysore P.W. Letter No. 313 dated 30-1-75 from the Commissioner to the Government of India

Statement showing the traffic on the Coorg Ghaut roads from the 13th to 21st October 74 (both days inclusive)

Forwarded to Government of India in Mysore P.W. Letter No. 313 dated 30-1-75


Selskrivelse B blatt
Government No 1
16 January 1845.
M.N. 313/
2/75.

A

Statement showing the traffic on the Coonoor Ghaut and between Ootacamund and Coonoor during eight months of the year 1869. The descending traffic represents the Coast Traffic. The up traffic is all loaded.

Months	From the plains to the Hills					From the Hills to the plains									
	On the Coonoor Ghaut					Between Ootacamund and Coonoor					On the Coonoor Ghaut				Between Ootacamund and Coonoor		
	Carts	Bullocks, cows and Buffaloes	Men	Asses	Carts	Bullocks, cows and Buffaloes	Men	Asses	Carts	Bullocks, cows and Buffaloes	Men	Asses	Carts	Bullocks, cows and Buffaloes	Men	Asses
January	623	9,589	6,923	2,411	521	933	1505	767	437	953	3820	76	157	618	701	22
February	407	6,957	5,759	2,158	574	4107	1453	849	338	687	3520	126	98	596	742	3
March	568	7,935	8058	2,063	574	5349	1976	637	358	922	4327	201	106	815	511	22
April	598	6,862	6835	2127	530	4861	1815	682	259	412	3023	48	81	450	603	28
May	616	8,143	8692	2,020	574	4697	2278	385	230	397	2673	151	91	112	867	"
June	527	6,357	6,056	2,633	484	5,371	1438	94	238	859	3275	141	82	997	816	4
July	389	6,324	6917	2,100	281	4249	2073	366	297	2165	4751	134	183	2713	691	"
August	565	5,789	7,630	2,541	323	5,339	2,787	220	318	1462	3,572	604	111	2,806	724	.
Total	4,293	57,956	56,870	18,053	3,881	38,196	15,325	4,000	2,475	7,857	28961	1481	909	9,106	5,655	79
Average per month	536.62	7,244.5	7108.75	2,256.62	485.12	4,774.5	1915.62	500	309.37	982.12	3620.12	185.12	113.62	1138.25	706.87	9.87

Commissioner's Office
Ootacamund
16 January 1870

H. Cockerell
President
Nilgiri Local Board

Exhibit A to the
Memorandum No 1
dated 11th January 1875

District Engineers Office

No. 10 Coldcammid 7th January 1875

From

Captain J. L. L. Morant R.E.
District Engineer
Nilgherries

To

Major Adelscourcy Scott R.E.
Under Secretary to Government
Public Works Department
Madras

Sir

I have the honor to address you on the subject of improving communication between Metapolliam and Coonoor, with reference to Public Works Government Order No. 2564 A, of the 10th of September 1874, which through your courtesy has been sent to me.

2. I hope Government will accept the great interest I take in the subject and its importance to the District of which I am Engineer, as my excuse

Excuses for respectfully offering the following remarks.

3. The above order admits the importance of improving communication to and from the Neilgherry Hills, and seems to imply that such improvement should not stop short of Potacammund. But I think it can be shewn that the cost of any improvement really worth having will be far greater than Government seems to contemplate, and thus it would seem more prudent now to consider only what is required between Metapolliam and Coonoor. This alone will meet by far the worst part of the difficulty, and would in no way interfere with any future method, which may be considered desirable, of facilitating traffic between Coonoor and Potacammund.

I will therefore confine my attention to improving communication between the present railway terminus at Metapolliam and Coonoor. Government does not define the nature of this improvement: It will hence be necessary to consider the subject at some length.

4. Among other things much obviously depends on the quantity of traffic, both of passengers and goods, which the present Ghaut carries. Statistics are being collected elsewhere, so I need not here further allude to them, beyond saying that I believe it can be proved, that the figures which appear in one of the accompaniments to the above Government Order are far too low. And it is not unreasonable to anticipate that a railway when completed will develope a great increase of traffic.

5. I beg also to be allowed to remark that the proper means of communication between Metapolliam and

and Coonoor is a subject that seems to admit of a more liberal treatment than it has apparently hitherto received. Has not the system hitherto pursued proved short sighted? The New Coonoor ghaut was constructed at a cost up to date of more than two and a quarter lacs of rupees and must have been intended not only to supersede the old road, but also to meet the future demands of many years. But from the steepness of its grade and other defects, it has not fulfilled these conditions; and now, after having taken eight years to construct and after having been opened to traffic for only five years during which improvements in its original construction have at inconvenience to the public been continually carried on, a better means of communication is considered desirable. Before, in now considering what the nature of this communication should be, with the experience of the past before us, provision ought to be made, not only for immediate pressing wants, but also for future requirements. Does not therefore a tramway, in the usual acceptation of the term, laid on either of the existing roads, seem quite out of place? It might perhaps be laid now at a comparatively small cost, only, after causing inconvenience from want of capacity, et cetera, to be superseded in its turn by a proper railway on a road of its own, which might have been constructed at first for no very large sum. In any case, whatever means of communication is now decided upon, ought it not, if true economy be studied, to suffice for the traffic for as far as it can now be conjectured, of the next 30 years?

With these preliminary remarks let me proceed

proceed to state that the tract of country between Metapolliam and Coonoor naturally divides itself into two distinct and very different parts.

The first the almost level piece between Metapolliam and Kullar;

The second the abrupt ascent or ghaut upto Coonoor.

For the former a railway like that between Coimbatore and Metapolliam, which traverses a very similar country, seems obviously the best suited. But for the latter must not a very different kind of railway be provided? Would it not be a fatal error to place upon the first piece a railway suited only for mountain traffic? Is not a mountain railway quite out of place on an almost level plain? While, on the other hand, surely a railway just suited to the first level portion would not be able to do duty

upto the steep Coonoor ghaut: for special engines and rails suited to level lines are considered always necessary for working lines over mountains. Moreover the physical nature of the country indicates somewhere at the foot of the ghauts as the point where the existing railway ought to terminate, and not at Metapolliam.

7. It will then be probably admitted that the present railway ought to be continued from Metapolliam to Kullar.

8. I speak under correction, but I believe the Railway Station at Metapolliam is 100 feet in vertical height above the road-way of the present Bowani Bridge, and that the station is half a mile distant from the river. The fall of the natural ground is therefore something like 1 in 27. By erecting a railway bridge over the Bowani

for Bowanie, with its floor some 20 or 30 feet higher than that of the present bridge, a gradient of 1 in 33 or of 1 in 37 for half a mile will be obtained. Should this descent be considered too steep, I may mention that on the Birmingham and Gloucester Railway there is an incline for a length of three miles of 1 in 37, up which trains ascend at the rate of 28 miles per hour, and another at Oldham, near Manchester, three-quarters of a mile long, of 1 in 27, both constructed many years ago, besides many others of short lengths, all of which are worked by the ordinary traffic engines of the lines on which they occur. Except the bridge over the Bowanie, and the lesser one over the Hullar river, this almost level portion, six miles long, presents, I believe, no difficulties whatever to the construction of a

Railway.

9. Hullar being now considered a deadly locality at night no residences for the railway employés, nor buildings of a permanent nature would now there be required. A small engine could easily convey such railway officials as would have to reside at Metapolliam, from thence to Hullar every morning, and back again in the evening.

10. I speak of course under correction but I believe the cost of this portion will probably be as follows

Six Miles at 1 Lac of Rupees per Mile, this being the entire cost of the portion already constructed between Pothanoor and Metapolliam	6 Lacs of Rupees
Iron Bridge over the Bowanie at Metapolliam.	3
Iron Bridge over the river at Hullar	1
* Total cost in Rupees	10 Lacs

No additional Rolling stock would be required.

* This estimate has been made to the best of my ability. The Consulting Engineer for Railways will naturally be better able to give more exact figures.

11. Is the suggestion worth consideration that the Madras Railway Company be called upon to complete this portion themselves, or Condition that Government undertake the Ghaut Railway?

The additional traffic, which a line upto Coonoor would naturally bring to the whole of their branch from Pothanoor to Mullar, would probably be held by the Company to be worth this additional outlay.

12. With regard to the ascent upto Coonoor, it seems desirable, in the first place, to eastricate the idea of utilizing either of the present roads.

13. The new ghaut is 16 Miles long. It has 12 Zigzags, many of which terminate in precipices of rock or at the edge of large ravines or streams. Its gradient is 1 in 18½. It possesses 32 timber bridges of Spans varying from 12 upto 50 feet, none of which could bear a railway. It has numerous very sharp Curves

Curves occurring mostly at precipitously rocky parts, all of which would have to be made easier for a railway. And it is only 18 feet wide, except in a few precipitously rocky parts, where it is merely 12 or 15 feet wide* This width would be insufficient for a railway and road together. The carriage road over Mont Cenis, on which Fells Railway was first tried, was 32 feet wide, of which the railway occupied the 12 or 13 inter feet, and there was besides a

* The best line for this ghaut would have started from the foot of the Hotagherry Ghaut, which is only 2 Miles distant from Metapolliam. There it could have risen, without lengthening the whole distance between Metapolliam and Coonoor, at a gradient of about 1 in 22, by the St Catherines Falls valley, and at the foot of Limb's Rock, upto the Coonoor Bridge where it now ends. This line would not have involved more than 3 Zigzags, and might possibly have been accomplished with only one. It was advocated by Major Law, I believe, when tracing the present line.

a ferry between the said roadway. Many parts
of the outer edge of the existing ghaut road, both in
the shape of stone walls and earth work, would
not bear a railway. If the whole of the new
ghaut be given up to a railway, what road, other
than the almost impracticable old ghaut, are
persons to use during its construction? Moreover
the first two miles at the top of the ghaut would
need to be kept permanently open for carts, as there
are Coanoor's only access with the important Sub-
-districts of Kartaing and Colacumbay. The next
three miles run along side of large Coffee estates
and are used for carting manure. There are also other
parts, especially about the middle of the ghaut, which
accommodate quite a local traffic. To attempt to
draw

* Civil Engineer and Architects Journal Vol XXVIII 1865 page 234.

draw this small local traffic, traveling very short
distances, into a railway running along the road,
would create inconvenience, and necessitate numerous
petty stations, and consequent expense in providing
power, quite disproportionate to its quantity and
value.

I. The old ghaut, which has been very unsatisfac-
-torily laid out, is 9 miles long, and possesses
II. various gradients, from nearly dead level up to
1 in 6, in some parts its gradients running the
reverse way. It cuts across the new ghaut three
times, and has a great many very sharp curves.
III. Most of its drains are of a very poor description
of Jungle wood, and some of its streams are un-
-bridged.
IV. Neither of these roads seem therefore at all
V. suited for a railway. Hence it will be perhaps ad-
-mitted that a railway of any description would
be

of necessity require an entirely new roadway to be made for itself.

16. With regard to the description of railway the is suited to the case, four kinds may be brought not to notice, upon each of which it will be necessary to make some remarks.

I. Railways worked up steep inclines in the usual way by the adhesion of smooth wheels on smooth rails.

II. Narrow guage lines, on gradients seldom exceeding 1 in 60.

III. Steep inclines worked by Stationary Engines.

and IV. Centre rail railways with Locomotives for working on very steep inclines.

17. V. Railways worked up steep inclines in the usual way by the adhesion of smooth wheels on smooth rails. These are worked on grades very seldom exceeding 1 in 25. On such grades they travel at the slow speed of about 8 miles per hour. The engines have to be of a special kind, very powerful and heavy. The rails must also be weighty. The wear on the permanent way, and consequent cost of upkeep are great. And there is no special security against derailment. Railways of this description have been laid in various parts of the world but those of the steepest grades have been almost entirely confined to the United States.

18. So long ago as 1851 a line worked by locomotives was laid over the Alleghany Mountains. It had an inclination of 1 in 15½ for 11 continuous miles, and, after winding among the summits of the mountains for 20 miles, it descended on the western side with an inclination of 1 in 15½ for 9 continuous miles. The passenger trains travelled at a speed of 15 or 20 miles per hour, and the goods trains at a speed of 10 or 15 miles per hour. The curves were frequently

frequently charge*. Such a line laid on the Coonoor ghaut would be nearly 40 miles long, and could not be ascended under 3 hours and 20 minutes.

19. Other lines, with gradients of 1 in 12, and with Curves of 300 feet radius, have also been laid, but their Engineers advocate them only for temporary use, while the construction of tunnels underneath, or more permanent works are in progress.

20. As is well known the Americans run great distances with locomotives over hedon sleep inclines, and it has not seldom happened, when the rails have been greasy, that the Engine and train have slid backwards, with locked wheels, from the top to the bottom of the incline.

21. To shew how the inconveniences of Continuous steep gradients are felt, it may be mentioned that on a long incline of 1 in 26, near Liege, a perfect system of stationary engines had been in use for many years. The Belgian Government, feeling the

*. Proceedings of Institute of Civil Engineers 23rd November 1858

the inconveniences of that system, had abandoned it, and substituted the locomotive, but such was the uncertainty of the power in meeting the difficulties of the incline that the stationary engines were again resorted to*.

22. And these steep inclines are attended with a heavy cost for working expenses, amounting in some cases, where the traffic was mainly dragged upwards, to 12 pence per ton per mile, which can only be considered justifiable on a long line of generally easy grades heavily worked. To give an instance, the returns of the Semmering incline, in Austria, which cost nearly £30,000 per mile, shew that the working expenses exceed the receipts, so great is the cost of working over 22 miles with gradients of 1 in 40 and 1 in 45, and with Curves of 10 chains radius*. And a further illustration is appended.

*. Proceedings of Institute of Civil Engineers 23rd November 1858.

*. Mr Vignoles at Institution of Civil Engineers on the 8th Nov. 1862

afforded from the returns published by the German Government, where it will be found that on an incline of 1 in 38 at Aachen Rothheide, on the Rhenish Railway, 63 per cent of the rails had to be renewed in 5 years; and on the Western State Railway of Saxony, on gradients of 1 in 80 upto 1 in 100 the former predominating, 58 per cent of rails with steel tops had to be renewed in 5 years, 50 trains passing daily over the line; whereas on many other German lines, whose gradients do not exceed 1 in 100, 2 or 5 per cent only of the rails have had to be renewed in 5 years.*

23. It will not, I trust, be considered here out of place to briefly illustrate the influence which Curves exercise on the paying load. It has been found that at a speed of 45 miles per hour, the traction resistance on a line having curves under one mile radius, at the ratio of one curve to 2½ miles, was greater by 20 per cent than

* Engineering Vol. XII. 1871. pages 261 & 347

than on a practically straight line, and on the South Devon line, in England, the engines took seven loaded waggons up an incline of 1 to 41 on straight portions, but on coming to curves of 15 chains radius one of the waggons had to be removed.* By means of the bogey truck and other contrivances the resistance due to curves has of late years been a good deal lessened, but it is still considered to be represented by the following fraction in terms of the load

$\frac{1\cdot36}{\text{radius of curve in feet}}$. The bogey truck must be attached to each of the carriages as well as to the Engine or otherwise the fraction becomes $\frac{3\cdot3}{\text{radius of curve in feet}}$.

Our great Engineering authority Rankine lays down as follows: "as curvature of the line increases the resistance of trains and the danger of jumping off the line at high speeds it is advisable to avoid very sharp curves on steep gradients. Where sharp curves

* Proceedings of Institute of Civil Engineers of 30th November 1858.

"curves necessarily occur in the course of a steep
"ascent, it is advisable, instead of adopting a
"uniform gradient, to make it slightly steeper on
"the straight parts of the line, and slightly flatter
"on the curved parts, in order that the resistance of
"an ascending train may be as nearly as possible
"uniform".

24. It may also be as well to point out a well known fact, often lost sight of, that the steepness of the grade exercises a very appreciable influence on the consumption of fuel and steam, an important matter in India, where fuel is dear and water at times scarce. This is roughly illustrated in the following table, by disregarding friction, and by supposing that only gravity has to be overcome, that an adhesion of one fifth can at all times be secured, and that the gross weight of the engine and train is 100 Tons.

Incline	Resistance to be overcome	adhesion weight required	adhesion weight in fraction of gross weight
1 in 50	2 Tons	10 Tons	1/10
1 in 40	2½ Tons	12½ Tons	1/8
1 in 20	5 Tons	25 Tons	1/4
1 in 10	10 Tons	50 Tons	1/2

25. The above, of course, is an extreme illustration, but it helps the more plainly to show that the adhesion weight available being simply that of the locomotive, the percentage of paying load which it is possible to take up diminishes very rapidly as the steepness of the gradient increases. While in another direction it will be found that in order that the boilers of a mountain railway locomotive engine may be of moderate dimensions, it is essential that a very slow speed be maintained, because the amount of adhesion

adhesion which any given locomotive boiler power is capable of using up depends entirely upon the speed at which the engine travels. For example: if, by the evaporation of a given quantity of water per unit of time, when travelling at a speed of 10 miles per hour, an adhesion weight of 30 tons can be utilized, then if the speed be reduced to two miles per hour, it will be possible, with the same expenditure of steam, to use upon an adhesion of 150 tons, or five times the former amount.

26. Moreover, an engine when on a severe incline, changes its position so much as to alter materially its running condition. Attempts to provide for this point have been made in many mountain engines, by building them expressly for working inclines, but the matter is in an incipient stage. It will doubtless not escape

Notice

notice how beautifully the Rigi engine meets this difficulty. The Fairlie Engines also have sloping boiler tubes.*

27. It is perhaps here necessary, in concluding this portion of my letter, to observe that the above remarks, brief as some of them may appear, are made solely with reference to the Coonoor ghaut. The traffic on this ghaut will not probably for some years be nearly so large as that, for example, on the Western Ghauts of India near Bombay. But some have thought that a railway might be placed on the Coonoor ghaut, of a similar kind, only with a steeper grade, and therefore of shorter length, and hence accommodating a much smaller but still sufficient traffic. In that case the points above illustrated will have to be carefully considered. Most

* See Engineering Vol. XVIII 1874, page 142 and illustrated double sheet.

most eminent Engineers of the present day, so far as the matter has at present been developed and where large traffic has to be carried, prefer to trust to the adhesion of a smooth wheel on a smooth rail rather than resort to any more complicated expedient. But they prefer this obviously with gradients and curves involving on the one hand an outlay which the traffic would not justify.

28. II. Narrow guage lines, low gradients seldom exceeding 1 in 50. The term narrow guage is intended here to apply to those lines with a guage less than the English standard of 4'-8½". Of these I have tabulated in the Appendix 3, merely as types. There are of course many others in different parts of the World.

29. The Soudan Railway is the first proposed to be constructed in that part of Egypt, so that it involves no breach of guage. It has just been

---

* For a general description of this Railway see Engineering Vol. XV 1873.

continued.

30. The Norway narrow guage lines are numerous and exist with those of a broader guage (4'-8½"). In 1871 the number of miles of the narrow were nearly double those of the broader guage lines. But in 1872 a line of 32¼ English miles in length of a guage of 3'6" between Christiana and the Port of Drammen was opened. There were upon it some sharp gradients and curves, which required adequate engine power. It was soon found that the engines and rolling stock were insufficient. The weight drawn by each engine (its own weight not included) was only 33 tons, as compared with 80 tons drawn by the engines on the 4'-8½" guage lines. It was therefore enacted in the Norway Parliament that for the future the State railways should only be made on the standard guage of 4'-8½"; and on that guage the

the new Slate line, 12½ English miles long, via Federikshald to the Swedish frontier is being constructed.*

31. In the sister kingdom of Sweden the standard gauge (4'8½") is the favourite. About five years ago a discussion took place respecting the continuation of the gauge of 4'8½", owing to the lines on that gauge being considered too expensive. The Swedish Government at length decided to continue the standard gauge, and some of the narrow-gauge lines were subsequently changed to the standard gauge, and lines which had been proposed on a 3'6" were being executed on a 4'8½" gauge. The Swedish engineers now state that they saw no reason to regret this decision. The Austrian State Engineers, with the facts and opinions of the Swedish Engineers before them, have also adopted

* M. Bidder at Institute of Civil Engineers Vol. XXIV. page 247.

adopted the same system. There were in Sweden, in 1873, 2400 miles of railway open and in construction. Of these 83 percent were standard gauge lines, and 17 percent narrow gauge. Of the latter 5 percent were unconnected and independent lines, and 12 percent were joined with the main system. These latter amounted in length to 258 miles, divided into 8 branches, but of these only 82 miles had been then constructed, involving only one break of gauge in all Sweden, the inconvenience caused by which, after having been felt for eight years, had led to no more breaks of gauge being allowed.†

32. The Festiniog Railway in Wales is, I believe, the only instance of an important narrow gauge line conveying passenger traffic in the whole of England. Its gauge is only 1'11½", but particulars regarding it will be found in the Appendix.

† Proceedings of Institutions of Civil Engineers Vol. XXXV. pages 337 and 520.

It is an independent line, quite unconnected in any direction with any other. It was constructed under special and peculiar circumstances. The main traffic of the line is in slate, and the trucks have to be taken right up to where the slate is quarried, and where no large waggons can go. The slates thus unavoidably let down steeply inclined planes in narrow waggons; and if the gauge of the main line had been broad, must have been reloaded into broad gauge waggons. On reaching Port Madoc, the end of the line, the slates have to be transferred from the waggons to the ships along-side the quays. This very narrow gauge Festiniog line is therefore the best for conveying slates to the port of shipment, and is thus well adapted to the circumstances of the case. In another direction this narrow gauge line meets the Cambrian Railways. It carries slates, minerals, and general goods. At the junction the slates are shifted by

by hand, the minerals are tipped from the narrow into the broad trucks, and the general goods are lifted from one truck to the other by means of cranes. By far the larger portion of the traffic is in one direction.*

33. In very narrow gauge railways the rails are subjected to greater strains by the oscillation of the rolling stock, because the narrower the gauge the greater the angle through which the vehicles are canted laterally, owing to any accidental elevation or depression of one of the rails; and thus the equality produced in the loads, or the springs, and on the rails on either side is much more felt. For these reasons the greatest possible care has been taken with the permanent way of the Festiniog line, and the rails are jointed with very stiff fish plates of a

* Narrow gauge Railways by C. E. Spooner and Proceedings of Institutions of Civil Engineers 11th April 1865, as also Civil Engineer and Architects Journal Vol XXIX 1866 pages 221 and 261.

a peculiar kind. Very great attention has also been paid to the rails laid, on the Curves; and the line is always carefully kept in first Class order. It will probably be admitted that a permanent way of such perfection is unattainable in India.

34. Part, independant of the inherent objections to which narrow gauge lines are open, it is necessary to consider, in the case of the Coonoor ghaut, the evils attendant on a break of gauge, if any line be made up to Coonoor and Metapaliam of a narrower gauge than that which now terminates at Metapolliam. Must the gravity of the subject will be considered a sufficient excuse for my enlarging upon it.

35. The late Lord Dalhousie, in 1850, thus addressed the Court of Directors: "The British Legislature fell unconsciously, and perhaps unavoidably, into the mischievous error of permitting the introduction of two gauges into the United Kingdom. The numerous and grievous evils which arose from that permission are well known, and will long be felt throughout all England. The Government of India has it within its power, and no doubt will carefully provide, that however widely the railway system may be extended in this empire, in the time to come, these great evils shall be averted, and that uniformity of gauge shall be rigidly enforced from the first."

36. Sir John Hawkshaw and other eminent English Engineers have often said, that the evils of break of gauge have all over the world proved to be too serious to be borne. And it is not unreasonable to suppose that these evils will be much more felt in India than in England, on account of the comparative insufficiency of the Stations, and the pilfering and bribery which so commonly goes on.

37. It is well known that in England Tunnels, Great

Great Western broad-gauge (*) has almost entirely disappeared. One of the last places where it broke with the standard gauge was at Gloucester. There the transfer of the traffic was so great an evil that the South Wales and Midland Railways arranged for allowing 20 miles of mileage to a proprietor for that break; and Mr. Molesworth, the Parliamentary Engineer for Indian State Railways, considered it equivalent to more than 20 miles.*

The damage to salt by this break of gauge was valued at one shilling per ton, where the value of the salt was 30 shillings per ton.⊗ And in all cases the delay caused by the break of gauge was numbers than one days, and very frequently it was two days.

38. In the Colony of Victoria, a proposed line touched existing railways at three points, where, if a break of gauge was involved, the Traffic Manager estimated the cost of transferring traffic at £3900 per annum.*

39. Fell. Mont Cenis line (which will be entered into more fully hereafter) between the French system of railways at St. Michel, and the Italian system at Susa, is another instance of the evil of break of gauge. It was constructed on a narrower gauge than that of the two railways which it connected. The traffic was chiefly in passengers, and to them the inconvenience experienced was most serious, but to the development of the goods traffic it was much more detrimental. Each ton of goods cost 8 pence in transhipment, and 2 days delay, the station arrangement being very expensive and complicated.#

* Proceedings Institute Civil Engineers Vol: XXXV pages 312 and 393.

⊗ Proceedings of Institution of Civil Engineers Vol: XXXV page 285.

* Proceedings Institute Civil Engineers Vol: XXXV page 373.

#. M. Fumeles at Institute of Civil Engineers Vol. XXXV page 337.

"In fact" says Mr Coombes "if there had been a
a great amount of goods to deal with, or had an army
with its baggage, Commissariat, ammunition, etcetera,
made its appearance, there would have been inextri-
cable confusion".

&c. &c. Even in India examples are not wanting
of the evils of breaks of gauge. The Indian Branch
Railway Company made two branches to the main line
of the East Indian Railway, one from Culhallie
to Moorshedabad, and the other from Cawnpore to
Lucknow. The former was made on a good existing
road on a narrow gauge, but the traffic on the line
did not answer the expectations of its projectors. The
latter was on the standard Indian gauge, and
returned a good dividend*. I have been favored
with the following remarks on this subject by one of
the leading Madras merchants, who also possesses

* The Railways of India by Captain Davidson R.E.

Land on these Hills. "The line I alluded to yesterday is
"the little railway that runs between Arcanum and
"Conjeveram. It is a trumpery business, constructed
"principally for passenger traffic; but it would likely
"have had a fair share of produce had it been practi-
"cable for the carriages to run through to Madras.
"I believe it has never paid even working expenses. I
"think I heard that Government had ordered this railway
"to be altered to the Indian gauge, as it is proposed to
"extend the line to Pondicherry; but I am not quite
"certain. My experience of the undesirableness of
"a breake of gauge is derived from many Conver-
"sations I have had with natives as to the reasons
"they do not more largely make use of the Conjeveram
"line for their produce. Their invariable reason was
"the breaking of bulk. They preferred, they said,
"to get bandies to come all the way to Madras rather
"than have bags of seed and dubbers of oil unpacked
twice

"view by the railway authorities. Of course, where engineering difficulties make a breach of gauge of great convenience, my opinion would give way, but where practicable I would most strongly advocate only one gauge. And I speak as a merchant, who entrusts his goods to the railway, and who has experienced how detrimental it is to Produce, breaking bulk. We had a long line of it when the P. and O. Steamers only went as far as Alexandria and Suez; now that the vessels go direct home we find a great difference in the condition of our Cargo."

41. "I believe the only reason ever advanced for adopting a narrow gauge is the belief in its superior economy. But it has been clearly proved in many instances, that the saving in first cost of construction between a narrow gauge line and one on the standard gauge is not large, and Mr. Molesworth has so reported to Government, in comparing the Indian standard (5'7") with the metre (3'3") gauge. Between a broad and narrow gauge of the same capacity there need be no difference in the depth of the ballast, nor in the weight of the rails, nor in the scantlings of the sleepers, nor in the engineering setting out of the line and preparation of plans and estimates. The only difference would be in the length of the sleepers, and in the widths of the cuttings, embankments, bridges and culverts. Mr. Brunel's Great Western Railway with a gauge of 7 ft., cost only £400 more per mile than the Great Northern, with a gauge of 4'8½", although Mr. Brunel added four feet in width to all the works, in order to increase the future capabilities of the line. * In the Colony of Victoria

* Proceedings of Institute of Civil Engineers Vol. XXXV page 430. Life of I. K. Brunel by Isambard Brunel 1870 page 129.

the Victoria plans and estimates were made for
a run of 220 miles of line on the two gauges of 5'3" and
of 3'6", and the difference came to £3350 per mile.*
Gauge has in fact a very insignificant influ-
ence on the cost of a railway, the real criterion
of expense being the carrying power.

It must also be pointed out that though
the data are not complete, there is much
prima facie evidence to show the probability
of extra expense being involved in working
narrow gauge lines. In regard to fuel the
consumption on the Festiniog line was stated by

* Proceedings of Institute of Civil Engineers Vol. XXXV page
372.

by Mr. Spooner the engineer of the line, and a
great advocate for narrow gauge railways,
to be 50 lbs per train mile, or double that of
an ordinary passenger engine on an English
(4'8½") line, and 24 percent beyond that of
the Madras Railway (5'6"). Mr. Holcworth
reported to Government that the working
expenditure per train mile on the Festiniog
was double that of the English and three
times as much as that of some of the Irish
railways, on which latter the ratio of labor would
probably more nearly resemble those of a remote
district

district Feelings(*).

44. Moreover, on a narrow gauge railway accommodating the same traffic as on a broader gauge, the sidings would necessarily be longer, and consequently both their first cost and maintenance greater. And the narrow gauge would obviously require more rolling stock, and a more numerous train, entailing increased wear and tear of moving parts, such as wheels, axles, boxes, and springs.

45. The Indian standard broad gauge, of 5'-6", which was so deliberately fixed by Lord

(*) Proceedings of the Institute of Civil Engineers Vol: XXXV pages [illegible] Narrow gauge railways by Col. Spooner.

Lord Dalhousie for the whole of India is more advantageous for articles of bulk, compared with their weight, such as tea and Cinchona bark, because the width of the carriages must bear a fixed proportion to that of the rail gauge, otherwise they became unsteady.

45. In the particular case of the Coonoor Ghaut we have the branch line from Cotharoor up to Metapollium already constructed on the same gauge as that of the main line between Madras and Beypoor. The length of this branch is 25 miles. Is it worthwhile now to break the gauge at Metapollium and to bear all its attendant evils, for the sake of perhaps saving a sum of 2½ lacs of rupees on the first construction of the remaining 23 miles of the branch up to Potacamund, while probably an increased cost in future years of maintaining and

and working the whole of this branch will have to be borne?

4th. Whatever be the kind of railway decided upon, the conclusion at which I hope Government will arrive will be to allow no breaks of gauge, but to continue the Indian standard right on to Cocanada, and thence at some future date to Calcutta and perhaps to the Andamans.

4th. III. Steep inclines worked by Stationary Engines. Examples are not wanting of inclines worked in the usual manner, with large drums, brakes, wire ropes and stationary engines. There is a long one, with curves, at a gradient of 1 in 12, on the San Paulo Railway in Brazil, and another very steep one, of 1 in 10 with sets in Hungary. On the railway now under construction over the Andes across South America, to connect Buenos Ayres

over the Atlantic with Valparaiso on the Pacific ocean, one such incline, perfectly straight, at an inclination of 1 in 8, is proposed for a length of only half a mile, to be worked with a single stationary engine*. This method is best suited for short lengths and straight lines. Here it works economically. But it is considered utterly unsuited for general use, its radical defect being that the disarrangement of any single length of it, by any accident, stops the travel on the whole line. It may be compared to a chain, the failure of any one link of which will render the whole useless. It possesses also the danger (more likely perhaps to occur in India, owing to the action of the climate on the rope) of the hauling wire rope breaking. A high engineering authority, Rankine, states the average of

* Report on the Francavilla Railway by Capt. Crawford, C.E.

of wire ropes to be from 6 to 100 percent per annum.
Moreover, Locomotives can do the work as well
and are more convenient. For these reasons
the system of working inclines by Stationary
Engines and rope traction has been quite given
up in England, where passengers have to be conveyed,
and is confined almost entirely to the haulage of
goods, minerals, and coals. The late Mr Berkeley
formerly Chief Engineer of the Great Indian
Peninsula Railway first laid out on the
Bhore Ghaut an incline to be worked by a
Stationary engine, but on the matter being referred
to the late Mr Robert Stephenson he advised
that this plan should if possible be avoided,
even though its omission were attended with a
considerable augmentation of the Cost of the
works.*

* The Railways of India by Captain Rundell R.E. (1868)

48. Government is, I presume, aware of Mr De Cloets
proposals to work a self acting narrow gauge
tramway incline up the Bhore Ghaut. They appear
with Public Works Government Order No 1155
of the 22nd May 1870. The incline was to be
7 miles long, divided into seven portions. At
each division there was to be a large drum and
Station. It was to be worked with a single wire
rope, on a gradient of 1 in 8. The gauge was to
be 3 feet, with rails weighing 30 lbs per lineal yard.
Each train was to convey up a paying load of
5 Tons at five miles per hour. The whole
affair was to be worked by gravity, assisted if
necessary by water, and was to cost five lacs
of rupees. An annual return of one lac of
rupees was expected, of which 30 thousand rupees
were to be consumed in working expenses. Mr
De Cloets proposals do not seem to have been
critically

critically examined. They appear often to much criticism. On a torturous & zig-zag line, such as the Coonoor Ghaut, curves necessary, other systems seem preferable. But the subject need not be further enlarged upon, as I presume Government will not view it with favor.

49. IV. Centre rail Railways with locomotives for working on very steep inclines. Of these, I believe, there are only two, the leading features of both being the provision of a centre rail in addition to the two ordinary carrying rails.

I. The Fells centre rail Railway.

II. The Riggi ladder rail Railway.

50. The Fells Centre rail Railway. This system consists of a centre rail, raised nine inches above the two side carrying rails. The locomotive is provided with two pairs of horizontal gripping wheels, which are

driven up against the centre rail by a pair of vertical cylinders worked by an engine quite independent of that which drives the vertical wheels. Adhesion is thus gained from the horizontal wheels almost equal to that obtained from the ordinary vertical wheels, thus making the engine almost equal in effect to one of twice the weight. This system was patented many years ago, but was never carried into practice on any large scale until the year 1865, when it was laid on an excellent zig-zag carriage road over the Mont Cenis Pass of the Alps, between St Michel on the French and Susa on the Italian side. After it was worked for a few years, in quite a temporary manner, while the elaborated

of [illegible] undertaken it was in progress. Captain
[illegible] Tyler R.E., of the Board of Trade, long connected
with railways, was ordered by the British Govern-
ment to be present at Mont Cenis, to witness
certain trials which were made with this system
before the railway over the mountain was comple-
ted. A full abstract of his report will be
found in the Appendix*. From it the following
facts are drawn. The trials were made on a
finer 1¼ miles long, being the whole way
with a mean gradient of 1 in 15, with one sharp
curve of two chains radius. The gauge was
3 ft 7⅝, and the rails weighed 75 lbs per lineal
yard. Several trips up and down this experi-
mental line were made with two different engines

* See Civil Engineer and Architects Journal Vol XXVIII
1865, page 254.

engines. With one engine a gross load (exclusive
of engine) of 14 tons was dragged up, at 8½ miles
per hour in weather very favorable to the rails.
Captain Tyler reported "that this engine labored
"under various disadvantageous ito machinary
"being too much crowded together for convenience
"in readjustment and repair; its boiler power being
"insufficient, and the oil from its machinery
"falling upon the horizontal wheels deprived them
"to some extent of their power of adhesion."

The second engine worked better, and took up the
same load as before, at 10¾ miles per hour. At the
time when Captain Tyler reported the projectors
of the line proposed to provide for the carriage of
132 passengers and 88 tons of goods daily, by
running 6 trains each way, as per following table,

the

of the average gradients of the line being in 25.6 & the exact

in 12

No of train	Nos passengers with luggage	Nos of tons of goods	Rate of travel in miles per hour	Gross weight of train (exclusive of engine
1	40	11		16 tons with 1 engine
2	26	20	8	40 tons with 2 engines
3		24	6½	48 tons with 2 engines
Total one way	66	44		
Back journey	66	44		
Grand Total	132 passengers	88 Tons		

31. The temporary line over Mont Cenis was estimated to cost, exclusive of stations, etc. etc., £6,750 per mile, but Captain Tyler states that the cost of a permanent and independent line, with a wider gauge and better curves, will be £20,000 per mile, the permanent way alone costing at least half as much

much again as that of a mountain railway without the centre rail. On the completion of the Mont Cenis tunnel in 1871 the summit line was taken up, and the experience gained during the five years in which it worked showed that the defects in the system were so serious as to greatly disappoint the hopes which had been held by many persons when it was first started. It consequently proved a financial failure.

32. In 1873 it was again resolved, under more favorable circumstances over the Organ mountains in Brazil, where it is reported to have dragged 15 tons of cargo and 22 passengers up an incline, about 8 miles long, having gradients varying from 1 in 20 to 1 in 12, and curves of 140 feet radius, at a little over 6 miles per hour.*

*Engineering Vol XVIII, 1875 page 187 and Vol. XVIII 1874 page 396.

of the permanent way is the same in construction as that which was laid over Mont Cenis. The gauge is 4 ft 8½ in. But the engine has been improved. Before the rolling stock was shipped to Brazil some experiments were made with it at Hallow in Yorkshire. A full account of these will be found in the Appendix*. It may be briefly here stated that the experiment took place on a new incline half a mile long, with a gradient of 1 in 12, except in one short part which was 1 in 11. There was only one sharp double curve with a radius of 85 feet on the 1 in 11 grade. The engine, working both horizontal and vertical wheels, took up, over the 1 in 12 part of the incline only, first a gross load of

* See Engineering Vol XIII 1872, page 129.

of 52 tons, or (excluding engine) of 22 8/10 tons, on a paying load of 13½ tons, at a speed of 10 and ½ miles per hour. A second time it took up the same gradient a gross load of 73½ tons, or train load of 43½ tons, or a paying load of 27 tons, at a speed of 8 miles per hour. The engine was then worked only with the ordinary vertical driving wheels, and first took up over the whole half mile, on the gradients of 1 in 12 and 1 in 11, and over the sharp double curve, a gross load of 42 tons, or a train load of 12 tons, or a paying load of 7½ tons. A second time, the boiler pressure being increased, it took up, over the 1 in 12 gradient only, a gross load of 52½ tons, or a train load of 22½ tons, or a paying load 13½ tons, and being applied to the bearing rails to increase adhesion. The engine was then worked with the horizontal

horizontal gripping wheels only, and, a start being
started, with the vertical driving wheels, carried
up a gross load of 52½ tons, or a train load
of 22½ tons, or a paying load of 13½ tons.
Fast, although the weather was very favorable,
owing to the centre rail being slippery from
oil droppings from the machinary, the hori-
zontal gripping wheels slipped from time to
time, notwithstanding that their pressure on the
centre rail was estimated at 40 tons. They had
therefore to be assisted occasionally with
the vertical driving wheels. This crucial test
brought out the weak points in the system. A
comparison of Captain Tyler's report made in
1865, and of the description of the trials at Mallow

in 1872 (both of which will be found amongst the
Appendices) will show that the inherent defects
in the system exhibited themselves on both occasions,
and have not as yet been overcome. These defects
are, complicated machinery, inefficient boiler
power, oil droppings from horizontal wheels falling
on centre rail and thus depriving both of much
of their adhesion and the great amount of
friction involved in the midrail machinery
producing great wear and tear of working parts,
and thus in the practical daily working of the
system making it costly and unreliable.*
I have quite recently received a letter from a London
correspondent who has at my request been
kindly making enquiries into the matter and he
says

* See Engineering Vol. XIV. 1872 page 3.

the Rigi. The Fell system does not propose to travel
at faster than the Rigi, but involves great incidental
"tear & wearing parts."

53. It is now necessary to consider the cost of
the Fell system if placed on the Koonoorghaut between
Coonoor and Kullar. Here it will be some 12
miles long, with an uniform gradient of 1 in 12,
will possess no zigzag, and will cost, at Captain
Tyler's estimate, with an addition of one-third for
freight of rails &c £26,666 per mile. Hence the
12 miles will cost £319,992, or nearly 32 lacs
of rupees, without including the cost of railway
stations and rolling stock.

54. ll The Rigi Laddar rail Railway. The Rigi
is an isolated mountain in Switzerland near Lucerne.
Its summit is about 4,500 feet above the
A few years ago its average number of visitors
totalled 40,000 annually. It used to be ascended
by a zigzag bridle road, and the ascent took 3
or 3½ hours. A railway to improve this com-
munication was designed by M. Riggenbach.
The line is 3⅝ miles long, and the maximum
gradient, which extends over ⅓ of the whole length,
is 1 in 4, the other gradients varying between that
that grade and 1 in 6, except in some few places
where the line is purposely made almost flat.
The curves have a radius of 82½ chains. The
line is formed almost entirely by benching on the
sloping side of the rock, with occasional revet-
-ment walls on the outside. The line consists of

a

a very stiff and strong entire wrought iron rack rail, formed like a ladder, in addition to the two usual bearing rails. The permanent way is constructed with great care and stability, being secured from any possible slipping of the wooden framing by masonry foundations built into the formation below at intervals of 400 feet. The locomotive has naturally many specialities of design. Its boiler has been made vertical, with vertical tubes, and covered with a dome, from the centre of which rises the chimney. The axis of the boiler is not placed perpendicularly to the base line of the engine, but is inclined to the perpendicular at an angle of about 15°. The effect of this is to cause the boiler to be upright or nearly so when running on the line. One consequence of this arrangement is that the locomotive must not be turned, but must always have the same end highest whether running up or down. The two side bearing wheels are not keyed on to the axle, but run loose like ordinary road carriage wheels. The centre driving cogwheel, which is most carefully cut out of cast steel, is keyed firmly on to the middle of the axle. This the engine shaft drives, by means of spur wheels, the main axle, and the cogwheel thereto attached, taking fast hold on the teeth of the fixed rack, forces the whole machine to mount the incline.

55. Various precautions are adopted to secure safety. First, if a hard substance should by chance

chance get between the teeth of the pack & the axle of the driving pinion upon it would have a tendency to lift up the engine, when a slipping off sideways might possibly follow. To meet this liability at each end of the locomotive are firmly fixed a pair of strong angular jaws, which loosely embrace the upper flanches of each side of the centre pack rail, and in the event of the wheels being lifted off the rails, the jaws or hooks catch against the flanches and hold the wheels in its place: Second, To guard against the danger of the train running down the incline by its own gravity the engine is provided with no less than three independent means of checking and governing its motion. 1 an axle brake, which, when put in action, holds the driving cogwheels firmly

firmly and prevents its turning; and so engaging in the pack: 2 a similar axle brake which acts on the two side bearing wheels: 3 a peculiar mode of working the engine by introducing atmospheric air when running down hill, which has the effect of offering a considerable resistance to the motion, whereby the force of gravity is to a large extent neutralized and the speed thoroughly regulated. Dr Sole says he saw the driver, when the engine was going rather too fast, touch slightly the cock handle which regulates the use of the atmospheric air, and instantly the speed was checked. Each passenger carriage is also furnished with a peculiar [illegible] brake (similar to the one attached to the engine) which, when worked becomes set fast in the centre pack rail and

close

close the carriage. The carriages are not attached to the engine, so that, in case the latter should get out of control and run away, no harm would result to the carriages. In ascending the carriages are pushed up, and in descending they follow the engine by their own weight down the incline.

56. The Rigi Railway has now been opened for four years, and has been found to work well, no accident or interruption having occurred in its service. A description of this railway (from which the above has been condensed) was read before the Institution of Civil Engineers in England, by Dr Pole F.R.S. in April 1873,* and in the subsequent discussion Sir John Hawkshaw considered that many of its details were ingenious and novel, and

* See Proceedings of Institute of Civil Engineers Vol. XXXVI page 103.

and that the Railway displayed much constructive cleverness. And Mr Thorny Croft held it to be a bold scheme well carried out. I have also received some letters on this subject from a gentleman now in London, who resided for some years at Coonoor and is well acquainted with the Coonoor Ghaut, and who has also seen the Rigi Railway several times. He says Dr Pole told him he considered the Rigi principle by far the best yet introduced for steep gradients, and he was much struck with the wonderful combinations for safety they had introduced in the making of the line. He adds "I was at Vienna last month and went up the Kahlenburgh, a very high hill in the neighbourhood, from which you have a splendid bird's eye view of Vienna. This hill (4000 or 5000 feet high) is

"is ascended both by a rack rope rail, and by a rail
"on the Riggi principle, & worked up by the former and
"down by the latter, and quite agrees with Dr Pole that
"ropes are not things to trust passengers to, even though
"they are doubled, and that the rack rail is by far
"the best and safest for steep gradients. The grades
"on the Hahlenbergh line are from 1 in 9 to 1 in 15."

I may add that since the Rigi railway was made the same system has been extended to other parts of Switzerland, and has also been introduced into Germany, Austria and Italy. And I take from the Statistics of September date, as the 21st of last November, the following paragraphs. "A railway is proposed to be constructed along the side of Snowdon on the plan of the

* See Engineering Vol. XVII, 1874 page 189.

"the Rigi line in Switzerland. Notice has been
"issued of a bill to be brought before Parliament next
"session for that purpose. The line will commence
"near Llanberis railway station and terminate at
"the well known spring about 900 yards from the
"summit."

57. With the above information before them I trust Government will be pleased to admit that the principle of the centre ladder rail railway, as applied on the Rigi mountain, has proved and been accepted as successful, and has after an experience of five years developed no objectionable features.

58. It may be as well here to note an additional argument for adapting to the Boonoorghaut some principle suited to steep inclines. The height of the

Potacummul

Pelaeammud, near the present place above the Coonoor bridge
is about 7000 or 750 feet. Just between these pieces
the high range of hills with Dodabetta and Snow-
dow as their apices, these latter points being
respectively 1500 and 1150 feet above the bed of the
Pelaeammud Basket. This range must be
either pierced, surmounted, or tunnelled. Limited
funds forbid the first method. With regard to the
other two. The railway will be able to gain Coonoor
and Pelaeammud with an easier gradient than
1 in 25, unless a long and expensive detour be
made, or unless those objectionable and expensive
features termed reversing stations (zigzags) are
resorted to. Moreover the centre of Pelaeammud
being situated in a hollow basin it will hardly
be possible within reasonable limits unless

tunnels

be made to arrange the line of railway
so as to terminate at the present place without
having a steep descending gradient into the town.
Now it is generally admitted that gradients as
steep or steeper than 1 in 25 require a centre rail
or some such principle to overcome their
difficulties. It will always provide the centre
rail for these steeper grades. Hence on the score
of economy a centre rail system will probably
have to be laid between Coonoor and Pelaeammud
The application to the Coonoor ghaut is therefore,
all the more desirable.

59. It will now be necessary to apply the
Rigi principle to the Coonoor ghaut. The Coonoor
bridge is about 1500 yards in vertical height above
Kullar

Pullar. If the Rigi railway ascended the ghaut at an uniform gradient of 1 in 7 the length of the line would be just 6 miles. The position of the Coonoor bridge with reference to Pullar is such that this line could not probably be laid between these two fixed points at any much steeper gradient than 1 in 7. But it will be safer here to assume that it will rise at an uniform gradient of 1 in 8 and be 7 miles long. This circumstance, while increasing the length and consequent cost of the whole line, gives some very important compensating advantages. At a gradient of 1 in 7 the Rigi travels at six miles an hour, and carries more than twice the paying load which it purchases on a grade of 1 in 8, on which it travels at only 4 miles an hour.

60. The Switzerland single line cost at first, all told, including stations, rolling stock, sidings, etcetera, £15152 per mile. The Coonoor ghaut is not so steep as the Rigi mountain, but, in order to cover freight to Madras and other additional expenses, it will be safer to assume that on the Coonoor ghaut the Rigi line will cost 33 percent more, or £20203 (202030 rupees) per mile. The Rigi however is on a gauge of 4' 8½", while, in order to avoid breaking gauge with the existing line, which I propose should be extended to Pullar, it must be put on the Coonoor ghaut with a gauge of 5' 6". This will increase the cost of a portion of the permanent way, and involve slight alterations in the rolling stock, which in any case would not be the same as that on the Rigi, for the conditions of traffic on the Coonoor ghaut

ghaut are somewhat different. For the additional
Cost in permanent way rendered necessary
by widening the gauge £ 000 per mile may be
allowed. For the change in the rolling stock
to suit a wider gauge and altered conditions
of traffic, £ 500 per mile will suffice. And
£ 800 per mile will cover the cost of additional
sidings and of any things else that may be
needed. Hence is obtained the mileage rate
of Rupees 225030, which gives for the seven
miles of the Ghaut railway a total of Rupees 1575210,
or Sixteen lacs of rupees.

61. The mileage cost of this railway may be arrived
at in another way.

Cost per Mile in English currency.

1. Railroad. Levelling hill side to form formation £
   a way 26 feet wide, for double line, including
   bridges and portion of ballast will at 2½
   times the cost of the new Coonoor ghaut
   road come to ———— 5000
2. Permanent way. Like M. Riggenbach
   plates costs £ 4500 per mile. one half
   of this will meet the cost of the three
   rails delivered at Metapollium, ab-
   £ 17 per ton, the rest sufficing for sleepers
   and portion of ballast. But it will be
   safer to add 50 per cent to M. Riggenbach's
   figures, to cover additional cost of wider
   gauge, and freight, &c. The permanent
   way will thus cost ———— 6000
3. Rolling stock. 7 Engines at £ 1800 each 12600
   21 passenger carriages, of 3 classes
   at £ 320 each ———— } 6720
   7 goods waggons at £ 205 each ——— 1100
   £ 20720
   add 50 per cent for wider gauge,
   freight, &c ———— } 10360
   7 £ 31080

Thus the share of one mile for Rolling stock will be £ 4

Carried over — 160

---

* will it not be admitted that this allowance for rolling stock

£

Brought forward — 180[illegible]

1st. Stations. 2 large at 3000 £ each. 6000
2 small at 2000 £ each. 4000
7 | 10000

Thus the share of one mile for stations will be 11:20

5th. Sidings. Share for one mile — 2500

6th. Contingencies. at 22 per cent — 2497

Therefore total cost per mile on Coonoor ghaut £ 22367

62. The cost for seven miles will thus be 156800

Rupees or add before under 11 lacs. Hence it may be safely assumed that the cost of a single line of the Rizi railway placed on the Coonoor Ghaut, with a way wide enough throughout for a double line of rails, and with all additions required for clearing the line, will not cost more than seventeen lacs of rupees.

63. I have not taken into consideration the compensation

compensation which may have to be given for land taken use from private individuals by this railway, as it is impossible to determine this figure with any accuracy until the line is actually staked out. The amount will be affected by the length of time which elapses before the railway is begun, for land is yearly rising in value, and the area of its cultivation is increasing. In the case of the Coonoor ghaut road it amounted only to Rupees 8000 in each. It must not be forgotten that compensation for land is a common factor to all the railways which may be proposed for the Coonoor ghaut, and will be least in the case of the Rizi system on account of its shorter length.

64. Nor have I taken into account the cost of the working

working expenses of the line, as this obviously depends greatly on the quantity of traffic, ie the receipts. In the case of the Rigi the working expenses were one-third of the receipts. The wear and tear in this system are very small owing to its slow speed and the happy mechanical combinations of all the working parts.

65. I have also purposely abstained from entering into details regarding the alterations in all the rolling stock, which an increase in the gauge and the altered conditions of traffic on the Coonoor ghaut will obviously render necessary. The centre ladder rail system was applied to the Rigi mountain to suit the peculiar nature of the traffic there. The circumstances of the Coonoor ghaut are to a certain extent similar, but they differ in other respects. In assigning

therefore this system to this ghaut the details of the rolling stock will have to be drawn up afresh and will necessarily differ from those obtaining on the Rigi. It would be beyond the scope of this report to consider them further, beyond saying that the necessary alterations can easily be carried out without increasing the weight on each bearing wheel.

66. It must now be shewn that this railway is capable of conveying up and down the Coonoor ghaut the maximum load that is likely to come to it on any one day. One locomotive on the Rigi railway pushes up a gradient of 1 in 4, 140 passengers with their luggage, or 12 tons of goods, and travels at the rate of 6 miles per hour. Supposing

Supposing that up and down the Coonoor ghaut
ow any one day the conveyance of 864 passengers
and of 408 tons of goods has to be provided for,
the following table shows that this can be done
with five Engines with the requisite number of
passenger Carriages and goods waggons stocked,
formed into five trains following each other
up and down at intervals of 5 minutes, allowing
each train 20 minutes at both Coonoor and
Kullar to fill the boiler and obtain fresh fuel
etcetera. To simplify the table the two mid
stations, which will perhaps be needed on the
ghaut, are omitted. Only a few trains need
stop at these stations, and, with sidings and
other arrangements, they need cause no interruption

to the general service, or in any way upset the
figures given below.

Stations of arrival and departure	Number of train, and starting from terminus or station	Number of passengers with luggage	Number of tons of goods	Time
From Kullar to Coonoor up	1	288	36	6 to 7.10 A.M.
From Coonoor to Kullar down	2	"	60	7.20 to 8.40 "
From Kullar to Coonoor up	3	144	48	9 to 10.10 "
From Coonoor to Kullar down	4	"	60	10.20 to 11.40 "
From Kullar to Coonoor up	5	"	60	12 to 1.10 P.M.
From Coonoor to Kullar down	6	144	48	1.30 to 2.50 "
From Kullar to Coonoor up	7	"	60	3 to 4.10 "
From Coonoor to Kullar down	8	288	36	4.30 to 5.40 "
	No of passengers	No of Tons		
Possible number per diem	864	408		

by. The above traffic is probably much in excess of
present

present requirements, so that a single line would suffice
for some years. It rapidly grew in this way to below
the capabilities of the line. Very seldom would so heavy
a traffic in one day need to be made. The possibility
of the line could be increased by employing a greater
number of locomotives on the single line, and hereafter
the line could be laid with a double rail. However
the Nizi railway has been constructed to meet a heavy
passenger traffic and a small tonnage of goods.
Its bearing rails weigh only 52 lbs per lineal yard,
its locomotives only 15 tons. I am informed, by a
gentleman who has seen it that there is now working
near Vienna a railway on the same principle
with larger engines and carriages, charging a

larger paying load per train travelling at a quicker
pace. The line might come on the Coonoor ghaut
when the light rails and engines should be replaced
by those of a heavier kind accommodating a
much more extensive traffic. The cost appears
that the Central Ladder rail system suits both the
comparatively small traffic of today, and can be
expanded to compass the much larger traffic of
tomorrow.

68. A uniformity of gauge be maintained
throughout the Metapollium branch, goods of
all kinds could be conveyed all the way from
Madras to Coonoor and vice versâ without
breaking bulk. The goods vans for the ghaut traffic
would possess no peculiarities, may be so light
weighing

(weighing as they do four tons on four bearing wheels) as to prevent their being attached to the Madras train running at speed on a wide gauge. With regard to passengers, the first class would probably prefer changing into the saloon carriages of the Madras railway, which would be out of place on the ghaut line. For the other two classes no change of carriages would be necessary. The seats might be suspended like those on certain steam vessels, so that the passengers always retain a perpendicular position. These carriages would be sufficiently large and weighty to run easily at speed over the Madras line. All the Riggi carriages as before pointed out are provided with peculiar Cogwheel

Cogwheel brakes which can at pleasure be made to engage into the centre rack rail. These brakes are sufficiently elevated above the level of the bearing rails to form no impediment to the carriages being run at speed along a mountain line. The goods waggons need not have these brakes.

69. It will now be well to meet certain possible objections which may be started against the Riggi system when applied to the Coonoor ghaut.

First. As to cost. M. Riggenbach states its cost per mile £21000 whereas Dr Pole says, "The capital of the Company was £50000 which sufficed

"sufficient for the first establishment of the railway,
"but the large development of the traffic has
"rendered necessary the doubling of six and a half
"miles of the line, the provision of new sheds,
"the erection of enlarged stations, workshops,
"etcetera, which have increased the outlay to
"about £ 60000. Elsewhere he says the railway
"is 33 miles long." This set against £ 50000
gives a mileage rate as aforesaid of £ 1515 2.

A gentleman wrote to me from Lucerne before
he had read Dr. Pole's paper thus: "The
"total Cost of the Rigi railway including
"sheds, stations was 1½ millions francs, or say
"£ 50000; but," he adds, "it could now be laid
for

[illegible] 61

for a much less sum, as this being the first of
"the kind, many experiments had to be made".
He further states "the line is double for about one half
"the way and single at the top and bottom." Thus
the only conclusion at which to arrive is that
M. Riggenbach's statement refers to a double
line with workshops, and that the cost of a single
line at first starting is that which Dr Pole
states it to be.

Secondly. Its slow speed. This is six miles
an hour. This defect is more than compensated
for by the short length of the line. The speed though
absolutely slow is relatively quick. This will be
seen in the tables which are appended. For, the
gradient at which it can be laid being much

steeper

thereon than that of any other line, its whole length,
where the same elevation has to be reached, will
be shorter. It thus possesses the advantages of
requiring a smaller number of miles to be construc-
ted in the first instance, of a smaller number
of miles to be constantly worked and kept in
repair, and of a much cheaper speed, involving
less wear and tear, being maintained in order
to reach the summit of any given elevation in
the same time as any other kind of railway.
Thirdly. its small paying load. This objection
must be admitted, but its force will be much
lessened by considering the circumstances of
the case to which it is proposed to be applied.
I for one would advocate the Rigi system for a
place

place with a large and heavy traffic. But does
such exist on the Coonoor ghaut? The truth is
just the reverse. The only doubt that arises in
any one's mind is whether the amount of traffic
can be shown to be large enough to justify a
railway at all. If the Rigi is cheaper than
any other railway when laid on the Coonoor ghaut,
and accommodates all the traffic, though it be
small, which that ghaut is likely to carry when
the line is opened, there seems little more to be
desired. Dr Pole states of the Rigi, "The total
"number of trips made up and down during the
"season* of 1872 on the single line was 2875; the
"total distance run was 23000 miles; the maximum
"number of passengers in one month was 15,161 viz

* Termed to be only 4 or 5 months long".

and 11,354 down (or 29815 altogether); and the number of locomotives in use was five." This was on a line with a gradient of 1 in 7. Whereas the line proposed for the Coonoor ghaut will be only half as steep, and will carry more than twice the paying load.

Fourthly. Its peculiarities make the necessities for uniformity of gauge less felt. It may also be objected that the evils of a break of gauge, upon which I have purposely enlarged in a former part of my letter, are not of such great moment in this case, where a railway of a peculiar kind with light rolling stock is proposed to be placed on the Coonoor ghaut, on which the traffic will be largely composed of passengers. This objection may

may perhaps to a limited extent be sound. But the following considerations must be weighed. By first, and perhaps by second class passengers, the inconvenience to themselves personally will probably be not grievously felt. But the changing of their luggage will be considered a nuisance. The third class passengers, the numbers of whom will largely exceed those of the other two classes, will be greatly annoyed by a break of gauge. Most of this class will be coolies with small head loads, coming up to the Hill markets or to estates. Many of them now travel on the existing line between Karamuddy and Metapolliam the scene of confusion and hustling, which will accompany the change of carriages, at the latter

latter place, they will probably lose or have injured some of their loads, whether these loads are placed in their own carriages or in a separate van. The ghaut railway would doubtless convey from the Coimbatore District upto the Hills live stock, such as poultry of all kinds, and perhaps sheep and bullocks. In the conveyance of these, and of tea, coffee, cinchona barks, grain, and of all other goods the inconveniences will be as much felt as in all other parts of the world. And it will not be disputed that this kind of traffic will increase every year after the opening of the railway. With regard to the rolling stock it must be pointed out that most of it need not be very different from that on the

the Madras Railway. It is the engine and not the carriages which is so different from the ordinary type. The Rigi carries up a small paying load, but its carriages weigh four tons on four bearing wheels and hold 54 passengers. The fear of dangerous oscillation to the rolling stock of the Rigi system, if allowed to traverse the wide gauge of the Madras Railway at speed, need not be entertained. The fair lighter rolling stock of the Trichinopoly line on a gauge of 5'6" than two feet travels at 30 miles an hour.

10. In now comparing the two partial systems the Fell and the Rigi as applied to the Kannur ghaut, we find:

1. That the Fell, costs double the Rigi system.

2. That the Fell system will be 12 miles long, and will ascend the ghaut in two hours, while the Rigi system will be 9 miles long, and will ascend the ghaut in 1½ hours.

3. That the Fell locomotive is deficient in boiler power and complicated, producing great wear and tear of working parts; while the Rigi locomotive is simple, light, and efficient.

4. That the Fell carries up twice the paying load which the Rigi pushes up.

5. That the Fell system will certainly manoeuvre the zigzags; while the Rigi can have none.

6. That the Fell system has been only twice applied and has proved no financial success, while the Rigi system has been worked steadily for five years, has been and is being extended to several Countries, including England, and has in every case paid larger dividends.

7. Here maybe briefly summed up the probable cost of my proposals of including railway communications from Metapollium to Coonoor.

	Total cost in Rupees	Lacs of Rupees
Continuation of present railway to Hillar		10
The Rigi principle laid on the Coonoor ghaut		16
Possible money compensation for land and other unforeseen contingencies		2
	Grand total Rupees	28 Lacs

Now I believe the Commissioners Mr Cockerell

Sirs

has reported to Government that the present annual cost of the transport of passengers and goods to and fro between Metapollium and Palacammud totals 6 lacs of Rupees. May it not be assumed that 4 lacs of this amount is paid for the same as far as Coonoor & since a railway upto Coonoor would be sure at once to secure the whole of the present traffic its charges might at first be fixed high enough to provide annually 3 lacs of Rupees. The working expenses on the short 6 miles between Metapollium and Kullar would I presume be hardly appreciable. And thus an allowance of one lac of Rupees upto Coonoor would seem sufficient

sufficient for the whole. This would leave a nett profit of two lacs of Rupees, which on the above 28 lacs gives a return of a little over 7 percent per annum.

72. Should Government desire to be more fully informed they will find tabulated in the Appendices information obtained from the best sources regarding existing mountain railways. For the sake of comparison I have entered as approximately their length, cost, and time of account if placed on the Coonoor Ghaut.

73. It may be well here to recapitulate the points which I have endeavoured to make good

the good in this letter. . . .

art I. For the present the desired improvement
of on the existing means of communication between
Ot the railway terminus at Melapolliam and the
ne Nailgherry Mountains should be for prudential
ptacons extended no farther than Coonoor.—

a II. In view of what has already occurred
on the Coonoor Ghaut the improvement to be
effected, whatever it be, should be of a lasting
and permanent character which will not require
to be superseded by something better after a
few years.

III No break of gauge should be allowed in
the continuation of any railway system from the
present

present terminus, which will be the centre of the
branch line from Pothanoor whenever the line is
extended as far as Palacammud.

IV. The existing railway should be continued to Kullar the foot of the mountain pass in exactly similar way to that in which it has been constructed between Pothanoor and Melapolliam.

V. To ascend the Coonoor Ghaut by any system of railway neither of the existing serviceable roads should be used, but the permanent way should be laid on an entirely new railroad

and VI. The Rigi ladder rail railway should be applied to the Coonoor Ghaut as being the cheap
and

h and best suited to the circumstances of the case

a 7th. I beg in conclusion to be allowed to say

g that the information which I have collected and

d the views which I have advanced are in no way

intended to forestall those which the Consulting

Engineers for Railways with his far greater

experience and knowledge will be able to furnish.

Some part of what I have written may be crude

some part may be wanting in information,

some part may be open to criticism, but however

wrong I may be in details, I believe my facts

and views to be in the main correct. They have

been carefully considered and have been drawn

up in communication with other persons well

Competent

Competent to consider the subject. I therefore

respectfully offer them to Government merely

as one of many grains of information which

they will on this subject doubtless receive.

I have the honor to be

Sirs

Your most obedient Servant

Jas Morant. Captain R.E.

District Engineer Railways

Appendix C

Table of weights of various Loads Obtaining on the Coonoor Ghaut.

Name of Unit	Weight of Load lbs	Remarks.
Bullocks	150	
Buffaloes	100	Seldom employed.
Asses	50	
Mysore Coolies	50	Small sized weighty load.
	40	Large sized bulky load of lighter weight.
Woman do:	40	
Cat or Poney	180	
Cart	1500	with 2 pairs of bullocks up the Ghaut.
	750 to 800	with 1 do do do do
	1000	with 1 pair of bullocks on level road.

Approved
2nd January 1875.

Jas Morant. Capt. R.E.
District Engineer

P. 99/75

G.O. 113 of 31-1-75

Appendix D.

Calculation of traffic represented by the contract amount paid for the Coonoor Reliant toll for the year 1874-75- viz 1st July 1874 to 30th June 1875.

The Contract rate for the four tolls Kulhatti Py-karra, Craigmore and Coonoor was for the above year Rs 14200 - The estimated price for the Coonoor toll will therefore be of 14200 = Rs3283-

The toll charges are as follows:-

		Rs.	As	P
a-	Four wheeled Coaches laden or unladen	0	8	0
b	Two do ——— do ———	0	4	0
c	Country Carts laden ———	0	2	0
d	Do unladen ———	0	2	0
e-	Bullocks and Buffaloes laden	0	1	0
f.	Horses laden or ridden ———	0	2	0
g-	do unladen or not ridden	0	1	0
h-	Pony or ass laden or unladen	0	1	0

The toll receipt under a, b, d, f and g must in the first place be deducted from the total receipts as they do not represent goods tonnage in the proportion of full loads.

The following are the numbers and probable receipts under each head.

		Rs
1448	four wheeled carriages at As 8	724
350	Horses ridden ———	44
350	———	22
2724	unladen carts ———	340
		1130

In January to August 1869 there was a registered traffic of 9015 tons carried by

6768	Carts at 4 As	Rs 1692
65813	Bullocks	1 - 4113
19534	Asses	1 - 1221
	Total	7026

and the receipt per ton therefore amounted to say 12 As or at 1/2 a ton per cart to 11 As per ton.

The contract rate for the Conmoor Toll has been shown the Rs 8283

Deducting receipts for carriages, horses &c. 1130

The balance representing goods traffic is Rs 7153

Add for cost of collection, profit, 20 per cent 1657

Rs 8810

Rs 8810 at 12 As per ton = Tons 11746

Add for head loads three elevenths of the receipts as shown the registers 3120

Add for each carriage as luggage 100 lbs Tons 55

Total tonnage of goods deduced for toll receipts = 14921

Say tons 15000

Appendix E

STANES & ROUSE.

Coffee Works 75-51

Coimbatore. 3 April 1875.

Majr Scott. RE.
Under Secty to Govt PWD.
Madras

Dear Sir

I am 2 letters with reference to the Ghaut Railway have remained unanswered from press of work & also in order to enable us to collect information.

We now return a list of questions, with our answers in the margin — We feel they are but imperfect but it is really impossible almost to say how the proposed Ghaut line will affect traffic — We believe it may open a much larger trade with the Hills.

The question becoming of great importance to planters is that of Manure. A trade in this should be developed, but at present the cost of carriage by Rail & thence by cart from Mettapollium to the Hills is so very high, as to render the introduction of artificial manures prohibitory. We believe too that a Ghaut

Railway would attract Rice to the grain from Pollachi & other towns at some distance; whilst at present no doubt a large quantity of supplies are drawn from the adjacent villages — and from Coimbatore district. —

With reference to your letter of — also about the carriage of the cash-plying up the Ghaut — the statement you enclose is certainly erroneous. The feeding of a pair of bullocks capable of making 9 trips up the Ghaut per month would cost double the amount estimated. —

We hope to send you another statement early next week.

We are Dear Sir.
Your obedient Servants
Stanes & Rouse

Appendix F

Balnadies Estate
Guynd. P.O.
March 22nd 1875.

63

77

Messrs Stanes & Rouse
Coimbatore.

Dear Sirs

With reference to your letter of the 11th inst., making certain enquiries with regard to the prospects of the proposed Coonoor Ghaut Railway, &c. I have to inform you that Mr Henry Wapshare is Mr Buchterloney's representative, & would be the proper person to give you information as to the probability of the Valley Coffee going by the Body & proposed railway route.

So far as this Estate, which is only a small one, is concerned, I can give you a few particulars, about the relative cost of the despatch of coffee by different routes, based on the supposition that 92 Bushels of Parchment make a Ton of clean coffee, & that each bushel of Parchment weighs about 36 lbs when it is sent away from the Estate.— There is no direct Cart road from Neddiwattum on to this property, but if one was made, (judging from present rates between Coonoor & Neddiwattum), Cartmen ought to take Coffee for 4 as a Bushel from our Estate to Coonoor.— that would be 23/. for 92. Bushels, which would weigh 3 Tons & a half. & send 25/8/. from Coonoor to Beypore @ 17/. a Ton. or 45/. for the same quantity from Coonoor to Madras @ 30/. a Ton.— At present we are paying 7 as. 2 Pies ₱ Bushel for the Carriage of Parchment Coffee from this Estate down to Messrs Parry & Co's Works at Calicut or Rs 1. As 3. for 92 Bushels by

road the whole way. About three years ago we used to send by Cart to Nilacorde, & by water from there to Calicut, the total hire to the latter place was then only Rs 33 for the 92 Buskels, but we were compelled to give the water transit up on account of the robbery by boatmen, & the utter hopelessness of recovering the value of the property stolen. Thus to summarize what I have stated we may say, the carriage of 92 Buskels of Parchment Coffee would be as follows. viz.

From Balnadies Store to Calicut (viâ Nilacorde, old route). 33 Rs.
" Do Do to Do. (by road the whole way). 41 Rs. 3 As
" Do Do to Beypore (by road to connect the rail). 48 Rs. 8 As
" Do Do. to Madras (Do Do Do.) 68 Rs.

The last item is taken at your figures for the rail charge at 30 Rs a Ton to Madras, but I was informed by Messrs Arbuthnot & Co., that we could send Parchment Coffee now at a special rate of Rs. 20. ₰ Ton, which would make the cost 8 Rs less.

I remain, Dear Sirs
yours faithfully
Wm Cotton Rohde

Appendix G

65

Seaforth Estate
10th March 1875

79

Messrs Stones & Rowell
Coimbatore

Dear Sirs I beg to acknowledge receipt of your letter regarding the carriage of Coffee from the Ouchterlony Valley district, over the Rail Service and by the proposed new Railway from Coonoor to Mettapolm and thence to Beypoor instead of by the Carcoor Chaut route, as it is at present carried. At this moment the only road by which a Cart can get from the O. Valley to the Hills is by Coonlabor which latter place is between 11 & 12 miles by road, from this Estate and 8 or 9 from the O. Valley. Say an average distance of 45 miles to Dotacamund & 12 miles on to Coonoor. A road has been partly made to Kodalinattum up the South side of the Valley but was not completed. Were this road made for handy traffic, the distance to Dotacamund would be greatly lessened. Hereunder is a calculation for the carriage of Parchment Coffee - at say 95 Imperial bushels (from the Estate) to the ton for Shipment - at an average weight per bushel of 37 lbs -

From Seaforth Estate to Coonoor @ Rs 12 per Cart load of 40 bbls -	Per Ton.	28-8.
From Coonoor to Mettapolm by Rail @ Rs 5. per 2240 lbs	"	7-13
From Mettapolm to Beypoor by Rail @ Rs 17- per 2240 lbs	"	26-11
From Beypoor to Calicut (perhaps)	"	4-"
		Rs 67-"

By the Carcoor Chaut as at present and delivered at any Curing Establishment in Calicut - 95 Bushels @ 7 as per bbl - - - - Rs 41-9

I have calculated Rs 12 as the Cart hire from this to Coonoor but I much doubt if, under Existing circumstances, Carts could be procured at that rate. If a large Carrying trade

were established, it might be done at even a cheaper rate.
The rate by the Coonoor Ghaut is that at which I sent ale my Parchment Coffee away this season. While such an immense difference in the cost of transport exists I do not think there would be a chance of the new route finding favor

I was desirous (as an experiment) to send about 30 tons of this season's crop to Madras to be cured, but the enormous cost of transport rendered it simply impossible. You mention Rs 30 per ton as the rate from Coonoor to Madras, but the special rate offered by the M.R.C. to Mr Arbuthnot (as an experiment) was Rs 20 per ton from Mettapollium and Rs 15. from Pallghaut. The ton by rail being understood to be 2240 lbs and the special rates only applying to full Wagon loads of — I believe — between 4 and 5 tons.

I shall be very glad to hear if you think my Calculations reasonable.

Yours
Dear Sirs
Very faithfully
A Arbuthnot

P.S. The road I mentioned as having been Commenced along the South side of the Ouchterlony Valley to Arbuthnot is a private one, but were it opened up for Bandy traffic. I doubt not arrangements might be made with Mr Ouchterlony for its use by the Estates below the actual Valley.

Appendix H Macaulay
March 11th 1875

Messrs. Staines & Rouse
Coimbatore

Dear Sirs

I am in receipt of yours of the 11th We are now paying for the Carriage of our Coffee from the Valley to Mandally Bungore Rs 33.13.8 per ton Cart & Boats inclusive. At the present rate of Cart hire it w? cost us Rs 23 per ton to send our Coffee to Coonoor, this with 5 Rs per ton to Mettapollium and a further Rs 17 per ton to Bungore would bring up the cost to Rs 45 per ton, & there would also be the expense of an Agent & Establishment at Coonoor to receive & load the Coffee

A Railway up the Coonoor Ghaut would of course throw out of employ all the Carts which ply between Mettapollium &

Coonoor, & the probability is that
work in the Coffee season. Were we
between Coonoor & Mettupalayam the Imp.
Govt. now would not then have the
Monopoly & the probability is that
we should be able to reduce by
3 or 4 rupees the cost per ton
between the Valley & Coonoor.

Yours faithfully
Henry Waterhouse.

Appendix H 2.

82 69

Expenditure on New Coorooor Ghaut

Quantity	Particulars	Rate	Per	Amount
	1.			
32765	Cub yards Earthwork 1st class	. 2/3	Cyd	5692123
10243	Do — Do 2d Do	. 36	"	224534 "
4885 3/4	Do — Do 3d Do	. 46	"	10782 7 "
2217 3/4	Do — Do 4th Do	. 66	"	4888 " "
1421 9/3	Do Raising embankments	. 2/6	"	4429 4 6
16379	Do Blasting and removing rocks	2/4	"	8082 12 "
3730 1/2		2/2	8 "	
16	Mile stones	7 8 "	each	120 " "
16	Miles Check channels	147 6	Mile	2356 14 "
16	— do — Levelling the road	300 "	"	4800 " "
				186844 59
	2.			
47108	Cub yards Revetments & Parapets	. 12/16	Cyd	41021 12 "
				41021 12 "
	3.			
1	Timber Bridge 70' span	7600 "	each	7600 " "
1	— Do — Do 56' Do	5140 "	"	5140 " "
1	— Do — Do 40' Do	3677 "	"	3677 " "
5	— Do — Do 20' Do	980 "	"	4900 " "
6	— Do — Do 15' Do	600 "	"	3000 " "
25	— Do — Do 12' Do	3758	"	9387 8 "
9	Drains 8'	100 "	"	360 " "
44	Stone covered drains	168 "	"	7392 " "
27	— Do — Do	125 "	"	3375 " "
16	— Do — Do	100 "	"	1600 " "
228	Common drains	14 "	"	5402 " "
		25 "	"	55084 6 "
	4.			
15808	Cub yds Metalling			13338 18 6
				13338 18 6
	Compensation for Land & Sundries			29628 " "
	Grand Total Rupees			325917 5 3

or average cost per mile ~~Rs~~ 20,370

Dictt Engrs Office
Polacamund
6th April 1876

J Sullivan Captain R.E.
District Engineer

Paid.
Mysore Stores Accts
Coimbatore

No. 16 of 1875.

Appendix

Coimbatore Collectorate
11th March 1875.

From

A. Wedderburn Esquire,
Collector of Coimbatore -

To

Major A. de C. Scott R.E.,
Under Secretary to Government Pub. W.,
Madras -

Sir,

I have the honor briefly to your letter No. 247 dated 4th March 1875 - you ask for observations on the report of the President of the Veilgherry Local Fund Board, regarding traffic that would avail itself of the ghaut Railway -

2. I am at present investigating the sources of supply of provisions sent up weekly to the Veilgherries - 3. Carts with heavy packages, I have noticed taking the inferior ghaut, but the light traffic on men, bullocks and donkeys for the

8- Then, Coimbatore till lately was 4 miles from the station - this was a second break, involving 4 loadings and unloadings, time, and trouble, and expense; where a cart could do the journey direct by the Wallier road in one march with one loading, and unloading -

9- Natives, it is true, do not use the Rail a mile longer than they can help - at the Sirumooggay market which supplies Koterchery, I noticed Beypore salt, and found that it left the line, at Karamadaipo.

10- It is also true that market trains from Coimbatore to Karamaday, did not pay - but then the Karamaday market drew goods from other sources, and chiefly buyers and not sellers were from Coimbatore - and they had

a good and easy road -

11- Now, very different conditions exist on the Neilgherry line - men are in a hurry to get up, and go down - if they could sell at bottom -pallicm, they would save time, fatigue, and loss of stock - which are appreciable elements -

12- If it be calculated that the difference of price of goods conveyed up the ghaut by cart, showed a marginal profit of 100 to 120 per cent, I am not informed if this calculation included time, the enormously increased tear and wear of stock, and casualties, which I believe, are not infrequent, owing to the change of climate, and exposure

13- As a general rule, it is found that native foot passengers prefer availing themselves of the Rail on all occasions

this is when not encumbered with heavy goods - which depend, as I have before noticed, on other considerations -

14 - I should be inclined to anticipate that instead of a weekly market, fixed bazaars and shops, with daily supplies, would, if furthered by a giant Railway, supply the place on the Hills -

15 - I was riding at the foot of the hills some years ago and stopped at a cattle grazing settlement near Dunkanikotta; an old blind man was brought out to speak to me - He told me he had been there from his youth, that he was 70 years of age, and had taken the first load of lime to the Hills 50 years ago in Mr J. Sullivan's time to build what is called "Stone-house" at Coteacamund -

That he had once traded greatly as a carrier in salt, but that this trade was unprofitable and is abolished since the establishment of the Railway - and that he now grazed cattle - I think this evidence from a Brinjary is somewhat to the point - These men, before roads for wheeled conveyances existed, were the sole carriers of India, and supplied armies, and trade, generally -

16 - It used to be thought before Railways were introduced, that the economical and poor natives would never use them - They are its chief source of revenue -

17 - There being generally competition in goods carriage, and a rate thereby being generally adopted, the very fact that a cart may be hired

to the foot of the ghaut at Rupee 1 for 10 miles, whereas the rate up the ghaut is 7 Rs for 16 miles; or about 5 times that rate, shows what the cost of carriage must be; and if goods were taken up ghaut, by rail, there would be no return carts, which are hired at a cheaper rate - and thus the Rail would acquire a monopoly of traffic - the goods that come down are products grown by Europeans, chiefly for exportation, but the means of competition, by the absence of carts, would be removed - and there would be no break of guage - Coffee would be railed as at present to be cleaned at Coimbatore - and tea to the port of Shipment -

18 - I hope that the above observations may be of some use - I think that bullock carts up the ghaut make a heavy charge, not because they have a monopoly, but because of the heavy expenses, 2 pairs of bullocks being generally needed instead of one pair - the tear and wear of pack bullocks, and donkeys is very great, and I am under the impression that the difference of price between goods conveyed either by cart or other conveyance is not a monopoly, but a trade, price, without a margin, that could be trenched on, with hope of profit -

19 - Mr Cockerell has entered so ably and in such detail into the question that I think I have but little of novelty to add, except to express my disbelief that the rail,

if charging within the present difference of prices, would have a rival.

20- There would indeed be a greater pressure on the Railways for about 7 or 8 months, from March to October, but fewer trains would be run in the slack season.

21- As I am asked for observations on Mr. Cockerell's letter, it may not be out of place to record an opinion somewhat opposed to the Commissioner's (para 15) in reference to Coffee - Kotergherry has a new ghaut, almost opened to wheeled conveyances, down to Mettoopolliem; would not the tea and coffee of eastern range estates prefer the shorter route, than to cart the long, in fact, double, distance of 15 miles from Kotergherry to Coonoor for the advantage

of railing down the ghaut. Similarly the south-eastern estates have their ghaut paths down to the Bhowany valley - straight from the estates to Mettoopolliem and Karamaday - Ijemallay and Cherigal would scarcely make the circuit to Coonoor - though doubtless Kattery valley would - There might be an abatement made in the estimate, for coffee and tea in Kotergherry, and in the Southern slopes.

22. The importance of the carriage of lime as noticed by the Commissioner is very great - both for building, and especially for manure, abundance of lime is procurable in the Coimbatore plains -

23- I don't know whether the rail would influence the influx of coolys

labour (para 21) which must, I think depend on other considerations, than a morning walk -

24 - Next to lime perhaps a manure which could be supplied, in the shape of Poudrette composed of night soil and ashes, would meet with demand from the low country, if the carriage up were facilitated - The small community of Coonoor and the larger one of Ootacamund dispose of their night soil at a very large profit - Tons of this valuable article might be supplied from Coimbatore, a town of about 35,000 people, Kara = =nadai and Suttoopalliem - aggregating at least, 5,000 more - The planters on the Hills, at least, are alive to the value of this field and garden manure, with which I have obtained surprising results in tree and vegetable production at Coimbatore, though as yet, the native population are indisposed to its use - It is a recognised article of Railway traffic -

25 - I have confined my observations to the present traffic on the Coonoor ghaut - As regards the traffic from Collegal, and the Mysore plateau, via Seegoor, the toll on the Seegoor ghaut, I observe brings Rs 1,260 per annum, and the Commissioner rates the traffic at 1,500 tons (para 35) - said in para 25 to be food grains supposing part of this to come from Collegal and Mysore, via Hassanoor ghaut, there is 25 miles to be added to carriage to Suttoopalliem - over the distance via Seegoor - if the grain be, as is probable, to some extent

brought on pack bullocks by the
more direct, but badly constructed
hand out of repair Tallamallay, or
Guzzlehutty ghaut, the distance
would be somewhat more - as the
Hassanoor ghaut toll is let for
about Rs 1,000 per annum, it includes
both up and down traffic, which
would give a share to the Tallamallay
ghaut - It may be doubtful.
if grain would stand an extra
cartage of 25 to 30 miles round to
Shettapollium -

I have the honor to be,
Sir
Your most obedt Servant -

Collector -

STANES & ROUSE.

Collectorate Office
Coffee Works
Coimbatore 10th Oct 1875

Major Lee Mc
Chairman Board of Conservancy
Fort St George

Sir,

I have the honor to solicit the attention of Government to the necessity of having a road constructed from the Railway Station at Mettupalayam to the Nilgherry Ghaut Road at Kotagherry, a distance of 18 miles.

2. The Railway Station at Mettupalayam is the only place where the Nilgherry produce can be brought to, and from which the supplies for the Nilgherry consumption can be obtained, and the want of a road between the two places is severely felt by the Nilgherry planters, who are obliged to send their produce to Mettupalayam on the backs of coolies, at a cost of Rupees 2 per cwt, and to bring back their supplies in the same manner, at a cost of Rupees 3 per cwt, or to employ carts, which are not always procurable, and which cannot travel over the rough and hilly country between Mettupalayam and Kotagherry.

3. The Nilgherry Planters have frequently petitioned Government on the subject of a road between Mettupalayam and Kotagherry, and I am of opinion that the construction of such a road would be a most beneficial measure, and would be the means of developing the resources of the Nilgherry District to a very great extent.

4. I have the honor to be Sir, your most obedient servant

[illegible]

P. W. 1875 Dept.
From The Collector
No. 1577
To The Commissioner,
The Under Secretary to
Government P.W.D.
Madras

Rd 11th March
Ans 13

No. 16

Submitting observations on the report of the President of the Nilgherry Road Fund Board regarding traffic that would avail itself of a Railway

the best material, but do not think that the working expenses would be less than those mentioned by us.

Native Ingehauts & shopkeepers do more upon down the Ghauts a good deal and would undertake to do so, but as to bringing up the facility of a railway would entail.

We remain, Dear Sir,
Yours faithfully
for Mares & Rose of
Hill Borden

Appendix K

Cost of purchasing & working 12 carts on the Ghaut

First Cost.

Cost of 14 pairs of Bullocks (2 spare pairs being necessary to take the place of sick & lame animals from time to time) at R 150/- 2 pairs	R	2100 — " — "
" 12 Salem Commting carts at R50/- each		600 — " — "
" Erecting Stables for bullocks		150 — " — "
" Iron pram boiler		25 — " — "
" Hatchets choppers &c for roadsuse		3 — " — "
" Sundries		10 — " — "
	= R	2888 — " — "

Balance Sheet Shewing the results of working 12 carts, on the Ghaut between Bettapollium and Coonoor for 1 year.

	Month			Year				Month			Year		
To pay 12 drivers @ R8/- P Month	96	"	"	1152	"	"	By average 50 tons 5 loads upwards @ 1 Month @ 11 Ghats	550	"	"	6600	"	"
" Batta	13	8	"	162	"	"	" 16 tons downwards @ 6/8	104	"	"	1248	"	"
" Gram Cotton Seed & Straw @ R30/- P pair	420	"	"	5040	"	"	" passengers upwards	6	8	"	78	"	"
" Firewood boiling Gram	7	"	"	84	"	"	" " downward	3	8	"	42	"	"
" Oil for Axles & Ropes	12	"	"	144	"	"	" Local work	20	"	"	240	"	"
" Laundy Stand rent & market tolls	6	"	"	72	"	"		684	"	"	8208	"	"
" Cost of repairs	12	"	"	144	"	"							
" Shoeing @ R1/8 a pair	21	"	"	252	"	"							
" Ghaut Road tolls	27	"	"	324	"	"							
" Renewals of cattle 25% P annum	43	12	"	525	"	"							
" depreciation of carts 10% P annum	5	"	"	60	"	"							
	663	4	"	7959	"	"							
" Profit for 1 year equal to 8 5/8%				249	"	"							
	Rupees			8208	"	"		Rupees			8208	"	"

for M & R

No. 23 Appendix M 10th April 1875 - 80

From,
A. Wedderburn Esquire,
Collector of Coimbatore -

To,
The Under Secretary to Govern=
ment - P.W.D. -
Madras -

Sir,

I have the honor to acknowledge
receipt of your letter of the 31st March
1875 in which you refer to the profit
from Bandy traffic between Pettao=
pollium and Ootacamund, as 75 per cent
on original outlay -

2 - Granting that the original outlay
be Rs. 50 for a cart, 120 for bullocks,
and 36 for a shed, bullocks capable
of such traffic, would be cheap at
Rs 120 a pair - but would one pair
take a fair load up the ghaut, or do
the journey twice a week for a=
continuance -?

3 - Of course, I am not aware how

many trips are made, but I should doubt whether bullocks could be worked in this way for a continuance without serious impairment of their value.

4- If they cost originally Rs 180 a pair, instead of Rs 120 it would make a considerable difference in the valuation of the cost - We purchase our municipal bullocks at fairs, at considerable advantage, but we could not get strong cart bullocks for Rs 120 a pair.

5- I do not think Rs 15 will feed bullocks doing ghaut and hill work, straw, grain, cotton seed, &c, have all to be carried up; Rs 22½ are considered here to be more like the cost.

6- I make the original cost for bullocks Rs 150 or Rs 30 extra; their feed Rs 22½ or 7½ extra; there is 14·5 per cent added to prime cost, and 14·28 per cent to working expenses - The profit will be reduced from 7·5 to 2·8 per cent.

7- But even granting that this is thought a good profit for working a precarious traffic, which I do not think it is, when the loss of one bullock, no unlikely occurrence, would cripple the trader perhaps for months; I recur to my original proposition, that the natives prefer the lower priced, but safer investment of carriage on the plains, to the risks of hill traffic, with its dangers, disagreeables & pain, cold and disease - If it were so profitable, there would be more competition, and lower fares, but in fact the supply is usually less than the demand.

8- There is no analogy between this peculiar traffic, and ordinary traffic on the plains, which will march along side of a Railway for 30 to 50 miles without thought of transfer -

I have the honor to be,
Your most obedt servant -
A Mackintosh
Collector -

Appendix N

Statement of the Traffic up and down the Neilgherry Hills by the Coonoor Ghaut &c per Messrs Stanes & Rouse's Carrying Agency for the year 1873-74 ending 30th September 1874.

Beer & Ale Hogsheads from Mettapollium to Wellington	Sundry Goods Mettapollium to Coonoor	Sundry Goods Mettapollium to Colacamund	Sundry Goods Coonoor & Ootacamund to Mettapollium	Sea Coonoor to Mettapollium	Sea Ootacamund to Mettapollium	Parcels Mettapollium to Coonoor & Ootacamund & vice versa	Coffee The whole of the Neilgherry Coffee crops, from about nine Hundred Tons. The average equals about 117000 Bushels at about 34 lbs per Bushel from Coonoor.
Rate at Rs 3/8 per cwt	Rate at Rs 2 per md	Rate at Rs 2 per md	Rate at Rs 2-8-0 per md	Rate at Rs 2-0-0 per md	Rate at Rs 2-8-0 per md	Weight lbs Amount Rs As P	
672 Hogsheads weighing 650 lbs each = Rs 2,352-0-0	2110 Maunds = Rs 2100-0-0	4329 Maunds = Rs 10,823-0-0	5800 Maunds = Rs 14,500-0-0	11892 Maunds = Rs 29,730-0-0	598 Maunds = Rs 1495-0-0	464 Maunds = Rs 1160-0-0	584 Maunds = Rs 1460-0-0	1103 Maunds = Rs 2757-8-0	64,277 2127 2 0	Rs 20,708/12-0 equals

Beside these goods there are at least 6 or 8 cartloads of Rice and market stuff go up each day on the average earning a hire of about Rs 6/- to Rs 8/- per day, say per year Rs 2000/-

There are quite 3 Randy loads of Potatoes &c &c that come down per day earning about Rs 6 to Rs 8/- hire per day or per year Rs 1200/-

Rs 12,1140/-

It must be remembered that the above sums are not profits, but gross proceeds, the profits really being barely 15 to 20 per cent of the amounts mentioned.

Coonoor
8th December 1874.

Thomas Rouse

Appendix O

Statement showing Comparative Prices

	Rice 1st sort No of lbs per one rupee	Rice 2nd sort No of lbs for one rupee	Horse Grain No of lbs per one rupee	Cholum No of lbs for one rupee	Cumboo No of lbs for one rupee	Ragi No of lbs for one rupee	Salt No of lbs for one rupee	Wheat No of lbs for one rupee	Ulundoos No of lbs for one rupee
On Neilgiri Hills	17·42	19·5	20·0	30·0	38·22		19·05	21·62	
At Coimbatore							114·4	103·6	
Per ton on Neilgiri Rs	125·5	114·7	80·6	64·4	53·2		65·1	77·5	
Per do. Coimbatore do	100·6	95·8	52·1	54·0	41·6		49·3	26·1	
Increase per ton Neilgiri	24·9	18·9	28·5	10·4	21·6				

Coimbatore and Nilgherry Hills in the year 1872

No.	Details	Per	Amount Coimbatore	Amount Nilgherry Hills	Differ. per cent	Remarks.
	Labour					
	Mistry	month	15		00	owing to a great deal of private work being done on the Hills by owners of houses & Estates. Masters of any kind are very difficult to get. The stone on the Nilgherries is much harder than that in Coimbatore.
	Stonecutter 1st Class	day	12			
	Do 2d Class		10			
	Bricklayers 1st Class		9	12	33·3	
	Do 2d Do		8			
	Carpenter 1st Class		12			
	Do 2d Class		10	12		
	Smiths 1st Do		10			It is at all times very difficult to obtain Blacksmiths and Painters. very few of either class are ever to be had. They cannot live on the Hills sometimes at any price.
	Do 2d Do		8		5	
	Painters 1st Do		8	12	50	
	Do 2d Do		6			
	Head Coolly or gangman		16			Unless these Head Coolies or gangmen are paid highly they refuse to procure Coolies. Coolies are always very difficult to get. There is such a large demand for them by private parties on Estates. I and all other official bodies on these Hills find it very difficult to procure sufficient labor. And Planters find others employ labor when they otherwise would if it was more plentiful.
	Coolymans		4		5	
	Do Woman		2			
	Do Do					
	Do Boy		16			
	Do Do					
	Bullock Cart to carry 1000 lbs	day	1			owing to steep grades on roads and to the hilly country a Cart on the Nilgherries carries only about 450 lbs of loss. The climate is also against bullocks. Numbers die annually.
	Rough Stone quarries and stacked	Cyd	12			The stones on these Hills is peculiarly hard, very much harder than that at Mettapolliam. Stones procured some cab stone from Mettapolliam & found it cost less delivered here than the dressed stone does on the Hills
	Stone, hammer dressed (roughly squared)	100 cft	198			
	Stone, squared & dressed to Strip		31		6	
	Flooring Stones 12"×12"	100 sft	50			
	Stone Slabs Rough split	100 sft	25			
	Lime Stone burnt	Cwt	6			The prices here are due to carriage. There is no lime stone of any kind on the Hill plateau
	Do burnt & delivered		45			Here is proportionately cheaper than at Coimbatore owing perhaps to the fuel used being slightly cheaper. This does not however account for the whole difference
	Sand Clean, sharp on river bank		16			
	Firewood Cut & Stacked		3		16·6	The price of firewood is now 3/8 per Cubic yard.
	Teakwood in log	Cft	18			The Malabar and Annamallay Teak grows on these Hills is inferior & sound than the Annamallay Teak used at Coimbatore. Consequently there is more wastage.
	Do Sawn into scantlings		24		5	
	Do Wrought & fitted		212		6	
	Jungle wood in the rough		12			
	Bamboo large	Each	2			There are no Bamboos of any use on these Hills. all have to be imported from Mettapolliam
	Do 1st Class	100	2			
	Do 2d Do		18			
	Bundles of thatch 5 girths	Each	4			

Native Iron wrought spikes lb 6

Europe iron "

Corrugated iron sheet 7 x 21 feet 3 12

No Native Iron is used on this bill Europe Iron of 1st & 2d Class only is used.

District Engineer Office

Cincinnati

June 30 1857

Asst. Q. M.

District Engineer

Abstract of Expenditures for Improvement of Ohio River between Pittsburgh and Cincinnati during the month of June 1857 under the direction of Capt. J. H. Dickerson Asst. Q. M. U. S. A.

Amount of Pay Rolls for Superintendence	$ 1,200 00
Amount of Pay Rolls for Laborers	1,200 00
Amount of Pay Rolls for Mechanics	1,200 00
Amount of Pay Rolls for Teamsters	1,200 00
Amount of Pay Rolls for Watchmen	1,200 00
Amount of Pay Rolls for Lockkeepers	1,200 00
Amount of Pay Rolls for Steamboat Hands	1,200 00
Amount of Pay Rolls for Pilots	1,200 00
Amount of Pay Rolls for Engineers	1,200 00
Amount of Pay Rolls for Firemen	1,200 00
Amount of Pay Rolls for Deckhands	1,200 00
Amount of Pay Rolls for Cooks	1,200 00
Amount of Pay Rolls for Stewards	1,200 00
Amount of Pay Rolls for Waiters	1,200 00
Amount of Pay Rolls for Chambermaids	1,200 00
Amount of Pay Rolls for Barbers	1,200 00
Amount of Pay Rolls for Bartenders	1,200 00
Amount of Pay Rolls for Porters	1,200 00
Amount of Pay Rolls for Deckhands	1,200 00
Amount of Pay Rolls for Cooks	1,200 00
Amount of Pay Rolls for Stewards	1,200 00
Amount of Pay Rolls for Waiters	1,200 00
Amount of Pay Rolls for Chambermaids	1,200 00
Amount of Pay Rolls for Barbers	1,200 00
Amount of Pay Rolls for Bartenders	1,200 00
Amount of Pay Rolls for Porters	1,200 00

The above abstract is made out from the Pay Rolls for the month of June 1857 which have been examined and approved by the undersigned.

Asst. Q. M.

District Engineer

The Pay Rolls for the month of June 1857 have been examined and approved by the undersigned.

Asst. Q. M.

District Engineer

Abstract of Expenditures for Improvement of Ohio River between Pittsburgh and Cincinnati during the month of June 1857 under the direction of Capt. J. H. Dickerson Asst. Q. M. U. S. A.

Amount of Pay Rolls for Superintendence	$ 1,200 00
Amount of Pay Rolls for Laborers	1,200 00
Amount of Pay Rolls for Mechanics	1,200 00
Amount of Pay Rolls for Teamsters	1,200 00
Amount of Pay Rolls for Watchmen	1,200 00
Amount of Pay Rolls for Lockkeepers	1,200 00
Amount of Pay Rolls for Steamboat Hands	1,200 00
Amount of Pay Rolls for Pilots	1,200 00
Amount of Pay Rolls for Engineers	1,200 00
Amount of Pay Rolls for Firemen	1,200 00
Amount of Pay Rolls for Deckhands	1,200 00
Amount of Pay Rolls for Cooks	1,200 00
Amount of Pay Rolls for Stewards	1,200 00
Amount of Pay Rolls for Waiters	1,200 00
Amount of Pay Rolls for Chambermaids	1,200 00
Amount of Pay Rolls for Barbers	1,200 00
Amount of Pay Rolls for Bartenders	1,200 00
Amount of Pay Rolls for Porters	1,200 00

The above abstract is made out from the Pay Rolls for the month of June 1857 which have been examined and approved by the undersigned.

Asst. Q. M.

District Engineer

II. The road between Ootacamund and Pippoocadoo down the Seegore Ghaut connects the Hills directly with Mysore. This used to be the main communication between Mysore and these Hills. From Ootacamund to the top of the Seegore ghaut is 5 Miles. The road undulates the gradients being not steeper than 1 in 25. The Seegore Ghaut which is 7 Miles long is very steep and there are 6 zigzags. Its steepest gradient is 1 in 10. Average 1 in 12. From the foot of the Seegore Ghaut to Pippoocadoo is 11 Miles. The whole distance between Ootacamund and Pippoocadoo is 23 Miles. The road undulates being in parts very steep. Maximum gradient 1 in 12. At Pippoocadoo the Moyar River is bridged and 2 roads branch here — One to the South East into Coimbatore — the other Southwest towards the Wynaad. This latter road meets the foot of the Goodaloor Ghaut 11 Miles distant from Pippoocadoo. The road between Ootacamund and Pippoocadoo is in parts very good, in others very indifferent. It is bridged with timber structures throughout. It is used a good deal by carts but very few carriages can traverse it. It had ceased to be of much importance and has not been kept up very well for many years past. One half of the whole road is metalled — the other half being composed of hard soil.

III. The New Koteyherry Ghaut. This Ghaut, which will be entirely completed in a few weeks, is 20 miles long between Koteyherry and Metapolliam. It has an uniform gradient of 18 Inches of 1 in 17. It has been opened out to a width on this part of nowhere less than 9 feet in many parts being 15 ft wide. It is bridged. The remaining 2 miles are wider and almost level but the streams are unbridged. A few carts will be able to traverse the whole line. But it will have to be widened if the number of carts becomes large. It is unmetalled.

IV. The Kesparah Ghaut. This approach to the Hills is almost abandoned. It is only used by a few persons who may have Estates in that direction and by pleasure parties. This line is under the Malabar District Engineer. It is merely a track for pack bullocks and ponies.

There are no other roads or paths of any importance which give access to the Nilgiri Plateau. But there are several small bye paths and routes put by planters or other private persons for conveying their produce down to Metapolliam. They are of no importance and could not be described without a Map.

Ootacamund
10th March 1875

Joe Morant Captain R.E.
District Engineer.

Sep Appendix R 89

STANES & ROUSE.

Coffee Works.
Coimbatore 23 Feby. 1875

Majr. A.D.B. Scott
Madras

Dear Sir, Your letter of the 15th inst. reached us in due course & we have since been making enquiries with respect to the questions raised by you in connection with the proposed Ghaut Railway. Enclosed we give answers to those queries as near as we can obtain. Correct information from the natives is very difficult to obtain so we cannot vouch for the truth of all the statements. We may mention that the production of Coffee & Tea is increasing in the Neilgherries so that increased traffic may be looked for and no doubt the greater facilities of conveyance will lead to develop the resources of the Hills considerably. We think too that a Ghaut Railway carried on to Ootacamund would draw traffic from the Anaikutty Valley & adjacent coffee districts.
We shall be happy to give any further information in our power,
Yours faithfully Stanes & Roake

STANES & ROUSE.

Appendix R (continued)

Coffee Works.

Coimbatore 23rd Feby 1875.

Answers to queries.

1. Food supplies, are for the most part drawn from Sultanmungalum, Erode, Avenashy, & Bangalore, and pass through Mettapollium. There are a few cultivators in the neighbourhood of the foot of the ghaut, who take their own produce to the Hills for sale, but the bulk of the despatches belong to merchants, who purchase from the cultivators, & arrange for transport.

Building materials are seldom sent up, except on Government account.

2. Most of the carriers, are agriculturists, who work on the ghaut only during their slack season. There are a few who devote themselves entirely to carrying on the ghaut, but their numbers are very small. It is impossible to state the proportions of each.

3. Bullocks & Buffaloes are purchased at the Car Festivals held at Avenashy, Sultanpy, Erodalour, Erratoor, Karamady, & other villages in the neighbourhood. Asses are procured, from Erode, Perundorai, and Karoor.

Country Salt come from Bargiaen, Salem, & Karoor.

Pack Bullocks, asses & Salt are always working on the ghaut, but carts, are used largely, only during the dry season, when they are not required for

the purposes of cultivation.

4. The quality of the stock employed varies very considerably, and it is impossible to give an average cost. The following are maximum, & minimum prices.

1 Cart & pair of bullocks	Rs 120 @ 180	Rof 7= maximum	
1 Pack bullock	13 @ 30	37 @ 40 = Rs 1 4 9 Minimum	
1 Ass	7 @ 30	7 @ 10	
1 Coondy Do	20 @ 100	7 @ 12	

The rates of hire fluctuate considerably, but Rs 6/= may be considered the average cost of a cart & pair of bullocks, from Kuttapollium to Coonoor. During the monsoon, the rate is very high, as extra bullocks have to be employed. It would be difficult if not impossible, to ascertain correctly, what rate would cover an agriculturalist's expenses in working on the plant, during his slack season, but we are of opinion, that they could not reduce their rates to any great extent.

5- Unless the Railway Co: could carry at a reduction on the present cost we think that it would be subjected to competition, during the dry season, but that it could command a monopoly, by carrying at lower rates.

James Rowell

Coimbatore
23 Feb: 1875.

Statistique concernant [illegible] Recensement fait le 31 Décembre 1855 [illegible]

| | | |

Questions proposed to the Planters & Merchants of Nuwara Eliya Coimbatore

Replies

1. From what parts of the Neilgherry District do Coffee Tea & Rice now come down the Coimbatore Ghaut? From what Estates?

The list of estates is attached, and from it will be gathered the information as to what estates would avail themselves of the Ghaut Railway

2. What is the average produce of Estates in Coffee per acre. Tea — do — In the District — ?

Coffee
About 6 cwt ℔ acre
Tea is in its infancy
At present about 100 lbs ℔ acre

3. What is the average number of Coolies employed on Estates per acre cultivated — ?

Average 1½ men ℔ acre

4. Is there any grain grown by the indegenous native hill population in excess of their own requirements for the supply of the Bazaars or low country Coolies — or does all required for such purposes come up from the plains ?

No — the Hill tribes often buy low country grain —

5. Would a railway carried up to Cannoor only, Command the traffic to and from the Kiddiattum and Ouchterlony valley districts, and if so what saving per ton would be made by finding Coffee from these places to Cannoor to take the rail there for Madras instead of forwarding it as now to Calicut by road? - On the supposition that the rail rate per ton was Rupees 5 to Mettapolliem and other rates as at present.

We dont think that Coffee from Mettapollem will ever go in large quantities to Madras - the West coast being so much nearer

6. It is said that 53000 Coolies visit Aolacamund or Coonoor Bazaars during the year with produce, and return to the plains -

per r

Especially as a great proportion are carriers of goods. The Ghaut Railway will probably diminish this number -

7. What are the prospects of a railway to Coonoor as regards that traffic - Would the Coolies be likely to take the rail at Mettapollium, and if so what would be the maximum rate which could be charged -

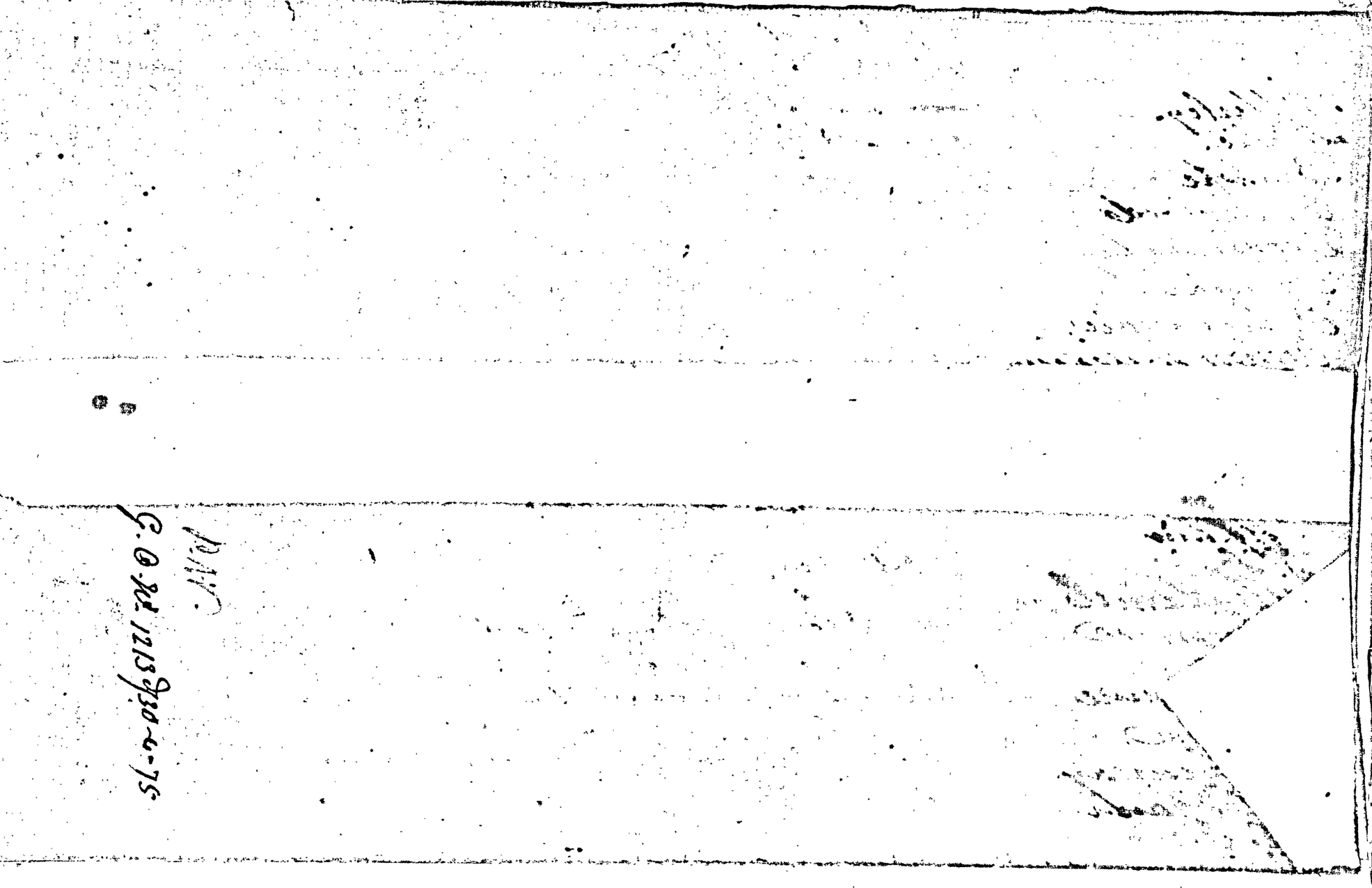
This is a question which the Railway Co. ought to be better able to answer than we are. We really dont feel competent to answer the question & can only say coolies must be fond of walking if they use their legs up the Ghaut instead of the Railway!

James Nowell

3 April 1875

Names of estates & distinguishing marks.	Route by which coffee would be despatched to Coombatore from existing estates if Railway is made to Coonoor	Appendix II
Ardsley	By private road to Kullar thence by Rail to Mettapollium	
Aslic	Koteyhery Ghaut	
Benhope	By rail ½ way of the Coonoor Ghaut	
Chelmsford	Kullar & Mettapollium by rail	
Coonombaddy	By rail ½ way of Coonoor Ghaut	
Chengal	By rail down Coonoor Ghaut ?	24 Sandawathole
Cobaccumbie	—do— —do—	9 Travl. Bungalow
Coonoor Kulchery	—do— —do—	46 Estates of which 13 do estates rent
Coonoor Kulchery	—do— —do—	46.
Craigmore Kulchery	—do— —do—	
D. C.	Koteyhery Ghaut	
Dhoro	By rail down Coonoor Ghaut	
Dolkhie		
F. C.	Koteyhery Ghaut	
Glendarrel	—do—	
Glenmore	By rail down Coonoor Ghaut	
G. H.	Koteyhery Ghaut	
Glencairne	By rail down Coonoor Ghaut	
Helfroue	By rail ½ way down ——	
Hallgacunay	Private Road to Kulla, thence to Mettapollium by Rail	
Halashanday	By rail down Coonoor Ghaut	
H. C.	Koteyhery Ghaut	
Koteyhery Ghaut	Koteyhery Ghaut	
Kulkutty	By rail down the Coonoor Ghaut	
Kilgwoode	—do— —do—	
Lofty Hills	Koteyhery Ghaut	
Louisiana	By rail down Coonoor Ghaut	
Little Snlands	—do— —do—	
Lone Hill	Koteyhery Ghaut	
Monkery	Private Road to Kulla thence by Rail to Mettapollium.	
Madanadu	—do—	
Mullanoor	By rail ½ way down Coonoor Ghaut	
Norwood	By rail down Coonoor Ghaut	
Northumbery	—do— —do—	
Pillon	—do— —do—	
Runnymede	—do— —do—	
Rockery	Private road	
Sutton	By rail down Coonoor Ghaut	
Snowden	—do— —do—	
Solards	Koteyhery Ghaut	
Tiamullay	By rail down Coonoor Ghaut	
Tuttapollium	Koteyhery Ghaut	
Woodlands	By rail down Coonoor Ghaut	
C. Ireland	—do— —do—	
Curzon	Koteyhery Ghaut	
Daramillay	By rail down Coonoor Ghaut	

Jas Rouse
8/4/75



C.O. Rd 1213 Dist 4-75.

Sketch shewing the Jacktalo Road
Drawing the marks
of August

1860

Abstract of Journal of Trains running on the Manchester Sheffield & Lincolnshire Railway for the month of August 1860

	Trains Passenger	Miles Passenger	Trains Goods	Miles Goods	Trains Mineral	Miles Mineral	Trains Coal	Miles Coal	Trains Cattle	Miles Cattle	Trains Ballast	Miles Ballast	Trains Special	Miles Special	Remarks
1	127	193	26	16	6	2	24	15	10	14					
2	39	186	18	9	5	3	14	12	.	.					
3	34	67	16	14	12	5	34	18	6	17					
4	28	36	14	17	6	2	16	10	.	.					
5	16	56	10	13	4	1	12	16	.	.					
6	27	35	34	19	9	3	17	12	15	34					
7	96	465	26	10	6	4	23	14	19	52					
8	136	214	37	15	7	5	27	17	.	.					
9	167	56	29	12	6	4	36	22	.	.					
10	56	37	35	16	7	3	41	16	.	.					
11	69	54	16	12	8	5	25	13	.	.					
12	26	37	19	14	5	3	16	10							
13	12	46	21	10	4	2	18	12	12	24					
14	54	514	16	9	5	4	22	14	6	17					
15	192	157	23	14	6	2	24	16	5	14					
16	67	36	18	13	4	3	32	17	.	.					
17	52	24	26	12	5	2	17	14	.	.					
18	17	47	36	14	6	3	28	16	.	.					
19	24	15	12	6	4	2	14	5	.	.					
20	37	34	25	13	7	3	23	14	19	34					
21	65	397	35	16	5	3	36	12	12	15					
22	184	134	17	12	4	2	19	13	.	.					
23	62	46	24	10	5	3	21	15	.	.					
24	47	32	22	14	6	2	16	10	.	.					
25	27	19	13	9	4	3	20	16	.	.					
26	18	37	16	15	6	2	18	12	.	.					
27	26	15	14	13	7	3	24	9	14	5					
28	76	375	17	17	4	2	17	13	.	.					
29	136	157	28	16	7	3	34	15	.	.					
30	57	163	13	5	4	2	25	16	.	.					
31	46	23	26	17	9	4	37	24	.	.					
	2010	3777	711	410	184	94	744	442	118	231					

	Trains Passenger	Miles Passenger	Trains Goods	Miles Goods	Trains Mineral	Miles Mineral	Trains Coal	Miles Coal	Trains Cattle	Miles Cattle	Trains Ballast	Miles Ballast	Trains Special	Miles Special	Remarks
1	56	14	16	24	5	2	17	10	16	9	17	67			
2	17	14	13	17	3	4	22	14	.	.	.	36			
3	49	13	15	26	6	2	18	16	.	.	.	26			
4	36	54	17	31	9	5	34	13	19	6	.	45			
5	44	16	12	14	6	3	16	12	.	.	.	31			
6	63	12	39	27	7	4	26	17	36	13	.	56			
7	736	26	16	31	5	3	21	15	54	5	.	252			
8	67	18	14	24	6	3	24	13	.	.	.	186			
9	84	17	16	18	3	4	26	19	.	.	16	37			
10	53	19	18	23	5	3	35	17	.	.	.	26			
11	47	25	13	16	6	2	23	14	.	.	.	17			
12	32	10	14	27	3	4	16	10	.	.	.	12			
13	45	13	17	21	6	5	20	16	26	10	.	56			
14	746	27	16	29	4	3	18	13	16	8	.	237			
15	37	17	23	16	7	4	25	15	.	.	.	94			
16	34	14	19	24	5	3	19	12	.	.	.	36			
17	41	16	14	31	3	2	17	14	.	.	.	13			
18	16	12	10	17	4	3	25	10	.	.	.	.			
19	34	11	13	16	3	1	15	13	.	.	.	16			
20	26	48	17	15	5	2	27	16	36	17	19	16			
21	764	21	21	26	3	4	34	17	19	10	.	347			
22	76	38	16	34	6	2	23	15	.	.	.	136			
23	37	53	18	24	4	3	26	13	.	.	6	.			
24	63	14	21	16	7	3	18	11	.	.	.	65			
25	16	10	17	13	5	2	16	14	.	.	.	17			
26	33	12	13	17	4	3	24	16	.	.	.	.			
27	24	17	16	22	6	4	36	19	16	7	.	16			
28	784	19	18	14	5	3	17	10	.	.	.	267			
29	36	16	14	17	6	4	27	13	.	.	27	16			
30	43	12	17	26	7	3	22	17	.	.	.	.			
31	29	16	21	23	9	4	26	15	.	.	.	140			
	4226	57	524	680	163	97	713	439	236	85	85	2413			
	4218	639													

92 / 260

43 / 152

J. Bond

J. Bond

Traffick account from Gainsborough to Lincoln for July 60

	Loaded Bullocks	unloaded Bullocks	Loaded Sheep	unloaded Sheep	Loaded Calves	unloaded Calves	Loaded Horses	unloaded Horses	Loaded Swine	unloaded Swine	Peas	Wheat
1	34	47	31	12	6	4	17	10	6	18		
2	18	16	23	10	8	3	26	13	10	25		
3	65	45	27	14	9	4	32	17	13	46		
4	78	294	21	16	5	2	27	12	.	.		
5	39	164	26	13	10	4	36	16	.	.		
6	67	125	38	11	7	3	29	14	.	.		
7	12	56	24	7	6	2	21	19	15	35		
8	37	51	26	16	4	1	16	10	.	.		
9	25	34	19	14	6	2	27	15	18	54		
10	56	467	17	13	4	3	17	14	16	31		
11	164	196	36	10	5	2	23	18	.	.		
12	36	35	47	15	9	3	29	16	.	.		
13	53	46	24	9	7	2	36	12	.	.		
14	26	37	36	14	5	3	35	13	.	.		
15	17	26	16	10	4	1	19	15	14	26		
16	38	65	39	16	5	3	26	19	18	52		
17	41	476	56	12	6	2	31	10	10	15		
18	56	195	34	14	4	5	29	16	.	.		
19	53	46	26	11	10	2	27	13	.	.		
20	32	37	16	17	3	4	24	17	.	.		
21	19	51	23	13	4	5	18	10	.	.		
22	14	26	36	14	3	2	15	9	.	.		
23	37	62	48	16	6	4	29	16	.	.		
24	75	439	37	15	5	3	24	19	16	34		
25	145	176	31	10	4	2	16	12	.	.		
26	67	54	17	8	3	4	14	10	.	.		
27	26	63	21	6	5	3	18	7	.	.		
28	17	31	25	14	4	3	16	12	.	.		
29	16	25	16	12	3	4	17	14	.	.		
30	27	56	18	14	6	3	18	12	18	44		
31	79	467	47	12	5	2	16	10	14	48		
	1529	4322	901	388	171	90	731	420	168	429		

90 / 261 — 420 / 1151

Traffick account from Gainsborough to Lincoln for July 60

	Loaded Bullocks	unloaded Bullocks	Loaded Sheep	unloaded Sheep	Loaded Calves	unloaded Calves	Loaded Horses	unloaded Horses	Loaded Swine	unloaded Swine	Peas	Wheat
1	36	12	19	26	4	3	16	9	19	5	30	27
2	23	14	13	24	6	4	24	14	26	9	.	18
3	194	36	24	39	5	3	27	18	34	13	36	187
4	126	32	16	28	3	2	21	12	.	.	.	69
5	34	17	19	25	7	3	35	16	.	.	.	37
6	46	16	27	32	5	6	24	17	.	.	.	31
7	17	19	12	47	4	2	25	10	36	14	12	46
8	23	10	14	18	3	4	39	19	.	.	.	59
9	54	13	16	32	4	3	24	13	56	16	23	67
10	181	36	18	37	5	2	13	9	32	15	.	217
11	67	14	19	24	3	4	19	15	.	.	.	94
12	59	12	15	19	6	5	26	11	.	.	.	50
13	36	16	21	33	5	4	37	13	.	.	.	34
14	45	19	26	37	4	2	23	14	.	.	.	16
15	25	10	14	28	3	4	18	12	26	14	10	63
16	76	17	23	34	5	3	24	10	53	17	.	25
17	156	37	34	27	3	2	19	17	16	9	.	237
18	69	27	18	15	5	3	26	18	.	.	.	46
19	24	13	15	34	6	2	16	14	.	.	.	37
20	52	16	17	26	3	4	24	11	.	.	36	52
21	67	12	16	31	4	2	17	13	.	.	13	26
22	56	26	14	23	3	1	15	10	.	.	10	43
23	34	17	21	38	5	4	21	15	.	.	.	.
24	194	39	34	26	4	2	16	9	37	14	.	253
25	156	15	19	35	6	4	14	6	.	.	.	104
26	39	12	15	18	4	3	13	11	.	.	.	35
27	26	13	17	16	5	2	17	9	.	.	.	57
28	17	41	18	26	6	4	12	7	.	.	.	21
29	58	16	36	45	3	2	21	12	.	.	.	34
30	43	13	27	30	5	6	19	14	64	17	.	67
31	75	36	14	37	4	3	13	10	46	16	.	262
	1204	626	611	914	138	98	668	386	443	96	0	2314

J. Bevil Edwards

H. Ridsdale 1860

Statement showing the average number of Local Measures of each Commodity sold per Rupee at Policaumund, Cobrroor, and Ratagherry

Months	Rice 1st Sort. Coarse	Rice 1st Sort. Fine	Rice 2nd Sort. Coarse	Rice 2nd Sort. Fine	Horsegram Coarse	Horsegram Fine	Cholum Coarse	Cholum Fine	Cumbo Coarse	Cumbo Fine	Ragi Coarse	Ragi Fine	Salt Coarse	Salt Fine	Wheat Coarse	Wheat Fine	Jaggery Coarse	Jaggery Fine	Firewood Coarse	Firewood Fine
January 1874	11-0	11-50	11-90	12-0	12-50	12-75	18-0	18-50	20-25	23-0	28-90	29-25	20-0	28-40	26-50	27-0	28-70	28-75	12-0	12-50	12-0	12-0	-	-	12	0	-	7	286	300	160
February	12-0	11-0	10-50	13-0	12-0	11-50	18-0	20-75	19-0	17-0	28-50	18-0	20-0	24-0	-	25-0	24-0	24-50	12-0	12-75	12-0	12-50	-	-	12	0	-	-	286	300	160
March	11-50	10-75	11-40	12-50	12-0	12-50	17-50	19-0	17-75	21-0	19-50	18-0	20-0	23-0	-	28-50	25-40	32-75	12-0	11-80	11-75	13-0	-	-	12	0	-	6-50	286	300	160
April	10-50	10-13	11-0	11-60	12-0	11-70	16-50	17-65	16-0	19-0	18-20	17-50	19-0	21-60	28-0	23-0	25-90	22-50	12-0	11-0	12-50	13-50	-	-	12	0	-	7-0	286	300	160
May	10-50	11-0	11-35	11-50	12-0	12-0	16-0	16-80	16-0	16-50	16-50	16-80	18-0	18-0	19-40	22-0	22-40	22-0	11-0	10-75	11-15	12-50	-	-	10	0	-	8-0	286	300	160
June	10-50	10-30	11-15	11-50	12-0	12-10	15-0	16-50	18-13	18-0	19-10	16-80	18-0	20-86	21-25	21-0	24-63	21-25	10-50	11-20	12-8	13-0	-	-	11	0	-	6-0	286	300	160
July	10-0	10-65	11-65	11-0	11-65	12-42	16-0	17-0	16-60	20-0	21-42	18-10	21-0	19-60	-	22-0	24-75	22-35	12-0	11-90	12-0	12-0	-	-	10	0	-	-	268	300	160
August	10-0	10-0	11-65	11-0	11-0	12-47	16-0	17-45	16-35	20-0	22-0	17-0	22-0	20-10	-	22-63	24-80	23-0	12-0	11-9	12-8	12-0	-	-	10	0	-	-	250	300	160
September	10-50	11-0	11-10	11-50	12-0	12-10	16-0	17-45	15-75	21-0	21-67	19-45	24-0	21-63	19-0	23-50	25-40	23-0	11-0	11-56	11-50	12-0	-	-	10	0	-	7-0	250	300	160
October	10-0	9-70	11-15	11-0	11-0	12-0	16-50	17-20	16-90	24-0	24-20	20-75	24-0	23-45	-	24-0	26-0	25-0	11-50	11-0	11-67	14-0	-	-	8	0	-	-	250	300	160
November	10-0	9-999	22-11	11-0	11-40	12-25	17-0	17-25	16-87	24-0	22-0	22-0	25-0	24-70	•	23-0	25-0	27-50	12-0	11-23	12-10	14-0	-	-	9	0	-	7-50	250	300	160
December	11-0	9-21	11-48	12-0	11-50	16-15	8	17-0	19-64	18-25	26-0	21-60	20-25	25-0	27-74	•	23-0	26-45	23-41	12-0	11-222	9-14	0	-	-	8	0	-	7-74	250	300	160

12	227.50	124.50	130.50	141.14	198.50	215.10	268.50	284.12	252.0	272.06	270.50	307.39	168.00	186.30	182.50	-	123.0	-													
Average	10-0	20-37	11-42	11-76	16-54	17-92	22-37	23-67	21-0	22-66	22-54	25-62	14-0	15-52	15-22	-	10-2	-													
Price	1-0	1-42	1-0	1-76	1-0	1-14	1-0	1-14	1-0	1-8	1-0	1-14	1-0	1-10	1-0	-	1-0	-													

* Rice measure of 65-25 Salabs.

Commissioners office
Date received 4th Feby 1875

N. Sells
Ag. Commissioner

Commdt 96
30 Aug/74 No 1213.

No 11

Commissioners Office
Ootacamund 13th Feby 1875

118

From

H B Grigg Esquire
Ag. Commissioner
Nilgiris

To

The Under Secretary to
Government D.P.W.
Madras

Sir

In reply to your Demi official
Letter dated 20th January 1875, I have
the honor to enclose a statement
showing average prices prevailing at
Ootacamund, Coonoor, and Kotagherry
in 1874. The prices have been calculated
to measure of 65·26 Th. I would suggest that you apply to
the Collector of Coimbatore for the prices
prevailing at Mettapolium and Coimbatore

I have the honor to be
Sir
Your most Obt Servant

H B Grigg
Ag Commissioner

P. W. 1875 Dept.

From No. 1168.

The Actg. Commissioner
Satpuras

To

The Under Secretary
to Government
C. P. & Berar.

Dated 19 February 1875
Rec'd 22 "

Enclosure 1.

No. 11.

Enclosing a statement of the average Bazaar prices prevailing at Betul, Loonoor & Hoshungabad in 1874.

G-O-R-1103-30-4-75

The above items such as Tonnage for way leave of 1½ per ton to Madock's Estate and 1 per ton to Mr. Bankes, Rents &c are quite irrelative of the working expenses of the Line –

The Railway Company provide all mineral Trucks for not only working their Line but in sufficient numbers for 15 different Slate Quarries over connecting Quarry Branche Lines with the Railway which have no' less than 33 self actuing Inclined Planes, and 14 miles of Railways, such require about Two thirds more stock of Slate Trucks than if for the Company's Line only –

The wear and tear of these Trucks off the Company's Line is fully equal to one half the cost marked (m) and half of item (n) in the above working expenses in Table B making together a Sum of £ 879 - 14 - 4 which in fact reduces the absolute expenses to £ 9.695 - 1 - 4 . On completion of the new Permanent Way the maintenance of Line for the first eight years will not require more than seven Platelayers at £ 32 6 - 12 - 0 and Renewal of Sleepers £ 160 or an annual cost of £ 486 - 12 - 0 or £ 34 - 2 - 0 per mile ; Exclusive of repairs of Fencing

	£ s d
Total Receipts for the year	23,676 - 12 - 10
Nett Revenue, less Account Table C	10,622 - 15 - 0
Capital of the Company –	36,185 - 10 - 0
Amount expended on Works and paid out of Revenue for improving the Line and works at different times, and converting the Line into a Locomotive Passenger Railway (including Locomotive Engines and Rolling Stock allowed in Act of 1869 –	50,000 - 0 - 0
£	86,185 - 10 - 0

The working expenses as per Table B is 44½ per cent of the receipts –

(7)

in 1874

Table B

Statement of Working Expenses for the year ending June 1869.

	£	s	d	£	s	d
Maintenance of Way.						
Wages	657	6	"			
Sleepers Keys. Pins &c	284	8	"	941	14	0
Masonry.				177	15	1
Locomotive Department.						
Wages of Foreman. Fitters. Cleaners &c	604	19	7			
Materials for Repairs &c per Work account—	402	0	8			
Oil and Cotton waste	83	15	"			
Fuel used with Engines &c at Locomotive shed —	867	19	4	1958	14	7
Staff —						
Station Masters. Porters. Signalmen. Guards. Breaksmen.						
Engine Drivers and Stokers. including clothing —				2707	3	11
Salaries —				604	16	8
Repairs of Rolling Stock &c						
(m) — Repairs of slate Trucks as per account.				1122	18	9
Repairs of Carriages. Vans. Coals. and goods Trucks &c				440	16	4
(n) Grease. Oil for Carriages. Trucks and Slate Wagons				244	0	0
Coal used at Works in repairs, and offices —				284	17	7
Miscellaneous						
Parish Rates				750	0	4
Passengers Duty				175	13	5
Income Tax				253	6	10
General charges —				854	8	9
Working Expences —				10578	6	3

Table C.

Special Expenditure.

		£	s	d
Rents to the Tremadoc Estate and Mr. Banks.		46	7	6
Interest to Exors of the late Sir Joseph Huddart on Mortgage of £ 5,170.		258	10	-
Tonnage for Way leave over certain properties being over the Tremadoc Estate Lands	736-2-6			
Over Mr. Banks's lands — —	554-8-6	1291	1	0
Interest on Banking Balance		599	13	1
Rebate to Festiniog & Conway Co		340	-	-
		2535	11	7
Total —		£ 13.053	17	10

The Railway being originally made as a horse Railway to 2 feet gauge, there was no alternative but to adopt that gauge on converting the Line into a Locomotive Passenger Railway.

The following Table shews the weight, carrying capacity &c of Rolling Stock, and working Expenses on the Festiniog Railway.

The Coal Trucks weigh 19 cwt and carry 3 tons each
" Goods " " 18 " " " 2 to 2½ "
" Bogie Timber Truck " 13 " each or 1.6 per pair " " from 6 to 9 tons
" Passenger Carriages Nos 1 and 2 " 1.6 — — — " of First Class 12
" Second " 14
" Third " 16.
" Passenger Carriages No 3 " 1.6 " " 12 Passengers
" Mate's Wagons " 19 cwt " 3 Tons
" do 13 " " 2 "

The wheels are 1.6" diameter tyred with Low Moor Iron and Cast Iron Centres -

The following is a Table of the Rolling Stock -

Total Number of	Locomotives	7	(Three generally in Steam)
" "	Passenger Carriages	11	
" "	Quarrymen's Carriages	32	
" "	Goods, Coal and Lime Trucks	10	
" "	Mate Trucks	852	
	Total Rolling Stock	938	

Mineral Traffic for 1859	118.132	7 Qr. 2
Goods	18.600	0 - 0
Number of Passengers	97.000	— —

There is no Night Traffic and no Sunday Trains -
The Train Mileage - 115.619 - The number of Extra Miles run by Engines over Earthworks Embankment and Shunting at Stations Exclusive of the above - 14.695 miles. Total 30,314

The Company are at present limited by the Board of Trade to a speed not exceeding 12 miles an hour, but I have made experiments with Trains at 30 and even 35 miles an hour with ease and safety and without heating the bearings of Locomotive or Carriages -

usual practical load of which over the average Gradient of 1 in 92 is from 70 to 80 tons at from 12 to 15 miles an hour.

The lengths of Trains with this Engine are from 250 to 380 yards on ascending gradients, with mixed Train of goods and empty Slate Trucks with Passenger Carriages.

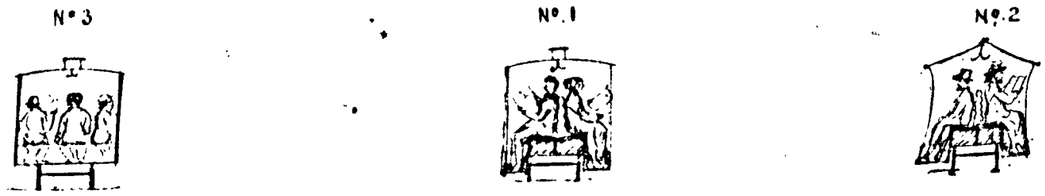
The other Engines are four wheeled coupled and are worked up to 160 lbs pressure.

There is much less wear and tear of Permanent Way and Wheel flanges, with an Engine on the "Fairlie" principle, besides the advantage of equalised grip to rail of all the wheels, together with easier movement round the curves without impact friction against the outer rail, of the wheel flanges.

The Fairlie Engine weighs 20 tons. four of the smaller ones 8 tons. and two 10 tons in steam. With light loads these Engines are used. The Diameter of the Bogie Wheels of Fairlie's Engine is 2'.1" and that of the smaller ones 2 feet.

The Company have First. Second and Third Class Carriages both close and open, somewhat on a similar plan to an Irish C with seats immediately over the wheels, with back Cushions down the Centre, and the Passengers sit back to back (see Diagram Sketch No 1 and 2).

I have made other carriages more on the plan of ordinary Railway Carriages which are in fact preferable as per Diagram Sketch No. 3 and which will replace Carriages on the plan No. 2 when worn ou



The first named are 10 feet long and 6 feet wide, the others are 10 feet long and 5 feet wide with elliptical springs—

The overhang of Passenger Carriage No. 3 from centre of Ra is 1'. 5" but from end of axle is 10 inches—

The Goods Trucks are made on similar principles to tho on Standard gauge Lines.

intermediate space filled with soil.

The Fences are chiefly dry stone masonry coped in mortar.

The Culverts are in dry masonry faced in mortar.

The Bridges are of stone masonry with the exception of one over a Turnpike Road which is an Iron Girder Bridge. There are also four or five over girder foot and cattle bridges.

The Rails of old Permanent Way (which are being replaced by new) of 30 lbs to the yard, most of which was laid 18 years since are too light for the work, and are being substituted by a rail of 18.66 lbs to the yard, double headed, laid upon Cross Sleepers of Larch 4'.6" x 9" x 4½ at intervals of 3 feet excepting at the joints where the centre bearing is 2 feet.

At the joint is fixed a Framing, the construction of which is arranged by placing two sleepers as longitudinals under the Cross Sleepers spiked together.

The joints are fastened with Socket-Fish plates which embrace the web and lower head of Rail screwed together with Fish Bolts and Nuts.

The Curves of Line are what may be described as parabolic, are carefully laid out having their extremities eased into the reversing curves, or straight lines.

The Cant or Superelevation of the Outer Rail is 3 inches in the Maximum Curves

The Joints and Crossings are made in the usual manner, and carefully constructed.

The permanent Way is well ballasted having internal water tables, and drained by side gutters in the Cuttings.

The Sidings at Stations are from 2 to 400 yards in length with mid space between lines of 4'.6" and 6 feet. There are no Platforms at Stations.

The Stations have proper Signals according to the requirements of the Board of Trade for Passenger Line.

The Company have seven Locomotives, one of which is a "Fairlie" Engine on two four wheel Bogies. The latter named is equal in power to 340 tons on a level at a speed of 14 miles an hour; the

Festiniog Railway.

Act obtained in 1832.

Description of Line.

This Railway is a Single Line of Way commencing at certain Slate Quarries in the District of Festiniog, terminating at the Shipping Port of Portmadoc in North Wales.

The length of Main Line is 13¼ miles with a Branch of 1 mile.

The difference in elevation from the sea level to Upper Terminus is 700 feet. The maximum Gradient is 1 in 74, and minimum 1 in 250. Except on the Traethmawr Embankment where the Line is practically level for one mile.

The Line runs through a rude rocky country. The greatest Filling is 60 feet and Cutting 27 feet.

The Width of Line between fences in parts is 8 feet and on Embankments 10 and 12 feet.

There are two Tunnels, one of 700 yards through Syenite, and one of 60 yards through Slate formation, neither of which is Lined.

The Gauge of Line is deemed 2 feet, but in reality is somewhat less.

The maximum Curves are 13¼ Chains radius. Nearly the whole of the Line is a succession of Curves following the Contour of the hills (See Plan)

Many of the Fillings are built through and through in dry stone masonry, and others with Retaining Walls, having the

Appendix No I

Tabular Statement giving details of Existing Railways Worked on Steep inclines.

I. Railways worked with locomotive engines on the main line of railway.

No.	Name and Location of Railway.	Approximate Cost.	Gradients.	Radius of sharpest Curve.	Rate of ascent in miles per hour.	Details of the Locomotive Engines.				Remarks.	Books of Reference from which facts have been drawn.
		Total Cost per Mile of Single Line in Sovereigns. £	Steepest Gradient in 1 mile. Miles								
1	Bhore Ghaut, Great Indian Peninsular Railway, from Bombay up to the Deccan.	44,000	1 in 48. Average 1 in 48. Ruling 1 in 40. Maximum 1 in 37.	15 chains	10	Worked by a pair of double tank Engines coupled back to back. Diameter of cylinders 16 inches. Each Engine has two pair of wheels 4' diameter coupled. Each tank contains 800 gallons, there being a skid brake between the wheels of both rails. Each engine weighs in working order 34½ tons.		36	Inside 15"	This railway has one reversing station or zig-zag. Took four years to study grounds and explore and seven years to construct the line. Rails weigh 85 lbs. per lineal yard.	Book of Reference from which facts have been drawn. Lectures on Civil Engineering delivered at Chatham by H. Conybeare. Proceedings Institute Civil Engineers 8th May 1860. The Railways of India by Captain Goodwin R.E.
2	The Semmering Incline on the Trieste and Vienna Railway, Austria.	65000	Ascends 13¼ miles Descends 9¼ Miles	Average ascent 1 in 47. Maximum 1 in 40. Descends uniformly at 1 in 38.	627 feet	ordinary passenger Trains 11½. Goods. able Engine to the sharp curves. The engine and train weighs 9½ tons and burns wood. 15" Cylinders 3' diameter of uncoupled wheels 3' Distance apart of coupled wheels 6'.	The Engine and Tender are in one. Attached to axles fixed at right angles to the axis of the boiler and reach upon five pairs of wheels. The three leading pairs are coupled together and at the front of the fire-box. The other two pairs are attached to a movable frame with the tender which is connected with 25" stroke. Diameter of driving wheels 4'3".	40	260	3½ 6½ ¼	This Railway traverses the Noric Alps. Takes up trains of 165 tons gross weight engine and tender included. Took six years to explore for line, and 5½ years to construct it. A torturous line with numerous Curves. This line which is laid with a double way throughout cost £98,270 per mile.	The Railway system of Germany read before the Institution of Civil Engineers by Robert Crawford Esq. on the 18th & 25th Nov. 1862. Civil Engineer and Architects Journal Vol. XXIX. pages 336 & 353.
3	The Giovi incline on the Trieste and Vienna Railways.		Average 1 in 36 Maximum 1 in 34.	1320 feet	6 11	worked with a pair of engines each weighing 28 tons and resting on four coupled wheels coupled by piston rods from outside Cylinders 16" diameter with 22" stroke, the pistons working together, so that the fire-box is opposite each other and the driver stands on a common platform.		32	3	Draws trains weighing 80 tons.	Civil Engineer and Architects Journal Vol. XXI. 1858 page 226.
4	The Mexican Railway from Vera Cruz over the Mountains to Vera Cria.		Maximum 1 in 25.	350 feet	22 8	Worked by Fairlie Engines with sloping boiler tubes. Double bogie engine with four 20 inch stroke. Is carried on 6 wheels 3½ feet in diameter coupled. Weighs in working order 62 tons. Has both a Chatelier steam brake and a Westinghouse air brake.		22½	2½	4' 8½" gauge. Steel rails laid on the heavy inclines. Drags up trains of 200 tons gross weight.	Engineering Vol. XIV. 1872. page 309. Engineering Vol XVII. 1874. page 112.
5	The Virginia Central Railway over the Blue Mountains Ridge at Rock Fish Gap		Average 1 in 23. Maximum 1 in 19.	300 feet on an incline of 1 in 22.	2¼ Ascending 7½. Descending 5½.	The locomotive is mounted and coupled 4½" diameter. Cylinders with 20" stroke. Boiler and fuel bogey and adhesion of wheels. Total weight in working order 27½ tons.	six wheels (all drivers) but bear only 8 feet. 16½ engine carries tank upon four boards to increase adhesion of one engine in working	20	3 or ¼	The engineer of this line advocates it only for temporary use. The cars dragged up when full weighing 45 tons. All the cars are provided with a break to each wheel, and a break-man is stationed at each end of the car. The whole distance worked by the mountain engine was 8 miles over which the average gradient was 1 in 29½.	Civil Engineers and Architects Journal Vol XXI. 1858. page 225.
6	The Pittsburgh Railway, California from near San Francisco to the Pittsburgh coal mines near Somerville.		Maximum 1 in 18½.	2	8	Single tank engine (16" outside cylinders with 18" stroke) has three pairs of coupled wheels 3' diameter. Wheel base 9½ centre pairs of wheels have no flanges. Engine, which does not economize fuel, weighs 25 tons.		16	2	A very crooked line.	Engineer Vol. page 115.
7	The Great Western Railway, New South Wales, from Sydney over the Emu Plains and the Blue Mountains to Lake Bear Burra.	20025	Average 1 in 182. Maximum 1 in 30.	12 chains	5			35	1 3 or ¼	Has three passages or reversing stations. This line traverses a very rugged and precipitous country. Heavy earthworks and rock cutting have been unusually heavy. Gauge 4' 8½". Double headed rails weighing 75 lbs per lineal yards.	New South Wales Blue Book of progress in 1870. Engineering Vol. XII. 1871 page 106.
8	Iqeique Railway, Peru.	25100	Maximum 1 in 22½. Average 1 in 29.	400 feet on grades 1 in 33.	24	Fairlie engines. Each weighing 50 tons with four cylinders 15" diameter with 20" stroke. Six pairs of wheels 3½ diameter all coupled. Double steam bogies.		25	Probably 6 3	Gauge 4' 8½".	Engineering Vol. XV. 1873. page 395.
9	Rigi Railway, near Lucerne, Switzerland (This Railway is entered here for purposes of comparison.)	16000 Permanent way Cost £4400 per mile.	Maximum 3⅓ extending over a third of whole length 1 in 4. Easiest 1 in 6. Average 1 in 5.	On 8½ Chains	The locomotive has a vertical incline. The axis of the boiler is inclined to the horizon at the same angle as the gradient of 1 in 4. 1 in 20 to coal stove at the lower end. Metre with a stroke of 16 inches 6 miles on the driving axle, last turned which is placed above the driving axle and is connected to it by spur gearing. The small 1 in 7 in diameter, and the large to 1 in three giving about three miles per hour. The driving Cogs in diameter and are not cast on but run loose. The driving Cogs last cast-steel, is keyed on to 25 inches diameter at the fire. This railway consists of two centre wrought iron Lattice or motive wheels a cast steel each rail and has smooth centre. There are three Spring provided in the engine and prevent derailment or inclines.	boiler with vertical tubes. to the perpendicular at H has a water tank and has two cylinders 10½" dia. They do not act directly a special crank shaft on the driving axle and is connected also wheels 10 8-7 inches one 26 inches diameter sections of the engine wheel shaft. Locomotives are 25 inches on to the driving shaft, wheels, which is of the centre of the axle. It 3 links each has 20 teeth. rail bearing rails with a rack rail. The cog. of the driving wheel into this engine also independent means carriages to stop the train runaway, off the steep	16 111	12 1-10	On 1 in 4 one locomotive can push 54 persons with luggage. On 1 in 10, 180 persons with luggage. Beame rails weigh 22 lbs. per lineal yard. Centre ladder rail weighs 128 lbs per lineal yard. Permanent way consists of cross sleepers 8"x5"x6" laid 2'6" apart from centre to centre and united firmly into a strong frame by longitudinal timbers 7"x6" on each side, 6½" apart from centre to centre. This framing is strongly secured at intervals of 400 feet to masonry foundations built into the formation below. Gauge 4' 8½".	Proceedings Institute Civil Engineers Vol. XXXVI page 103. and Indian Engineering Second Series. Vol. III. page 327.

N.B. The probable cost on the Connor's Ghaut of the above Railways is taken from what they have cost in their own countries. This is not absolutely correct, but is near enough for purposes of comparison.

Ootacamund
7th January 1875.

Joe Morant
Captain R.E.
District Engineer — Nilgherries

P. W. 699/75
2

G.O.W. 1213 300-4-75

District Engineer's Office
Ottawa and 31st January 1875

No. 35.

From

The District Engineer
Nedgheuico.

To

Major Adelbert Scott R.E.
Under Secretary. D. P.W.

Sir,

Availing myself of your kind suggestion to quote authorities in my letter No. 10 of the 7th of January 1875 on the subject of the Connoor Railway I have taken the liberty to add two paragraphs (paras 58 and 71) and to alter para 10.

2. I beg you will kindly substitute the enclosed letter for the other.

3 Will you also kindly either return me the other letter or destroy it, so as to avoid the possibility of any confusion between the two?

I have the honor to be,
Sir
Your most O. H. Servant
Jos. Morant Capt R.E.
District Engineer

Appendix. No. III.

Tabular Statement giving details of existing Railways Worked on Steep inclines.

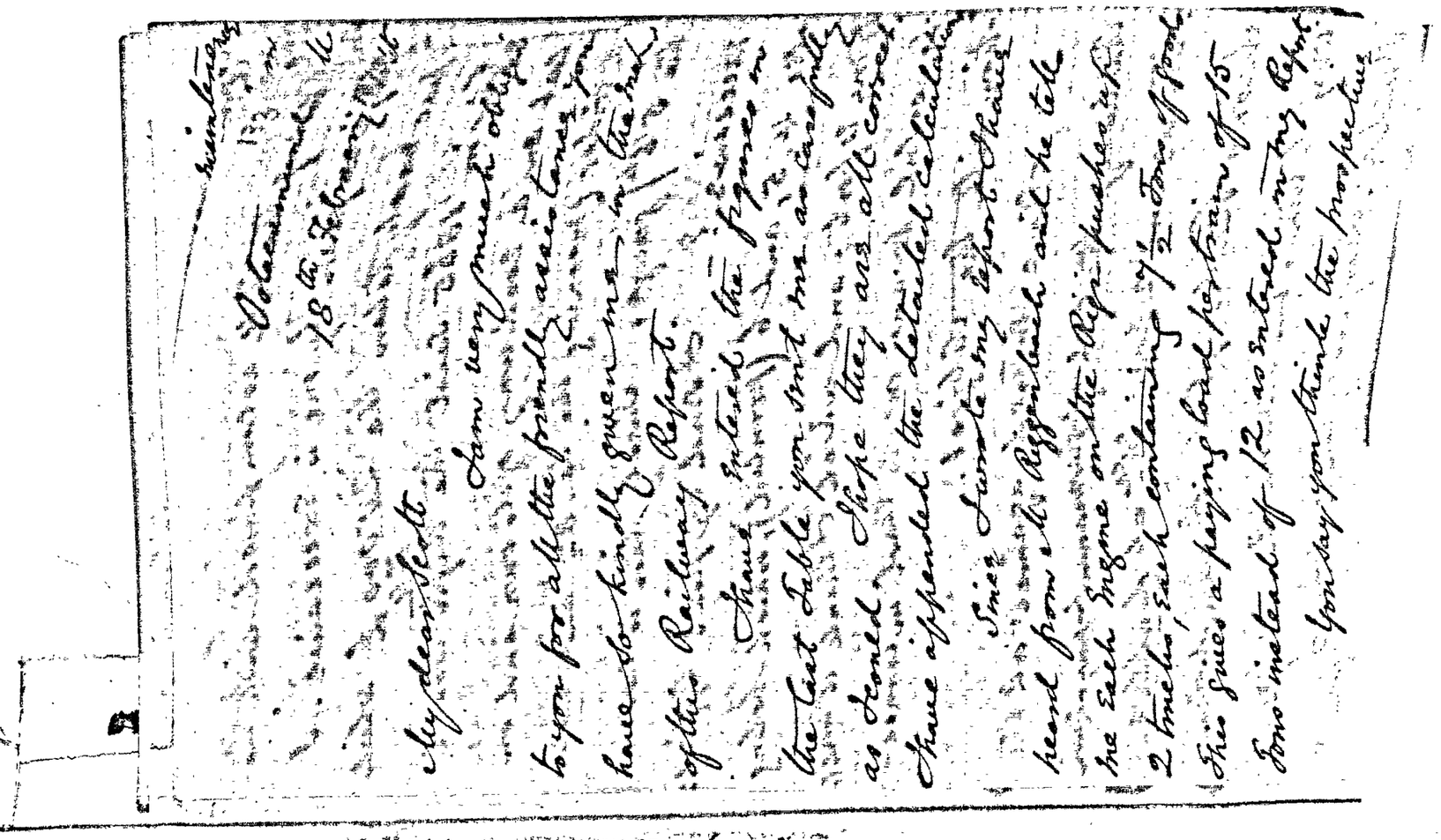
IV. Cable railways with fixed engines working on steep inclines.

Number	Name and Location of Railways.	Approximate length of line and cost per mile of single track in sovereigns	Gradients.	Radius of sharpest Curves	Rate of Ascent in Miles per hour	Details of the Locomotive Engines.	Remarks.	Books of Reference from which facts have been drawn.
1	Fells Railway over Mount Cenis from St. Michel to Susa	7,000 Metres. £20,000 with roadway of its own and pointa mostly Laid on broader gauge	Maximum 1 in 12 Average 1 in 25.	2 Chains	Maximum 11 Miles Average 7 Miles	The locomotive engine weighed in working order 16 tons 10 Cwts. Its boiler 7'9½" long and 2'9" diameter containing 200 tubes of 1¾" internal & 2" external diameter. Heating surface 620 square feet. Grate area 6'6". Provided with four cylinders, two outside 11½" diameter with 18" stroke for working four coupled wheels 2'3" in diameter, with a wheel base of 5'3"; and two inside Cylinders 11" diameter with 16" stroke for working four horizontal coupled wheels 1'6" dia. meter with a wheel base of 1'7". Captain Tyler R.E., reported to the English Government that this engine labours under serious "disadvantages inasmuch as its machinery "is too much crowded together for convenience in readjustment or repair; its boiler "power is not sufficient for working the fast "traffic of the Mont Cenis; and the rib from "its machinery falls upon the horizontal "wheels and deprives them to some extent "of their power of adhesion."	This railroad was laid over the outside shirting of the high road of the mountains. The road was 32 feet wide, 13 of which the railroad occupied. Gauge 3'7½". Rails of the I Section weighing 75 lbs per lineal yard. To provide for the carriage of 132 passengers and 88 tons of goods daily three trains were run each way, one train carrying 40 passengers with luggage, & second train carrying 20 passengers and 20 tons of goods, and a third train carrying 25 tons of goods; the first train being taken up with one engine, the other two with two engines each. Captain Tyler, R.E. estimated that this same line, if made permanently and on a railway of its own, would cost £20,000 per mile.	Civil Engineer and Architects Journal Vol. XXVIII 1865 page 231.
2	Fells Mantagallo Railway, in Brazil, over the Organ Mountains	Probable £20000	7¾	Easiest 1 in 20. Average 1 in 13. Maximum 1 in 12.	A little over 6 miles per hour.	The locomotive engine is carried on two pair of coupled wheels 2'6" diameter which are driven by a pair of outside 13" cylinders with 12" stroke, and a second pair of inside 10" Cylinders with 12" stroke, with a complicated mechanism, drives the two pairs of horizontal gripping wheels 2'6" diameter placed close together. Wheel base of engine seven feet. Each engine in working order weighs 31 tons. The engines for driving the horizontal and vertical wheels are perfectly independent of each other, there being two regulators and two sets of reversing gear, while there are also independent ordinary and midrail breakes.	Gauge 3' 7⅝". Rails, of which there are three, weigh 65 lbs per yard. Centre rail being carried 9" above the carrying rails. The total haul on this line including weight of engine and cars is 43 tons.	Engineering Vol. XIII. 1872 page 129. And Vol. XIV. page 3.
3	Rigi Railway near Lucerne Switzerland. (This Railway is inserted here for purposes of Comparison)	£16000. Permanent way cost £4,400 per mile	3½	Maximum extending over one third of the whole length 1 in 4 Easiest 1 in 6 Average 1 in 5	8½ to 4 miles per hour with a stroke of 15 inches.	On The locomotive have vertical boiler with inclined vertical tubes. The axis of the boiler is inclined to the perpendicular at the same 1 in 20 angle as the gradient. It has a small water tank and coal store at the lower end. It has two cylinders 10½" diameter by 15 inches stroke. They do not act on Special Crank shaft which is placed 1 in 7 above the driving axle and is connected to it by spur gearing. The small wheel is 8'7 inches in diameter, and the large one 4 feet 2 6 inches in diameter, this giving about 3 revolutions of the engine for one revolution of the driving cog-wheel shaft. The wheels carrying the locomotive are 25 inches in diameter, and are not keyed on to the driving shaft but run loose. The driving cogged wheel which is of the best cast Steel is keyed on the centres of the axles. It is 25 inches in diameter at the pitch line and has 20 teeth. This railway consists of five light bearing rails with a centre wrought iron ladder or rack rail. The locomotive works a cast steel toothed wheel into this centre rack rail and thus moves the steep incline. There are three special and independent means provided in the engine and carriages to stop the train and prevent derailment or running off the steep incline.	On 1 in 4 one locomotive can push 54 persons with luggage. On 1 in 10, 180 persons with luggage. Bearing rails weigh 22 lbs per lineal yard. Centre ladder rail weighs 121 lbs per lineal yard. Permanent way consists of cross sleepers 8'x7" x6" inches laid 2'6" apart from centre to centre, and united firmly into a strong frame by longitudinal timbers 7"x6" on each side 6' apart from centre to centre. This framing is strongly secured at intervals of 100 feet to masonry foundations built into the formation below. Gauge 4'8½".	Proceedings Institute Civil Engineers Vol XXXVI page 103. and Indian Engineering Second Series Vol. III. page 327.

N.B.— The probable cost on the Governor's Chart of the above Railways is taken from what they have cost in their own countries. This is not absolutely correct, but is near enough for purposes of Comparison.

Ordnance Office
7th January 1875.

J. E. Morant.
Captain R.E.
Assistant Engineer — Stirlingshire.



P. No. 1875 Depart.
No. 35

Spun. No. 699.

The District Engineer
Ireland

Sir.

Major Nolan C. Bertron
Brevet Lieutenant Colonel
U.S.A.

Date
Rec'd 30 January 1875
Referred to
Answered
Referred to

I Request that the
Carlow Railway
Auckland Report may
be substituted for
the one submitted
on the 7th January 1875.

P. M.

G.O.W. 1213 30-4

cost of the Fell as compared with the Rigi as given by me is excessive. I have merely taken the 20 000 £ which Tyler in 1865 said the Fell would cost on a road very of its own and on wider (meaning the 4' 8½" and not the 5'6") gauge. Surely this is not excessive? — I send by post Appendices 4, 5, and 6 (printed), which belong to my report, and which I think it may be useful for any one to read in connection with the subject.

I have entered against all the Railways the cost of permanent way-maintenance and repairs &c. at double the Madras Railway cost. I cannot see why 5 times the Madras Railway cost should be charged against the Rigi.

owing to its slow speed &c its maintenance cost ought to be somewhat less. I am very much obliged to you for the idea all the same. Should you still think it ought to be so high please have my figures altered. I cannot ascertain the cost of the locomotives &c of the systems except of the Rigi.

I tried to manage the traffic by not allowing the trains to leave the terminal stations at less than half hour intervals, and by having shunting stations at 4 mile intervals. But I found the matter became very complicated and so I took the liberty of changing these conditions to 5 minute intervals and only one shunting station or portion of double line in the centre of each railway. In every case &c.

Cart of Letter 7 ... with the
exception the case of the Bhore Ghaut
the trains could easily run at 5
minute intervals. They travel the
2 or 3 miles apart.
With regard to the cart &
bullock traffic I have gone into the
matter as carefully as I can. I find
the carriers make from 100 to 7
per cent profit. But I do not think
there is any chance of their competing
with the Railway. The full effect
lower gradient of the Ghaut and
the extreme changes of climate affect
the cattle greatly and very many die
annually. The men who own the cattle
are not Agriculturist, but trade so
by the money they make as carriers.
The case of the Bullary cotton whic
is different. There
men use their bullocks and them
bullocks in their fields during certain
parts of the year and are glad during
the part of the year when they have
nothing to do either for themselves or
their bullocks to cart cotton down to
Madras. You will find in one of
papers full information regarding
and cart
bullock carriers of these Hills.
I am looking out for a small cottage
for you and will let you know in a
few days. I cannot get hold of the
present Owner of Snipe Cottage - but
will try again.

With many thanks
Believe me
Yours sincerely
J. Mollison

26. Feb. 75

My dear Scott

As I mentioned yesterday the Revenue account of the Keelhaug Canal is not kept separate from the rest of the line, and to obtain the information you ask for would entail a very large amount of labour on the Chief Auditor's Office. It would be impossible

STANES & ROUSE.

Coffee Works.

Coimbatore 9th Decr. 1874

To Major A. de C. Scott
Under Secy to Govt. D. P. W.
Madras

Dear Sir.

As the statement of Traffic on the Coimbatore Road given in our letter of yesterday is not very clear, we beg to enclose herewith a statement which we trust contains all the information required, & will be found useful

We remain, Dear Sir
Yours faithfully
Stanes & Rouse

ARBUTHNOT & Co

Madras, 6th April, 1875.

My dear Major Scott,

With reference to the statement that Coffee cured at Metapolliam is worth £2 per ton more than Coffee cured at Calicut I am under the impression that no Coffee has ever been cured at the former place. There are some excellent Coffee curing Works at Coimbatoo, owned by Messrs Stanes & Nunn, and possibly that Firm may have it in contemplation to transfer their Establishment to Metapolliam so as to set up other machinery; but I should doubt very much whether an adequate number of women could be got to be on a daily large scale would be available at Metapolliam for the Garbling process - at Coimbatoo the curing is good, and an experiment I instituted some two years ago between Coimbatoo and Calicut curing showed a result of from £1 to £2 per ton in favor of Coimbatoo - Still I am not sure

sure that the experiment was altogether reliable, and we know this, that Messrs Evans & Pym entertain strongly their large interest in Coimbatore themselves personally under the style of Messrs Maylor & Co within the last few years of a large Coffee curing Establishment at Bangalore - whether it has been their experience that Coimbatore gives a better result than Bangalore by £2 a ton I do not know.

As regards Freights I have no hesitation in saying that a rate of £3. 15/ a ton from this port cannot be considered excessive the last rate we paid was £11. 10/- a ton by a Canal Steamer, being the same rate as has been paid from the West Coast this season.

I will ascertain about the relative cost of the transport of Coffee to Calicut & Mangalore & may say that I doubt much if the Coffees of the Ouchterlony Valley & of S.E. Wynaad would be benefited by a railway

railway at Conoor. If they were completed, they would not, I think, benefit at Metapolliam or Coimbatore, but would come straight through to the parchment to Madras to be cured here, this climate being I believe all that can be desired for Coffee curing from December to April -

Instead of a railway to Conoor, or in addition to it, why do they not persevere the already almost sanctioned, but a Stewards disallowed line from Bangalore to Mysore? Every bean of Coffee from the Ouchterlony Valley & S.E. Wynaad would probably go thither for transport to Madras, and there would be a large return traffic in Manures, Guano &c &c. I am not sure if the measure would be popular with the planting Community of Wynaad, Coorg & Mysore, but that it would be for their ultimate advantage I entertain no doubt.

Believe me,
Yours sincerely
W. H. Arbuthnot

Major A de C. Scott

Belongs to files
of Papers in
Crown Plank Railway

Q

P. 17.

Commenced with 96
30 April/75 No 1213

1. All the available statistics of traffic are submitted in the following Return of Sent.

19.	Dec.	1856	£ 2562
20.	Oct.	62	- 551
4.	Aug.	68	- 2497
17.	June.	74	- 1613.

In the last quoted will be found the number of passengers & tons of merchandise booked, & and also particulars during the four months from 1st September to 31 December, 1875.

The details of the Commodities conveying the goods traffic are not available in this Office, nor are the weights of parcels, & numbers of carriages, horses &c. but these particulars can be obtained from the Railway Company, if necessary.

2. No information available

3. Present cost of Engines with Tenders £ 35000

Average weight of locomotive & tender when in half loaded and fully loaded 42. 15 tons

Weight of Tender Engine in full steam. 34.40 tons.
" Tender " " 19.40 "
Total. 53.80 tons.

Tender weight on driving axle. 12.35 tons.

4 - Passenger Carriages -	1st Class -	weight 6.70 tons.	Cost. ₹ 6500
	2nd "	6.71 "	₹ 4000
	3rd "	6.04 "	₹ 3500
	4th "	6.0 "	₹ 3000
Goods wagons		4.74 to 6.16.	₹ 1573 to ₹ 1743.

Cost of one ton of iron rails delivered at metal stations - ₹ 164 0 0 & ca.

		£	s. d.
Cost in England		12	0 0
Freight & Insurance		1	10 0
		£ 13	10 0
Insurance. 3 p.c.			8 1
Customs' duty. 1 p.c. on Value			2 5
Landing charges. (₹ 2½)			4 7
		= 14	5 1

Equivalent at present exchange of 1/10 per Rupee ₹ - ₹ 153 8 0

Carriage by rail 328 miles at 5 pies per ton } ₹ 8 8 8

₹ 164 0 8

5. Cost of fuel per passenger mile — .229 pie.
6. " " ton mile of goods. .901 " } approximate
7. Rising gradient on Hill Peony branch. 1 in 80.

Work

No. 219

From

The Under Secretary to Government

Pub. Works Department

To

The Collector of Cawnpore

Fort St. George 24th Feby 1875

Sir!

Having been directed in G.O. P.W. Dept. of the 10th Septr 1874 No. 2564 A. (a copy of which is enclosed) to collect statistics of the traffic on the Conoor Ghaut, I should feel much obliged if you would kindly further the object in view by giving me such information as you may possess relative to the share taken by your district in contributing to that traffic.

It is desirable to ascertain what portions of the Dt. furnish the Chief supplies of food grains, live stock &c. which travel up the Conoor Ghaut, & whether the cultivators carry up their own produce when not engaged in their land, or whether it is purchased from them by merchants and conveyed by cattle Carts and Coolies continuously engaged in

in that work. — In the former case it is presumed that such carriage could afford better to compete with a railway than in the latter. —

Thanking you

[Signed] A de C Scott Major R.E.
Under Secry to Govt
P.W.Deptt.

142

STANES & ROUSE.

Coffee Works.
Coimbatore 8th Dec 1874

Major A de C Scott
Under Secretary to Government.
Public Works Department
Madras.

Dear Sir,

Referring to your letter of the 1st October, we regret exceedingly that we have been unable to send you the Returns of Traffic up and down the Neilgherry Hills between Mettapollium and Kotagherry before this. We now enclose it, and trust that its completeness will make up for the delay.

As regards our own business and interests we should be sorry to see the Railway made, but believing that it will greatly tend to the development of the resources of the Neilgherry Hills, we hope Government may decide to construct it.

We have the honor to be
Your Obedient Servants
Stanes & Rouse

Statement of the Traffic up and down the Neilgherry Hills by the Coonoor Ghaut per Messrs Stanes & Rouse's Carrying Agency for the year 1873/74 ending 30th September 1874.

Beer and Ale Hogsheads	Sundry Goods				Sundry goods		Tea		Parcels			Coffee	
From Mettapolliam to Wellington	From Mettapolliam to Coonoor		From Mettapolliam to Potacamund		From Coonoor to Mettapolliam	From Potacamund to Mettapolliam	From Coonoor to Mettapolliam	From Potacamund to Mettapolliam	From Mettapolliam to Coonoor & Coty and vice versa			The whole of Neilgherry Coffee Crops.	
Tariff Rate at Rs 3. 8. 0 per Hogshead	Public rate at Rs 0. 14. 0 per md	Trade rate at Rs 0. 11. 0 per maund	Public rate at Rs 1. 4. 0 per maund	Trade rate at Rs 0. 14. 0 per maund	Public rate at Rs 0. 8. 0 per maund	Public rate at Rs 0. 14. 0 per maund	Special rate at Rs 0. 7. 0 per maund	Special rate at Rs 0. 11. 6 per maund	Weight of the Parcels	Amount Rs	Amount As	From various Estates the average equals about 117,000 Bushels at about 34 pies per bushel from Coonoor to Mettapolliam.	
612 Hogsheads weighing 5,319 Maunds & 20 Seers	2,100 Maunds = Rs 2,100. 0. 0	4,329 Maunds = Rs 2946. 3. 0	3,800 Maunds = Rs 4760. 0. 0	11,329 Maunds = Rs 9,895. 6. 0	398 Maunds = Rs 199. 0. 0	462 Maunds = Rs 404. 2. 0	384 Maunds = Rs 161. 0. 0	403 Maunds = Rs 289. 10. 6	lbs 64,277	257	2	equals Rs 20,718/12 as	

Besides these goods there are at least 6 or 8 cartloads of Rice and market stuff go up each day; on the average earning a hire of about Rs 5 0/- to Rs 6 0/- per day. say per year Rs 2007/-

There are quite 3 Bandy loads of Potatoes &c &c that come down per day earning about Rs 12/- to Rs 14/- hire per day or per year Rs 12 140/-

It must be remembered that the above sums are not profits, but gross proceeds. The profits really being hardly 15 to 20 per cent of the amounts mentioned.

Coimbatore
8th December/73

Madras Railway

Statement of the Outwards and Inwards Traffic at Mettapollium showing the Number of and receipts from each of the different classes of Passengers and the Number of Carriages and Horses, and the Tonnage of Goods from the date of its opening 31st Aug 1873 to 31st December 1873, and from 1st January to 30 June 1874

Period		1st class		2nd Class		3rd class		Carriages	Horses	Tonnage of Goods
		No	Amount	No	Amount	No	Amount	No	No	
From 31st Augt to 31st Decr 1873	Outwards	283	5,372 11 -	538	2716 11 -	10,208	9,547 15 -	26	112	1,204
	Inwards	280	3,699 4 -	394	1,342 13 -	8,357	4,751 5 -	9	52	1,360 3/4
	Total Outwards & Inwards	563	9,071 15 -	932	4,059 8 -	18,565	14,298 4 -	35	164	2,564 3/4
From 1st Jany to 30 June 1874	Outwards	534	8,078 4 -	725	3216 7 -	15,896	12,095 6 -	27	183	1,425
	Inwards	708	11,645 3 -	846	5,458 15 -	15,371	17,425 2 8	76	391	2,695
	Total Outwards & Inwards	1,242	19,723 7 -	1,571	8,675 6 -	31,267	29,520 8 8	103	574	4,120

True Copy
W. H. Conley
4. Dec. 74.

Sd/ Robt B. Elmi
Agent & Manager

Sd/ Fitzgerald Church
Chief Auditor

146

4. Receipts for 3 years at Rs 56 8 months — 2016

Deduct

Expenses for 3 years at 31/12/6 Months 1143

2/3rds of original outlay (the bullock being only worth 1/3rd at end of 3 years) — 137

12 % on original outlay for 3 years 7/4 — 1354

Balance of Profit in 3 years. 662

Therefore on original expenditure of Rupees 206 gives annual interest of 100 per cent.

206 | 20600 | 136
206
6 1 6
136 p.c.

5. There are 3 * main carrying Firms at Metapallium who buy bullocks and carts and hire drivers keeping a regular service between Metapallium and Coonoor.

6. Persons who bring up grain bring it up for other people. It does not belong to them.

7. The carriers work all round the year, more or less. In the season they are employed in carting for visitors &c. out of the season they cart coffee, potatoes &c.

* 1. Contractor Commissariat
2. Evans & Jones Contractor
3. Indian Carrying Company

Ootacamund
20th February 187

Lieutenant Colonel
District Engineer Nilgiris

Details of Calculations &c to accompany Table

Train Resistance Calculations

Column 12
Resistance to Traction in lbs = sine angle of gradient × gross load in lbs + load in tons × 20 lbs

$$= \text{sine angle of } 1 \text{ in } 48 \times 220 \text{ tons} \times 2240 \frac{\text{lbs}}{\text{ton}} + 220 \text{ tons} \times 20 \frac{\text{lbs}}{\text{ton}}$$

$$= (.02083 \times 220 \times 2240) + (220 \times 20)$$

$$= 10265 + 4400$$

$$= 14665$$

Column 14
Indicated Horse Power = $\frac{\text{Resistance to Traction in lbs} \times \text{speed in feet per minute}}{33000}$

$$= \frac{14665 \times 880}{33000}$$

$$= \frac{12905200}{33000}$$

$$= 391$$

Column 16
Fuel per trip per train per diem

$$= \frac{\text{lbs} \quad \text{H.P.} \quad \text{hours}}{5 \times 391 \times 3.6}$$
$$\overline{2240}$$

$$= 3\tfrac{1}{2} \text{ Tons}$$

Column 17
Cost of fuel at 9/6 per Ton.
= (from Column 16) $3\frac{1}{2}$ Tons × 7 trains × 6 trips × 6 days × 9/6

$$= 7128 \text{ d}$$

Column 6.

Trains Trips Tons Tons
7 × 6 × 85 = 3570 per diem

Therefore 20,000 Tons will be Carried in

$\frac{20,000}{3570}$

= 6 days

Column 6. = Trains Trips Tons Tons
7 × 8 × 21 = 1176

Therefore $\frac{20000}{1176}$ = 17 days.

Column 19. Tons Trains Trips days Rs
1.05 × 7 × 8 × 17 × 9 = 8996 Rupees

Column 6. = Trains Trips Tons Tons
9 × 8 × 29 = 2088

Therefore $\frac{20000}{2088}$ = 10 days.

Column 19 = Tons Train Trips days Rs
$\frac{1}{2}$ × 9 × 8 × 10 × 9

= 3240 Rupees.

Column 6. = Trains Trips Tons
7 × 12 × 15 = 1260 Tons

Therefore $\frac{20000}{1260}$ = 16 days.

Column 19. = Tons Trains Trips days Rs
$\frac{1}{3}$ × 7 × 12 × 16 × 9

= 4032 Rupees.

Column 6. Trains Trips Tons Tons per diem
7 × 6 × 32 = 1344

Therefore 20000 Tons will be Carried in

$\frac{20000}{1344}$

= 15 days.

Column 19. Cost of fuel at 9 Rs per Ton

Tons Trains Trips days Rs
2 × 7.54 × 7 × 6 × 15 × 9

= 8731 Rupees.

Column 6. Trains Trips Tons = 2646 Tons per diem
7 × 6 × 54

Therefore 20000 Tons will be Carried in

$\frac{20000}{2646}$ = 8 days.

Column 19 Cost of fuel. Tons Trains Trips days Rs
2.1 × 7 × 8 × 9

= 3024 Rupees.

	Rs. as. p.
1 Average price of cart	50 - 0 - 0
Average price of a pair of bullocks	120 - 0 - 0
Do Cost of sheds	36 - 0 - 0
Total Rupees	206 - 0 - 0

2. Cost of monthly keep of a pair and pair of bullocks

Drivers pay for one month including travelling batta — Rs 10-0-0

Gram, straw and Cotton seed — 15-0-0

Shoeing — 1-0-0

Chank of yoke and rope &c. — 0-2-0

Grease — 0-4-0

Toll — 3-8-0

Tyring wheels and repairing Carts — 0-10-0

Market and Bandy stand Toll. — 1-4-0

Total Rupees 31-12-0

3. A pair of bullocks working regularly between Metapolliam and Coonoor will last on an average for 3 years, and will on an average allowing for unavoidable detentions and absence of hire make only 11 trips up and down between these two places per Annum

Average Fare between Metapollium and Coonoor up — Rs 5½

Do — Do down — 2½

Therefore

Monthly Receipts

7 Trips up at 5½ Rs per trip — 38½

5 " down at 2½ Rs Do — 12½

Rates of Tolls leviable at Coonoor Ghaut, Pykara and Kundahtty Toll gates on Carriages &c —

	Rs	as	P.
One 4 wheeled Coach laden or unladen	0	8	0
" 2 wheeled Coach — Do	0	4	0
" Country Cart laden	0	4	0
" — Do — Do unladen	0	2	0
" Bullock or buffalo laden	0	1	0
" Horse laden or ridden	0	2	0
" Horse not laden or ridden	0	1	0
" Pony or Ass laden or ridden	0	1	0
" Elephant	1	0	0
" Camel	0	4	0

Coonoor Toll gate.

One 4 wheeled Coach laden or unladen	0	8	0
" 2 wheeled Coach laden or unladen	0	4	0
" Country Cart laden	0	4	0
" — Do — unladen	0	2	0
" Horse laden or ridden	0	2	0
" Horse not laden or ridden	0	1	0
" Pony or Ass laden or ridden	0	1	0

Ootacamund

3rd February 187[illegible]

37	Mustard	lb	"	1	3	Rs	110	"	
38	Cummin Seed	"	"	5	"	"	60	"	
39	Vendiam or Dill	"	"	1	"	"	115	"	
40	Saffron	"	"	1	8	"	180	180	
41	Onions	"	"	"	6	"	36	"	
	Vegetable								
42	Potatoes 1st Sort	lb	"	1	4	Rs	140	8	1
43	do 2nd do	"	"	1	"	"	112	"	"
	Miscellaneous								
44	Sugar Ashagram	lb	"	3	6	Rs	392	"	"
45	do White	"	"	2	6	"	280	"	"
46	do brown	"	"	1	1	"	119	5	1
47	Jaggery	"	"	1	3	"	170	"	"
48	Coffee 1st Sort	"	"	6	8	"	720	"	"
49	Tea	"	2	"	"	"	2584	"	"
50	Eggs	Dozn	"	2	6	"	"	"	"
51	Salt	lb	"	"	6½	Rs	65	"	"
52	Lamp Oil	Bottle	"	3	6	"	"	"	"
53	Gingely oil	"	"	3	"	"	"	"	"
54	Cocoanut Oil	"	"	3	6	"	"	"	"
55	Honey	"	"	"	10	"	"	"	"
56	Nutmegs	lb	2	8	"	Rs	448	0	"
57	Cocoanut 1st Sort	Each	"	"	7	"	"	"	"
58	do 2nd do	"	"	"	6	"	"	"	"
59	Lime	100	"	"	6	"	"	"	"

Govt. Litho Department
Fort St. George.
Madras. 19th February 1875.

Abstract Statement of the inwards and outwards traffic at Villapolliem Station on Madras Railway during the half years ended 30th June 1874

Goods.

		Passengers		Parcels and Luggage	Carriages Horses Dogs &c.	Total	Merchandize and Minerals for the Public		Live Stock		Railway Materials		Sundries	Telegraph	Total	Grand Total
		Number	Amount				Quantity	Amount	Quantity	Amount						
1st half of 1872.	Outwards															
	Inwards															
2d do	Outwards															
	Inwards															
1st do of 1873.	Outwards															
	Inwards												112½	8¾	1480½	3693½
2d do do	Outwards	1729	1616¾	192½	343¾	2153	1204	1356½	2¼					12	1762¾	2903½
	Inwards	9031	897¾	116½	127	1141¾	1360¾	1729¾	18¾	10	4¾			17¾	933½	3622
1st do of 1874.	Outwards	17155	2144	223½	421	3788½	1425	815½	¾							
	Inwards	16925	3165¾	470	1109¾	6745	2695	3527¾	46½	8	1¾	151¾	39½	3768¾	6513¾	
		54240	7823¾	1002½	2001½	10827¾	6694¾	7479	68¾	18	5½	264¾	78	7845	18672¾	

Tabular List giving details regarding cost of carriage on the Coonoor Ghaut by Railway and Steam power and by carts, bullocks &c.

1 Railway Systems or modes of carriage applied to the Coonoor Ghaut.	2 Length of line or of road on the Coonoor Ghaut	3 Cost of roadway complete on the Coonoor Ghaut	4 Cost of rolling Stock Price	5 Total Capital charge	6 Days required for traffic of 20000 tons	7 Locomotive weight of engines per train	8 weight of waggons per train	9 Paying load per train	10 Total gross weight per train	11 Average gradient	12 Resistance to traction at rails per train in	13 Speed per Minute in	14 Indicated Horse power obtained from 12 & 13	15 Times of trips in	16 Fuel per - trip per - tramper - diem	17 Charges Interest 6% on Capital for Carriage days	18 Charges Maintenance repair, Management &c for working days as per Column 16	19 Cost of fuel for - days - trips - trains	20 Total Charges	21 Cost per ton from Station to Coonoor or reverse inv
A railway working with a smooth wheel on a smooth rail on the Indian gauge (5'6") with a pair of double tank Engines coupled back to back like the Kharr Ghaut Railway	36	158000	8 Locos	166 1597500	6	Double Engine 74	56	85	220	1 in 48	14665	880	391	3·6	3 ½	13644	5184	7128	26956	
Iguiqui Railway Peru	25	62½ 625000	6½ Locos	69	15	57	22	32	111	1 in 29	10793	704	250	3	1·54	14178	9000	8731	31909	
Norway Narrow Gauge	48	21 216000	7½ Locos	28½ 220100	8	With Tender 37	36	54	127	1 in 20	1711	1581	471	2·6	2·16	3123	9216	7408	19747	
Festiniog Railway	60	24	5½ Locos	29½	17	19½	11	21	55	1 in 13	2860	2640	235	2	1·06	6870	24480	8996	40346	
Fella Brazil Railway at 2250 per mile Sterling Rigi	12	24 270000	8 Locos	32	10	31	13	29	73	1 in 13	11001	528	224	2	½	1384	2880	3240	10504	
Rigi Railway	7	12 157500	6½ Locos	17½	16	15	7	15	37	1 in 8	5994	528	114	1·6	⅓	3855	2688	4032	10555	

Cart and Bullocks	100	22	20600	4884	5090	years 2796
				10300	30900	3200
Pack Bullocks	500	15	35	2662	2697	years 1777
Asses		15	17	2646	2661	years 3733
Mew		15				years 3733

Rather being a deadly country at night the distances from the Coonoor have been taken as minimum distances

Prime cost & cost of renewals of Bullocks at certain intervals taken as a mean for whole period

	Interest at 12 per cent per Diem	at 31 p/c per Diem	
	180796	112776	298662
	74116	126800	18500 6·41
at 13½ Rs per annum	574839	287874	865375
at 9½ Rs per Diem	1190827	607962	1798789
at 8 annas per Mensem		358368	358368

Data upon which Calculations have been made.

1. The lengths of each line, its time of ascent, its cost exclusive of rolling stock, and the load drawn up by each engine is at the rate entered in the appendices of my Report dated 10th of the 9th January 1875.
2. The proportion borne by the paying load to the train weight (exclusive of locomotive) on the Fell and Rigi systems is as 70 to 100—as the lower velocity admits of lighter waggons. On the other systems it is as 60 to 100.
3. The cost of maintenance of permanent way, repairs to rolling stock, and engine expenses and management is each calculated per mile per day at double that of the Madras Railway.
4. The cost of all the rolling stock whose cost known is put down at Railway rates for narrow gauge which is 15 per cent less.
5. The consumption of fuel is at the rate of 5 lbs per Indicated Horse Power per hour, and its cost at 9 Rs per Ton.
6. Separate Trains are not supposed to leave Terminal Stations at less than 5 minutes intervals, there being one shunting station on the entire length of double line allowed in the centre of each Railway, and the traffic being limited to 12 hours out of every 24—subject to the above the lines are supposed to be worked to the greatest possible extent.
7. Resistance to Traction at Rails per Train is calculated from this formula $\frac{\text{sin. angle of gradient} \times \text{gross load (excluding engine) in lbs} + \text{gross load in tons} \times 20 \text{ lbs}}{33000}$ (for carriage) and Indicated Horse Power per Train is obtained from this formula $\frac{\text{Resistance to traction in lbs} \times \text{Speed in ft per Min.}}{33000}$
8. I have ascertained since I wrote my Report of the 10th of the 9th January 1875 that a single engine on the Rigi pushes up 9 waggons each holding 7½ Tons of goods.
9. Detailed calculations are appended.

District Engineer's office
Ootacamund
20th February 1875

Jos. Morant
Captain R.E.
District Engineer Nilgherries

Statement of Bazaar prices current for the principal articles of Consumption in the Coimbatore District.

2/53

No	Description of Articles.	Per	Rate per lb	Per	Coimbatore	Caroor	Dharapuram	Erroad
	Food grain							
1	Bread white	lb		"	2 "	Jon		
2	do brown	"		"	2 "			
3	Biscuit 1st Sort	"		"	6 "			
4	do 2nd do	"		"	4 "			
5	Rolong	"		"	28			
6	Flour	"		"	28			
7	Rice Table 1st Sort	"		"	13			
8	do 2d do	"		"	11			
9	do 3d do	"		"	1 "			
10	Cholum 1st do	"		"	4			
11	do 2d do	"		"	3			
12	Raggiee	"		"	3½			
13	Thenay	"		"	3½			
14	Cumbu	"		"	3½			
15	Arhoor	"		"	8			
16	Dholl	"		"	9			
17	Graw Bengal	"		"	8			
18	do Horse	"		"	4			
19	do grocw	"		"	7			
	Animal							
20	Mutton 1st Sort	lb		"	3 "			
21	do 2nd do	"		"	2 "			
22	Beef 1st do	"		"	4 "			
23	do 2nd do	"		"	2 "			
24	Pork 1st do	"		"	3 "			
25	do 2nd do	"		"	2 "			
26	Fowls 1st do	Each		"	6 "			
27	do 2nd do	"		"	4 "			
28	Chickens	"		"	2 "			
		lb		"	66			
29	Ghee	"		"	54			
30	Butter	Bottle		"	2 "			
31	Quilts							

32	Chillies		lb	"	1	3
33	Coriander		"	"	1	6
34	Tamarind		"	"	"	6
35	Garlic		"	"	2	"
36	Pepper		"	"	5	"
37	Mulstard		"	"	1	3
38	Cummin seed		"	"	5	"
39	Vendiam or Dill		"	"	1	"
40	Saffron		"	"	1	8
41	Onions		"	"	"	6
42	Potatoes	1st Sort	lb	"	1	4
43	do	2nd do	"	"	1	
44	Sugar	Astragram	lb	"	3	6
45	do	white	"	"	2	6
46	do	brown	"	"	1	4
47	Jaggery		"	"	1	3
48	Coffee	1st Sort	"	"	6	8
49	Tea		"	2	"	
50	Eggs		Dozen	"	2	6
51	Salt		lb	"	"	6¾
52	Lamp oil		Bottle	"	3	6
53	Gingely oil		"	"	3	"
54	Cocoanut oil		"	"	3	6
55	Honey		"	"	10	"
56	Nutmeg		lb	2	8	"
57	Cocoanut	1st Sort	Each	"	"	7
58	do	2nd do	"	"	"	6
59	Lime		100	"	6	4

Govt Litho Department
Fort St George
Madras 19th February 1878

1

564

From

Major A. de C. Scott R.E.
Under Secretary to Govt
P.W. Dept

To

Colonel G.T. Walker R.E.
Chief Engineer & Secy to Govt
PW Dept

Sir,

I have the honor with reference to the Order marginally noted to place at the disposal of Govt the information which I have been enabled to collect in regard to the existing traffic to and from the Neilgherry hills via the Coonoor Ghaut, the charges with which it is at present burdened, the prospective increase of such traffic from the extension of colonization and cultivation and under the influence of facilitated

G.O. No 2564 A 7/10 Sept/74.

facilitated communication by rail and generally the prospects of the success of a railway in a financial point of view.

2. Mr Cockrell, the Commissioner of the District, in his capacity as President of the Local Fund Board has compiled and forwarded to me for transmission to Govt a valuable paper on the subjects above noted, which will be found appended to this report; he has carefully weighed the evidence at his disposal from various sources regarding the goods and passengers traffic now in existence and from his local knowledge his forecast

of

165

of the prospects of the district and its probable increase in material wealth and prosperity is entitled to much consideration.

To the Consulting Engineer for Railways I am indebted for information regarding the existing traffic on the Neilgherry branch line between Pothanore and Mettapollium near the foot of the ghaut. Captain Morant R.E. the District Engineer has assisted me by obtaining information regarding the conditions under which the present arrangements for the transport of goods and Passengers are carried on and the probable profits

of

of the Carriers as will as the
rates current for labor
& materials. Messrs Staines
& Rouse the owners of
Coffee Works in Coimba-
tore and who I believe
carry nearly the whole
of the produce in Coir
and Coffee which find
its way to the Ghaut
have courteously given me
full details regard-
ing their own operations, & they have spared themselves no trouble in collecting information on various points referred to them.
The Collector of
Coimbatore has furnished
a report relative to
the trade between his
District and the
Neilgherries. Most of the
Communications received
are to be found appended
to this report.
3. The instructions given to me
do not appear to contemplate
that

266

that I should enter into
that part of the general
question now under con-
sideration, which relates
to the form of railway
best suited to the ground
to be traversed in sur-
mounting the Ghaut, and
to the nature and amount
of the traffic to be pro-
vided for, but having
received from Captain
Morant a very care-
fully written paper con-
taining much useful
information on the subject
which he wishes to be
laid before Govt - and
it being apparent that
the records of the actual
cost of the Coonoor Ghaut
Road and the Neilgherry
branch line already complete

as

as well as that of the narrow guage line under construction in this Presidency afforded valuable data for arriving at the probable cost of a Ghaut railway. I have entered so far into this branch of the inquiry as to enable me to furnish approximate estimates of such cost, confining them however to the line between Mettapollium and Coonoor which it is undoubtedly necessary to consider alone in the first instance.

4. The sources from whence information more or less reliable can be derived regarding the extent of the traffic to and from the hills are various. The returns of inwards and outwards traffic at Mettapollium, the terminal station of the Nilgherry

Sources of Information.

branch line, afford trustworthy data as respects first and 2d class passengers, certain classes of goods and also horses and Carriages; for it may be assumed that probably all such appearing in the returns were on their way to or from the hills. The traffic on the Coonoor Ghaut as well as that between Coonoor and Dolacamund was registered at two toll bars during 8 months of 1869 and although such returns are liable to falsification from the circumstances under which they are taken it may be assumed as tolerably certain that they

they err rather by
omission than by undue
entries -

The proceeds of the
toll contracts it might
be supposed would
enable a tolerably cor-
rect estimate to be made
of the number of loaded
carts and Pack bullocks
&c passing on the road
and no doubt this means
of information is the
most valuable of all
now available - The
element of uncertainty
in it is of course the
amount of profit of
the Contractor which
represents traffic in
excess of that calculated
from the selling price
of the toll farm -
All these and a variety of other
sources of information [illegible]

General description of the Neilgherry District -

6 - It will lead to a
clearer comprehension
of the questions to be here-
-after discussed by those
who are unacquainted with
the locality of, before
dealing with the informa
-tion which exists relative
to the existing traffic
on the Coimbatore Ghaut,
a short description is
given of the leading fea-
-tures of the District with
which railway communi-
-cation has been proposed -
The Neilgherry District in-
-cludes the elevated tract
of country which is bounded
by Mysore territory and the
Coimbatore District on the

north by the Coimbatore District and Malabar on the east and South and by the Malabar District and the Kondals Mountains. Its area is about 749 square miles and it is on all sides except towards the Kondals well defined by the hill slopes which fall more or less precipitously to the plains below. Although the general characteristic in reference to the surrounding country is that of an elevated plateau the surface is diversified by hills which assume in some parts the character of distinct ranges. The difference of level between the different parts of the country wherein are included within the District is considerable.

* The Kondals Mountains are an extension of the Nilgherry Ranges at generally a somewhat lower level but possessing similar features.

Coonoor, Kotagherry, Pykara, Kadamattam and Ootacamund Lake are approximately 6000 6571 6766 ~~6200 6766~~ and 7361 feet above the sea level while the higher Peaks which rise above the general level such as Dodabetta, vary in height from 7000 to 8640 above the sea. The surface is in fact composed of a succession of rounded hills valley and water courses. All the recesses and sheltered parts being generally wooded. The slopes towards the low country densely so. Water is abundant. The climate temperate, slight frost at night is not uncommon in the cold seasons. But the temperature

in the shade never risen above 79°. A considerable area of land has been taken up by European planters for the cultivation of Coffee and tea and Cinchona. Australian timber has also been planted with success. and the cultivation of cereals and vegetables as well as the raising of stock is carried on to a considerable extent by the indigeneous and imported population. There are said to be about 300,000 acres more or less fit for cultivation of which only 150,000 acres have been taken up. The population by the rates and returns amounted to [illegible] and consisted of

Europeans and Eurasians	2135
Military	500
Indegeneous and imported natives of India	46687
Aboriginal tribes	635
Total	49957

The export of Coffee in 1874 including the produce of the Dunkeldeny Valley on the North West slopes amounted to not less than 4000 tons, the value of which at the current prices was about £ 440,000 and the value of the exports and imports together did not probably fall short of 3/4 of a Million Sterling.

The plateau is pierced by several large streams and the valleys or reservoirs by

by which they reach the low country accommodate roads or pathways more or less easy of ascent. The principal lines of communication are, the through trunk road between Mettapollium and Coimbatoor passing through Kullar Coonoor, Wellington (the Military Cantonment) and Dotacamund, the road between Dotacamund and Sispoocadoo down the Ligoor Ghaut to the Mysore District. The new Koteyherry Ghaut between Koteyherry and Mettapollium, and lastly the Siruva ghaut leading to Shevaloi hills.

The first mentioned road is by far the most important. There are also a number of local roads giving access to different estates and intersecting the settlements at Coonoor and Dotacamund. A more detailed description of the various ghaut lines of communication will be found in the appendices. The District is much resorted to by Europeans from the

Letter D

the Madras Presidency during the last season i.e. from April till November and Visitors from more distant parts of the country. Bombay and even Calcutta are tolerably numerous. Cannor and Calicut are now of considerable importance and contain a number of permanent Europeans and the District is rapidly increasing in importance from the extension of colonization.

Para 6

~~All these and a variety of other sources of information have been recorded.~~

5 HEADS OF ENQUIRY. The subject to be discussed resolves itself into four heads of inquiry.

1st. The existing amount of traffic on the Grant Road and which would be immediately observed by a railway.

2nd. The prospective traffic which would be attracted by a railway from other lines of road or which would be created by increased facility of

Communication

and
communication by the
natural extension of
Colonization.

3d. The probable
cost of various systems
of Railway as applied
to the Coonoor Ghaut.

4th. The relative
economy of carriage
up the Ghaut by
Railway and by the
existing means of transit
as bearing on the pos-
sibility of continued
competition between the
two systems.

5. EXISTING TRAFFIC. The Railway Returns.
inwards and outwards
traffic returns for the
Metapolliem Station
of the Madras Railway
from August 1873 till
June

12 273

June 1874 lead to the
deduction shown in the
last column of the sub-
joined statement as the
yearly rate of
traffic.

	Inwards	Outwards	Total	Yearly rate.
Passengers				
1st Class No.	988	917	1905	2224
2nd Class No.	1240	1263	2503	2920
3rd Class No.	23728	26104	49832	58137
Carriages No.	85	53	138	161
Horses No.	445	295	740	863
Goods tons	4055	2629	6684	7798.

It has already been
remarked that all
1st and 2nd class
passengers as well
as Horses and Carriages
entered in the Metapol-
liem returns may be
considered

considered to be either
proceeding to or return-
ing from the Hills.
As regards 3rd Class
Passengers there is not
this certainly but if
the papenger returns
at Mettapollium
is compared in this
respect with that
at Karamody on this
line (a place next in
importance to Metta-
pollium on the line)
there is found a dif-
ference during the year
in favor of the latter

mentioned

mentioned town of 41,459
third Class passengers
3000 of whom may
fairly be accounted
for by the fact that
this number of natives
arrive at Mettapollium
with the view to travelling
up the Ghaut.

Again as regards
the goods traffic the
same method of
eliminating that which
is fairly local may be
adopted. At Karamody
during the year the deliver

and

and receipt of goods by the railway does not exceed eighty tons and if this quantity is deducted from the Mettapollium traffic it leaves a balance of say 7700 tons which may reasonably be credited to the Neilgherry district. The Madras railway returns afford evidence therefore of a annual traffic on the Coonoor Ghaut derived from or destined for the more distant localities of the following extent.

1st Class Passengers	—	2224
2nd — do	—	2920
3rd — do	—	30,000
Horses	—	863.
Carriages	—	161
Goods — Tons	—	7700

And this represents traffic which having already sought the rail may be considered Except perhaps as regards Horses and Carriages, entirely at the command of a Ghaut line when one be constructed. A classified list of the goods passing through the Mettapollium station will be found in Appendix — and it is evident that a large proportion will from their intrinsic value bear a high rate of charge.

87. Toll Bar Traffic Registers.— The Registers of Traffic on the Ghaut Road between Kullar and Coonoor and Kotacamund and Coonoor which were kept from Janry. to August 1869 both months inclusive

inclusive are abstracted in the Appendix to the report of the President of the Kilbegherry Local Fund Board. The results are shown in a Condensed form below. They have been recalculated on the basis of the loads per Cart, pack animal and Coolie shown in the Statement C of the general Appendix. And they practically accord with the sum total as mentioned in para 3 of Mr Cochrell's report. They indicate that there was at that time a traffic up or down the Coonoor Ghaut of 12,020 or 13524 tons, and between Coonoor and Aotacamund of 7,118 or 8178 tons per Annum according to the loads assigned to carts which are shown to vary from one third to one half a ton.

~~Abstract Statement showing traffic on the Coonoor Ghaut and between Coonoor and Aotacamund during 8 months (January to August) of 1869.~~ 8/9

Between Kullar and Coonoor

	Carts No	Loaded Bullocks Cows and Buffaloes No	Loaded Asses No	Loaded Coolies No	Total Tons
Downwards	2475	7857	1487	28961	1965
Upwards	4293	57956	18053	56870	7058
Total	6768	65813	19534	85831	
At 1 Ton	2256	4407	436	1916	9015
At ½ Ton or 12 months traffic	3008 / 4512	6876	587	2555	12020 / 13524

Between Aotacamund and Coonoor

Downwards	909	9106	79	5655	
Upwards	3881	38396	4000	15325	
Total	4790	47502	4079	20980	
At 1 Ton	1596	3181	91	467	5355
At ½ Ton or 12 months traffic	2128 / 3193	4241	121	623	7113 / 8178

Note. ~~The following weights are carried by each Head of Cattle and Coolies~~

~~Bullock Cart with pair of bullocks~~ lbs 1000

~~Do 1 Do~~ lbs 750

~~Pack Bullocks~~ 150

~~Asses~~ 60

~~Coolies~~ 50

8.

8. But these returns Cannot be relied on as recording the movement of goods at the present day and although they are useful in checking information from other sources it is on the result of the Auction Sales of the Toll Contracts of the latest dates that we must mainly rely. This subject is carefully gone into in Mr. Cockerell's report and his calculations have been verified. The Contract prices paid for the whole of the Tolls in the District four in number for the year 1874-75 was Rs 1420 per mensem-how on the occasion of a previous sale of the toll bar contracts separately the prices realized were for the

	Rs
Nuthetty Tolls per mensem	185
Pykara	63
Kraigmore	269
Coonoor	600
Total	1037

and the toll receipts at Coonoor with which this inquiry is concerned were therefore estimated as being about seven twelfths of the whole receipts collectively. It is probable that the general increased of tolls which the sale for 1874-75 indicates has been much greater on the Coonoor Ghaut than on the other roads and at any rate it will be safe to assume that 7/12 of the receipts for 1874-75 will be collected at the Coonoor bar. Mr Cockerell accordingly takes this as the proportion and it amounts to Rs 8283. It is stated that an offer of Rs 2000 over and above the auction sale price was made for the tolls, and a calculation is made of

2400

2400 tons additional traffic on the plant in this account. I think it is better to reject such data and to calculate from the basis of Rs 8283 the assumed price paid.

Calculation of Traffic.

9. On the supposition that each cart carries one third of a ton and that therefore the toll on a lin amount to 12 Annas it is stated that the total proceeds of the toll represent a traffic of between 12000 and 13000 tons. In Checking this result a closer investigation has been made. The toll receipts are derived not only from loaded carts but from Hirees, Carriages and Pack loaded animals, as well as unloaded carts. A proportion of the returns

... dais

does not therefore represent good traffic and a deduction must be made accordingly, further the tonnage carried by Pack animals must be calculated from the proportion of these to carts as shown in the registers of 1869 & from the rate levied on pack loads - Again the margin calculated on by the contractor to cover the cost of collection, risk & profit represents traffic, at least 2 per cent must be added for this reason - Headloads not paying toll are an addition in the proportion borne out by the registers of traffic. The result of this calculation the details of which may be seen in the Appendix D shows a traffic on the Coonoor Chaut in 1874/75 of tons 16928. as against tons 15866 in Mr Cockerell's report. The estimate then given of 21826 tons is based on the supposition that each cart carries 1/2 a ton instead of 1/3 of a ton. And that the whole of the toll paying goods is carried on Carts - This assumption is not altogether correct for as may be

herewith in reference to the traffic registers of 1869, abstracted in para 7 a considerable proportion of the goods were carried on pack animals and as a toll of 4 annas is levied represents pack loads of only 600 lbs while if paid on carts it indicates the tonnage of from 800 to 1200 lbs of goods, the introduction into the calculation of a due proportion of Pack animal traffic reduces the total resulting weight, nevertheless it is indisputable that a certain number of carts with two pairs of bullocks do drag as much as half a tow up the ghaut and that such a load is usual going down, & as moreover the tendency since the opening of the new ghaut road has been for cart traffic to supersede that of pack animals. 2000 tons additional weight may fairly be added to the estimate of the goods traffic of 1874-75 taken at in round numbers 17,000 tons.

Coonoor - Dotacamund Traffic -

12. As regards the traffic between Coonoor & Dotacamund which forms part of the inquiry on the assumption that a railway may be continued to that settlement. It may be assumed that

that it bears at this day the same proportion to the Coonoor ghaut traffic which it exhibited in the 1869 registers already noticed, and in this proportion it is represented by $\frac{5}{8}$ of 17000 tons or 10625 tons.

PASSENGER TRAFIC

12 bis. I have unfortunately not been able to obtain the passenger traffic returns for the following for the half year ending 31st December 1874. It is probable that these would show an increase in the number of passengers as compared with previous returns. It will however suffice to assume that the number of 1st and 2nd class passengers proceeding annually up the ghaut are correctly derived in para 6 from the Railway returns available, and I prefer to accept the Calculation

Calculation in lieu of that
made by Mr Cocherell from
Hotel Registers. It is not
easy to distinguish Passenger
traffic properly so called of
the Coolie and native class
generally from that which
represents load carriers and
which would be extinguished
by a railway to a great ex-
tent. Mr Cocherell includes
loaded Coolies in his estimate
of 3rd Class passengers; but
whatever may be the view
taken of the propriety of so
doing it seems both and Re-
latched fact that from
80 to 90 thousand loaded or
unloaded natives traversed the
ghaut during the year.

Live Stock Traffic

12. The amount of live
stock of various kinds drawn
up the ghaut yearly is very
Considerable

Considerable. The number
slaughtered in Coimbatore
alone is stated to be 20,000
sheep and goats and 1500
beasts besides pigs. One
third of the above would
probably represent the con-
sumption at Coonoor. His
questionable however whether
much of this would seek the
railway.

Summary of existing Traffic.

13 The following is a summary
of the actual traffic on the
Coonoor ghaut derived from the
considerations noted above.

Goods	tons	17000
1st Class passengers	Nos	2,220
2d " "	"	2920
Loaded and unloaded Coolies & native passengers	}	80000
Carriages		161
Horses		863
Bullocks &c for slaughter		2000
Sheep, Goats & Pigs per day		30000

34

PROSPECTIVE TRAFFIC

traffic

The inquiry into the prospects of a railway up the Canon Pelant as regards the future development of traffic must be based mainly on a comparison of the past with the present state of things and within the limit of the twelve years last past. Daily Registers of traffic were kept on the Canon Pelant in 1862 for two months and a comparison of the results with the Register of 1869 already quoted for two similar results is made below.

Direction	Average monthly Traffic of 1862				Average monthly Traffic of 1869				
	Cattle &c	Bullocks Cows &c	Sheep	Loads Cattle	Total Tons	Cattle &c	Bullocks Cows &c	Sheep &c	Loads Cattle &c	Total Tons
Downwards	78	1824	791	2,194	118	384	836	107	3,478	260
Upwards	334	2292	4,365	4,546	488	515	2,273	2,284	4,341	984
Total	407	4119	5,146	6,730	606	902	3,098	2,395	1,811	1154

It will be observed that the monthly average during the first period is 606 tons in the second 1154 tons an increase in twelve years of about 90 per cent. And if the toll contracts for the year 1874-75 which represent a traffic of 15000 tons per annum are taken for the purpose of comparison the percentage nearly shown is 100 per cent in

in twelve years or at the rate of between Eight and Nine per cent per annum. At the rate the traffic would doubled itself in about twelve years.

Traffic of 1865

15- The estimate of traffic for the Veilgherry branch Railway was derived from the average shewn by returns for the three years 1865-66-67- but from the returns of 1865- only as supposed by Mr. Cockerill but as the registers included the traffic between Pattanoor and Kullar it is possible that some small portion stopped short of the ghaut. The Consulting Engineer in his report on the prospects of the Railway Shewed a million

mentions that there was from the average results evidence of an annual traffic of 11634 tons between Pattanoor and Kullar at the foot of the ghaut a distance of 30 miles. It is improbable therefore that the ghaut traffic itself could have been so low in 1865 as is stated by Mr. Cockerill viz 4,4 15 tons. Taking the amount adopted by the Govt Engineer and allowing for a rate of increase of 12 per cent per annum as indicated by the comparison made in para 14, the traffic in 1862 reduced

from that of 1865 would
tier about 83/10 tons and
thus calculation accords
fairly with the actual
registration of 1862
which was at the rate
of 7968 tons per annum.

Increase of Passenger Traffic

16. It is not easy to
institute a useful com-
parison between past
and present passenger
traffic. The registers of
1862 do not in this res-
pect give trustworthy
information. The opening
up of the new Grand
road with its comparatively
easy gradient diminished
the carriage by packs
animals and Coolies and
increased that by Carts
and the number of passengers

on

22

Conjoint would naturally di-
minish as respects untraded
ones pertaining to the plains.
With reference to 1st and 2nd
Class Passengers the esti-
mate of carriage traffic to-
wards the Neilgherries from
Pollachie which is made
in the Consulting Engineers
report before quoted may
however be reasonably taken.
It would indicate that
on the average 3000 persons
of these two classes made
the transit to and from
the hills during the years
1865-66 and 67. The traffic
returns of the Madras Rail-
way from the 31st August
1873 to the 30th June 1874
show a traffic in 1st and
2nd Class Passengers at the
rate of 5196 annually and

the

the increase has probably averaged eleven per cent per annum. The traffic would therefore double itself in nine years.

In calculating above the annual rate of increase of the Ghaut traffic owing to the development of the resources of the Country no account has been taken of the impetus to that development which the existence of a railway up the Ghaut would give. No doubt the effect would be considerable.

The rate of increase assumed by the President of the Local Land Board since 1865 is in goods from 4415 tons to 18960 tons and in 1st and 2nd Class Passengers from one thousand to 5400 but the 1865 traffic appears to have been taken at far too low a figure.

Sources of increasing traffic

The particulars comes from which

which the increased traffic would be derived are referred to by Mr Cockerell in some detail.

It has not long been established that tea can be successfully and profitably grown on the plateau. Its cultivation is rapidly extending. The success of Chinchona plantations as a speculation seems now to be assured and the suitability of the soil and climate for the growth of several varieties of valuable Australian timbers is fully ascertained by the practical results of planting on an extensive scale. Domestic the exclusion of the cultivation of Coffee, tea, Chinchona and Australian timber which is certain to take place

his

is the most important source of prospective traffic creating as it will both products for exportation and an increase of the labouring population, already the chief consumers of the imports into the district. It is stated by the Neilgherry Commissioner that in 1850 - 24 years ago the area under cultivation of tea and coffee in the Ouchterlony Valley, the Central Wynaad and the Hill plateau together hardly amounted to 1000 acres. That these districts have now 20,000 acres under these products and that while in the Neilgherry district there are 300,000 acres

acres more are less cultivable only 60,000 acres have been taken up including the area cultivated with food grains by the indigenous population.

The extension of cultivation will create an increased demand for lime as manure for hardware and a variety of other articles.

Diversion of other existing traffic

18. It can hardly however be assumed that the construction of the railway to Coonoor or even to Ootacamund would ensure the diversion to that route of traffic now carried on between the Ouchterlony Valley, South East Wynaad and the low country.

Taking the average of three estimates given in Appendices F, G and H it would appear that the charges for the carriage of a ton of parchment and clean coffee from the

the Coimbatore Valley & the two ports of shipment would compare as follows.

To Coonoor by cart and thence by rail via Mettapolliem to Beypore and Carriage to Calicut (if cleaned at Mettapolliem)	54-6 per ton
As above If cleaned at Beypore	62-6
by the same route to Mettapolliem cleaned at Mettapolliem and thence by rail to Madras	53-14
If cleaned at Madras	64-2
From the valley via the Carcur Ghauts & by road to Calicut	41-6
By road to Pricacole and by water to Calicut	33-8

The advantage of carriage from the valley to Beypore by road or canal over that by rail is represented by a sum varying from Rs 13 to

Rs 33-14 per ton according to whether the road and canal or the road only is used in the former case and to whether the coffee is sent at Coimbatore or Beypore in the second. Again if coffee were sent from the valley to Madras for shipment the extra cost of carriage incurred over that sent to Beypore direct would vary from Rs 11-8 per ton to Rupees 22-8 a saving being made in the first case by having the coffee at Coimbatore first in the other hand the inconvenience and expense of breaking bulk at Coimbatore when packed for Madras would have to be taken into consideration and while it seems doubtful that the value of

of Coffee cured at the former
place is nominally greater
than that cured at Beypore
as asserted by Mr. Cockerell.
I have been informed by
I heard Mr. Arbuthnot that at
present the charge for freight
is not practically less at
Madras than it is at Calicut
& the effect of the pro-
jected harbour at Madras
in lowering freight and at-
tracting traffic must not
be forgotten and if the
Cochetchony Valley and the South
East Wynaad are without
the sphere of present or
future attraction the
same cannot be said of
produce grown now or in
the future on the Nilgherry
plateau likely.
It does not seem likely however
that coffee and tea from
Kotergherry

Kotergherry and the Eastern
or South Eastern range of hills
could go round to Coonoor
for the purpose of rail carri-
age down the Ghaut. Seeing
that there are shorter paths to the
Bhowany valley. Grain
and produce from
the Sispara country via the
Segur & Guzzelhitty Ghauts would
probably still continue to come
up for the estates in that
direction but a very much
larger extent of country
along the line of the Madras
Railway including such
places and Vellore, Erode
and Bangalore would prob-
ably throw produce into
the hill markets via
Coonoor and the traffic
along other routes would
decrease. These are the
views taken by the Collectors
of

× and a road for wheeled traffic
from Kotergherry to Mettu-
pollium

of Coimbatore and Dharapuram Mines and Ranges will be fully detailed in their letters and enclosures vide Appendices E and J.

19. General Considerations pointing to increased Traffic

Increased facilities for reaching the hills combined with a reduction in the cost of provision and build[illegible] materials owing to facility of transport and fuel in the cost of living would undoubtedly increase the number of residents and visitors as well as labourers. It is certain that the opening of a railway would be to diminish enormously the charges for carriage both of goods and passengers. This is demonstrated in the last portion of this report which relates to the relative cost of carriage by

Road and by cart.

The advantage of easy communication with the Sanitary Cantonment at Wellington which is in process of reduction is a point to be considered and also the increased consumption of imports which that increase will give rise to.

The climate of the hills affords facilities for the establishment of breweries which circumstance has already in one case been taken advantage of and an increase in the export of beer and the creation of a trade in fruit are looked for by the Madras Railway Company.

All these considerations are worthy of note and point to a prospective large increase in population and in exports and imports to and from the Neilgherry hills which would

18
50
would be doubtless much reduced.
by the construction
of a line of railway to the
plateau. The broad fact and
rules of the whole subject that
in spite of the first and
existing difficulties of trans-
port by animal power to
the elevation of from 5000
to 7000 feet, after a mount-
ain slope the District
has grown during the last
10 or 12 years in wealth
and population at a rate
which with comparatively
little expenditure
in temperate latitudes
among the most favourable
which are unique in this
part of the world, and
that from the first it
does not seem extravagant
to assume that with the
aid

51
aid of a railway the traffic
to and from the plateau would
in ten or twelve years be
double its present amount.

PROBABLE COST OF A CHAUT RAILWAY.

Captain Arnaud the District
Engineer of the Neilgherries
has compiled a useful ab-
stract of the information
which exists regarding the
cost and working of railways
on steep gradients and he
has carefully and clearly
summed up the arguments
in favour of the adoption
of the system he advocates
now worked on the Rigi mountain
in in Switzerland and
which consists in a central
rack rail acting as a
pulley for the motive
power to work on either two
outer pairs as guides to the
wheels

52

Rails of the locomotive and
vehicles.

The four classes into which
Short railways have been
divided are the first referred
to possess in certain respects
so to those classes
distinctive features and distinc-
tive advantages or disad-
vantages. The systems
treated of are

1st Railways of ordinary
Gauge working on inclines
seldom exceeding 1 in 25 and
generally limited to 1 in 40
or 1 in 45.

2nd Narrow gauge lines on
gradients seldom exceeding
1 in 50.

3. Rope inclines worked by
stationary Engines.

4. Central rail railways
with locomotives

It

21. It has been established by
experience that the first-
class are very expensive
to construct and to main-
tain. They must be worked
by heavy engines in order
to secure the necessary ad-
hesion which with a
sufficient power to be utilized to overcome the resist-
ance of gravity with a fair
load. The roadway and rails
must be proportionately
strong and at the same time
the length of line is consider-
able compared with the gain
in altitude and the aver-
age gradient sufficiently
flat to be suited to vari-
ance with the ordinary
natural slopes of a mound-
ain chain and therefore
difficult to trace and
expensive to work cost-

Narrow

Narrow gauge lines are re-
ported to have been con-
structed in Norway at a
very low cost and to have
taken considerable loads
up inclines of 1-50, but
the data available in
this country which is
derived from current ex-
perience in the construction
of the Carnatic Railways
and which therefore can-
not be impugned does not
support these statements
of low cost and the amount of
adhesion which must
have been required to haul
the loads asserted to have
been moved is so great that
it could not be calculated
on in the case of the
Coimbatore ghaut, where
for many months it rains
daily

Gradients

In as much as the worthy
the roadway the permanent-
way, the bridges embank-
ments and cuttings are functions
of the cost of the line the re-
duction of these and the by the
adoption of a narrow gauge
and light rolling stock necess-
arily leads to a saving in
cost of construction, but
that this saving is not so
great as has been imagined
is evidently a comparison
of the village in the Pulghery
Branch line with the es-
timate for the Carnatic
Railway which is now
in progress

The cost of break of gauge
which such a railway con-
nected with the Madras
Railway would entail
amended by the District
Engineer

Engineer and they seem to be conclusive as an argument against this adoption.

The two advantages or inducements urged by Stationary Engineers and ropes may be summed up in few words. It is a system of long sweeps to short and straight lines not so long and various ones of diversified ground. Some part of the rope or machinery stops the whole traffic. The wear of the rope is immense and the friction great. It has been generally abandoned.

22. Central Rail Systems.

The central rail system seems on practical as well as theoretical grounds to be best adapted to the circumstances

of Mauritius and the balance of advantages is certainly in favour of the adoption of the Indian standard gauge of 5, 6" Both the Fell and the Riga systems are fully described in Captain Minett's report and it is unnecessary here to enter into the details of the construction of the locomotive engines. It will be necessary before coming to a final decision on the question which of the two should be adopted to obtain thoroughly trustworthy information of the results of the working of the most special states of the Riga system as applied to Mountains in Europe and of the Fell system

railway at Cantagallo on the Brazilian Mountains in Brazil & think that Captain Stewart has taken a somewhat extended view of the cost of the Fell Railway. Assuming that the gradient of 1 in 7½ the latter of 1 in 12, would be reduced to sum up the advantages of the Fell system as follows.

The locomotive is capable of carrying up nearly twice the load per train which is drawn by the Rigi locomotive, consequently it can accommodate more trains. It is

adapted

adapted both by gradient and by the mechanical principle of its construction for working a higher speed than the Rigi locomotive. The driving gear is not dependent on friction, the brake power can be more easily applied and more speedily. There is more driving gear in use on the ordinary line with two pairs and the central rail, and the locomotive is independent of adventitious aid. Including rolling stock the line is made for much cheaper than the Rigi Railway.

Comparative advantages of the Fell & Rigi Systems

1873. In the trial of the locomotive for the Brazil railways on the Fell principle 7 tons of passing load were taken up an incline of 1 in 12. The Rigi locomotive cannot take more than 5 tons.

&c

on the Fell railway is
speed of 10 miles per hour
has been worked up to and
by limiting the load
there is no reason why a
greater speed should not
be attained. The working
and gear of the machinery would
would be reduced by work-
ing the Rigi arrangement
at speed would be very
great as well as the danger
of breaking of the teeth of
the spur wheel engaged in
the rack.
The tendency to derailment
on curves &c is instan-
taneously checked by the cen-
tral wheels of the Fell lo-
comotive. The clutches
in the Rigi engine would
have play and only come

into action in time to prevent
a dynamical shock. The
atmospheric break can be
as easily introduced into
the Fell as into the Rigi
locomotive and as regards
the axles breaks of the Rigi
engine, these tend to skid
the spur wheel the result
of which would be great-
er friction between the rack
and spur wheel teeth
& wheel. The whole success
of the Rigi depends on very
low speed. The data ob-
tainable in Ohio country
favor the supposition
that as before stated
the cost of a mile of the
Fell line will be less
than that of the Rigi
railway.
It may be used for the
Rigi

60
62

Rigi system that the line is shorter than the Fell line when applied to our mountain the same incline and that consequently the effect of low speed and small loads is mentioned. That the cost of the whole line is much less than that on the Fell plan and that the amount of steam power which can be utilized for propulsion is restricted by the variable adhesion of the wheels to the rails.

Comparative Cost of several Railways.

24 In the subjoined statement the estimated cost of the several systems of rail way worked by locomotive engines as applied to the

Statement of the actual Cost of Railways of the Coonoor ghaut road and the probable cost of various the broad and narrow gauge on the Madras Presidency systems of Railway line as applied to the Coonoor Ghaut.

I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII
	Average Ruling Gradient and Inclination	Radius of Curvature (Sharpest Curve of Railway)	Ballasting and Permanent Way	Masonry Work and Girders	Station Buildings Gate and Gearings	Rolling Stock	Electric Telegraph and Fencing	Cost of Land	Contingencies	Total per mile for Ghaut line	Total Bridges on the Ghaut	Total for Crushers & Cairn of Ghaut line	Extension Land & Installations to Station	Total cost of line from Installations to Coonoor	Interest of Outlay during Construction	Grand Total	Capital Charges
	Ft	Ft	Ft	Ft	Ft	Ft	Ft	Ft		Ft	Miles	£	£	£	£	£	£
Nilgherry Branch Madras Railway 5'-6" gauge	5760	8268	45891	16271	12936	11660	1616	Data	Included in former head	101547	25			10223			
Trichinopoly to Tuticorin Metre Gauge	5622	4468	19393	5934	3951	4981			463								
Ghaut Road from Kulsur to Coonoor. Gradient 1-18 6 yards wide																	
Australian System of Mount Railway - by Heavy Engines - Rails Gradient 1-29 on Indian Gauge	15,000	20,000	5000	18,000	9,000	12,000	1,500	Estimates 500	12850	138050	25	345125	50,000	395725	39500	434625	
Norwegian narrow gauge light Rails and Rolling Stock - Gradients maximum 1-54 gauge 3'-6"	14,000	13,000	20,000	9,000	4,000	5,000	1,500	500	6700	73700	48	353760	50,000	403760	40,000	443760	
Fell central rail system - average gradient 1-12																	
On Indian Gauge		20,000	70,000	20,000	10,000	15,000	1,500	500	2214	169708	12	130640	50,000	243650	15000	258650	
Riggi Central rack rail system																	
Average gradient 1-7 Indian gauge		20,000	70,000	20,000	17,140	30,000	1,500	500	5217	196834	7	150331	50,000	170337	11462	181799	

Coonoor ghaut is given under
several heads of expenditure
and the outlay on the Madras
Railway, Nilgherry Branch
-line constructed in 1869-
73 as well as that current
is estimated for the entire
guage Carnatic Extension
is progress is added. It
is considered that a couple
allowance has been made
in the estimate for the
greater difficulties of
Construction on the Ghaut
and that it may be safely
considered that these estimates would
not be exceeded.
(Enter Statement)
It is to be observed that the
Calculations of Cost are based on data of
an unmistakably unexcep-
tionable character that is to say
on the actual cost of work
of a similar kind recently
executed in the country and
chiefly

chiefly in the same locality
in prisoner while the gradients
of main used on the Madras
Railways branch lines have
been taken into account
the cost has been estimated
at the exceptionally high market-
rates of 1873. At the rates
current when the lines was
constructed the cost per mile
was actually £1000 per mile
less than that entered in
the statement.
The cost of the earth work,
and rock excavation for the
present Chaul road to Cooncor has
been recorded * and there can
be no reasonable doubt of the
fact that the similar
work of benching on the in-
cline for the railroad
can be executed for the
sum set down. As regard
the other items it will be

* Appendix H²

observed that a generally large
allowance has been made
for the difficulties of con-
struction on a steep gradient
and for unforeseen contin-
gencies. It is to be remarked
and it is important to bear
the fact in mind, that
railways in this country
can now be constructed at
rates far below those ori-
ginally current when
the plans and contracts
were all more or less ten-
tative.

RELATIVE ECONOMY OF RAILWAY & OTHER CARRIAGE

35- Comparatively few years ex-
-perience in working the Rail-
-ways in the Plains has shown
that the amount modes of car-
-riage & communication com-
-pete with them in their
country under circumstances
& to an extent which had
certainly not been anticipa
-ted when estimating the
probable returns on the
Capital invested. The lesson
has been taught that it is
necessary when attempting to
make such forecasts to ascer-
-tain & take into consideration
the circumstances of the carriers
which may favor them in their
competition with the Railway
& make allowance for the
prejudices of the people & their
distrust of new modes and
methods which are attempted
to be introduced - the periodicity
of the rainy and dry seasons

creates

creates an interval com-
-prising several months
during which agricultural
operations practically are
suspended. The farmer
has to main-
-tain his live stock and
in reality also his la-
-bourers who under the
Patriarchal system pre-
-vailing in the village
communities are attached
to and dependant on the
rich throughout the year.
To yoke his bullocks to a
cart and to employ them
in the carriage of his own
produce or that of others,
to a market is the natural
resource of the cultivator &
during the dry season it
is obvious that it would
pay him so to employ
them with or without merely

equivalent to their bare
subsistence. Whereas in
these cases time is of little
value, and for moderate
distances the railway in
the plains can offer to the
native few advantages
over the primitive mode
of carriage and moreover
the customs and feelings
of the people are in favor
of the latter where they
retain throughout the
custody of their own goods,
and it is only thrown
aside when the gain of
transit by railway is
palpable and substantial.

Nature of inquiry necessary

26- It is now proposed
therefore an inquiry into
the prospects of a giant
railway as a remunerative
enterprise it is necessary

to ascertain as far as possible the actual cost to the carriers of the present modes of transport and the conditions under which they work, and moreover to institute a comparison with these methods and transit by railway as respects necessary or minimum charges which in both cases would yield a fair profit. Such an enquiry is attended with considerable difficulties. Accounts respecting the circumstances of the carriers differ and it is not easy to obtain thoroughly reliable information respecting their average outgoings and returns.

As respects the railways

The

4.

3]

The estimate of the cost of construction and to a considerable extent of maintenance also must rest on hypothesis. Enough information has however been obtained to establish the fact that the profits on the carriage of goods at present rates though considerable when considered in relation to the capital outlay represented by the cost of the carts and live stock needed form but a comparatively small portion of the charges which are largely made up of outgoings not susceptible of reduction.

Detailed statements showing the outgoings and returns of present carriers will be found in Appendices K and L. The hard-ships entailed by exposure and the wear and tear of cattle and the unequal division of traffic of which three fourths is in an upward direction, thus preventing return loads from being obtained in the majority of cases are all circumstances rendering a reduction of charges to any material extent impracticable.

Cost of Maintenance & Working of a Chaunt Railway.—

27. The cost of several systems of railway as

applied to the Jammu Chaunt together with that of an extension of the present line to Kullar has been estimated in part III of this report and it is now proposed to show what the cost of maintenance and working would probably be in each case, to derive therefrom and from the Capital outlay given in para 24 the annual charges which will be considered the 5 per cent on that outlay in addition to the cost of working & to deduce from the data thus attained and

the annual existing traffic the charges on that traffic which must be made to meet the annual Railway charges. A comparison of these with the existing rates for carriage up the ghaut ~~heavily interested~~ will indicate pretty clearly what are the prospects of the success of a railway in a financial point of view.

The cost of working and maintaining the existing Madras Railways is shown in the most complete detail in the half yearly accounts and it is only necessary to apply the charges under the several heads to the case of the ghaut railway

railway with due allowance for the circumstances in order to arrive at what would in all probability be the annual expenditure. The difficulty lies in estimating the allowances required - The annexed statement shows the expenses incurred annually on the North West and South East branches of the Madras Railway derived from current returns and under the several heads those which it is estimated would attend the working and maintenance of the ~~several~~ systems described in the first column. In consideration has been

Comparative statement showing the actual cost of maintenance and working expenses of the Madras Railway and the estimated cost under the same heads of various systems of Railway applied to the Conoor Ghaut.

1. Name of Railway	2 Maintenance of way, works and stations Per mile per annum Rs	2 Maintenance of way, works and stations Per annum Rs	3 Locomotive & carriage expenses exclt fuel. Per loco-motive mile	3 Locomotive & carriage expenses exclt fuel. Per annum	4 Fuel Per loco-motive mile	4 Fuel Per annum	5 Traffic expenses Per mile per annum	6 General charges special & Dis: Telegraphs Per mile per annum	6 General charges special & Dis: Telegraphs Per annum	7 Total for Ghaut line Rs	8 Miles of Way	9 Locomo-tive miles	10 Low Mile-age	11 Total for line from Mettapolliam to Coonoor	12 Remarks
Madras Railway.	12,701	0,96,736	as P 5-6,9	10,80,910	Rs as P 3-2,4	5,34,644	674	57,964	532	22,617	36,66,961	858	12,64,034		The cost of the branch from Mettapolliam to the foot of the Ghaut for maintenance and working expenses will be Rs 21,900 per annum at the Madras Railway rate and this Sum is added in each case to give the total in Column 11.
Ingineer class Railway Fairlie's 1.29 gradient Indian gauge	1905	4,7,625	as P 5-6,9	9,000	Rs as P 1-1,8,8	27,000	674	16,860	532	13,300	1,13,775	25	25,000	4,50,000	1,35,675
Narrow gauge Norwegian type.	1,270	60,960	80	7,850	Rs as P 0-13-8	24,000	674	32,352	532	25,536	1,52,678	48	27,872	13,37,856	174,578
Fell system Indian gauge	2,340	29,480	as P 7.10	7,000	Rs as P 0-11-68	10,600	674	8088	700	9,400	64,468	12	14,400	196,000	86,368
Riggenbach Rail System Indian gauge	2,340	17,780	as P 10-7	9,500	Rs as P 0-14-9	13,500	800	6,600	700	4,900	51,280	7	14,462	51,280	83,180

Same Contents in other Parts of Ghaut.

16 63

Juries & the effect of heavy Gradients and Special Con-struction in increasing the cost of Maintenance and Tear of Per-manent Way and the expenditure of Fuel, while the necessity of working on compound with the Madras Railway con-sequent on Sharp Curves, absence of all straight traffic, smaller Train and Train Mileage &c &c has also much effect on the total cost.

Comparative

Solabannual Charges & Rentting Rates.—

D8 - In the succeeding statement the capital outlay for each of the several species of Railway lines from Mettapollium to Coonoor and the annual charges for interest thereon at 5 per cent per annum are entered, as also the maintenance and working expenses from the previous statement. The total annual charge is thence derived as well as the tariff of rates per ton and per passenger necessary to meet that charge. The present charges are by Carl also inserted.

45 Analysis of traffic and proposed rates

No 38 - The amount of traffic on the various lines will be the tariffs on which calculations are based

1st Class passengers - 2,500
2nd " 80 - 3,000
3rd " 80 - 10,000
Goods classed above - 1,500
(Luggage - furniture &c &c)
&c &c &c - 18500

Nothing with the exception that the traffic will goods and private and general classes passengers at the present is as stated in para 44, that the railway will be some years to come that the conveyance traffic will fall off

Next - more over the opening

	Capital Outlay	Interest on Capital at 5 per cent	Maintenance and working expenses	Total annual Charges	Tariff of rates to cover total annual charge for journeying from Mettapollium to Coonoor or reverse: Passengers 1st Class	2nd class	3rd class	Goods Special rate	Goods Ordinary rate
	£	£	£	£	3500	3000	10,000	Rs 20	Rs 12·5
Quadrilateral system of Bleaut-R railway Indian gauge - Ready Engines	636,635	31731	13567·5	35298	Rs 20	Rs 10·1		Rs 20	Rs 12·5
Harnegain Harrow gauge light rails and Rolling Stock - gradient one in - - - - 54 gauge 3'-6"	443760	22,188	17,598	39,664	- 20	- 10	- 1	- 25	- 14·5
Fell system Central rail 1-12 Indian gauge -	25655	12933	8157	21,090	10	- 5	- 1	- 15	- 7·5
Rizi Central rack rail Indian gauge gradient 1-9	186437	9322	80380	17360	10	5	1	15	6·1
Bullock Cart or Carriages on Ordinary Grant road					20	12	2	1 3000 Lms Rs 34	15

of a railway will at once attract some traffic now leaving the hills by other routes and carry some supplies there from districts which do not now feed the hill markets. It is considered that the above estimate based on sound foundation.

The maximum rates which would ensure the use of the railway by all persons who might be supposed to confine themselves to the 1st and 2nd class carriages and by a fair proportion of the Native travellers of the better sort are it is thought Rs 10 for the 1st class Rs 5 for the 2nd and Re 1 for the third. It is considered

46

useless to attempt to bid for the ordinary Coolly class as no rate which would admit of profit to the railway would tempt them to Engagement.

The rates for goods are so arranged for each railway that the returns added to those for Passengers shall make up a total sufficient to pay for the working of the railway and 5 per cent on the Capital outlay.

Analysis of Percent Charges and Carriers per Mile.

3/- From the District Engineer of the Neilgherries I have received an estimate of the outgoings and returns of a carrier employing bullock Road Carts and another has

been kindly supplied to me by Messrs Staines and Ronse who own a carrying agency which actually works on the ghaut - These two statements already referred to, differ considerably, but Messrs Staines ~~have~~ x ~~had reasonably good opportunity of mastering the subject and~~. Admitting that the outlay of the ordinary native would be considerably less than that of a European yet the result shown in the foregoing statement is probably very near the truth - The considerations which enter into the question of completion are doubtless

x have very good opportunities of knowing what the outlay of a Carrier really is & as this head their account is more likely to be correct - The amount carried by each cart as entered by them on the receipt Sicca is however larger than is warranted by the opinion of others and it is not in accordance with the results derived from the analysis of their own operations given further on, where the average charge per ton for general traffic in both directions is shown to be equivalent to Rs 21 per ton -

many and intricate and to give each & all of them due weight is a matter of very great difficulty - ~~&~~ The Collector of Coimbatore in his letter which has been attached to this report has entered at some length into the reasons which in his opinion would induce traffic in goods and passengers to seek the railway the ghaut - no doubt the difficulties of the present arrangement are great and the hard - ships and exposure involved by a journey often very considerable -

* Appendices J and M

the change to, what is to natives of the plains and to cattle, a trying and ungenial climate is often injurious when added to the fatigue and exhaustion of the ascent and the cost of carriage is much influenced by such circumstances - It is ~~—~~ at present proportionately high and if the concurrent opinion of the Railway Commissioner, the Collector of Coimbatore, the District Engineer of the Railways and before the Standing and Select Committee of the Carrying Agency, that these rates cannot be materially reduced by

Vide Appendix

the Carriers and get leave a margin for profit be correct, the financial success of a giant Railway would seem to be assured beyond a doubt.

Present Public Outlay on Traffic

33- The present average charge from Mettapolliam to Coonoor is stated to be Rs 6 per Cart load of ~~one third of a ton~~ and Rs three down & three fourths of the traffic is in an upward direction and therefore the average cost of the carriage of a ton of the exciting traffic would vary from Rs 11½ to Rs 15 per ton according to the standard load taken.

× and the load is variously stated at from one third to one half a ton

But it can be shown that the former is too low an estimate of the average charges.

Luggage carried by Coolies costs 12 Annas per head load of 60 or nearly 3d Rupees per ton from

Kettapallieus & Coonoor or the reverse.

The fares charged for 1st class passengers amount to about Rs 20 a head for the same distance.

And probably the cost of persons travelling as 2nd class passengers by rail is on the average not less than Rs 12 under most circumstances.

As regards the 3d class Passengers ~~by rail~~, it is probable that the minimum rates now chargeable for transport to the Hills are for the most part prohibitive and that but few avoid walking. A certain number of Native Shopkeepers and

Letter N

& merchants no doubt ride up on Doingo or asses or enter Carts but obviously at not less than double Goods rates or say Rs 2. As the chance of a return load is small their numbers may be placed at 1000 per annum. A reference to the abstract of the operations of the several Carrying Agency with which they have obligingly furnished me and which is placed in the Appendix shows that the charges for carriage of goods are on the average fully equal to those entered in the Statement in para 28. Reduced to tons as a unit it appears that during 12 months in 1873-74 they carried the following from Kettapollieus & Coonoor or the Reverse.

Description	Freight	Cost Rs	Rate per ton Rs
Beer & ale	60 tons	2252	37·2
Luggage &c	27 "	2100	72·4
Various goods	53 "	2976	56·1
Laundry do	4·8	199	41·5
Tea	4·7	167	35·6
Parcels	28·5	1063	43·8
Coffee	1838·0	20719	11·3
Rice & grain	973·0	20075	20·6
Vegetables	245·0	12140	33·21
Total	3346·0	61791	18·2 average rate

giving an average rate of Rs 18.2 per ton carried of which it is observed more than half is downward traffic - And the profits are stated by only from 15 to 20 per cent of the amount - If this ton carried upward & downwards in the proportion in which the existing traffic travels in either direction - that is 3 tons up to 1 ton down their average charge on the basis of the present charge - would be Rs 21 per ton instead of Rs 18 - Mr Cockerell states in his report - that another agency carried during that year 300 tons downwards & obtained at similar rates & therefore their receipts by these two Agencies alone represent an annual outlay by the Public for carriage of goods & passengers up & down the ghaut of £78 17 per annum.

The foregoing rates show that for the conveyance up & down

the ghaut of the traffic which it is estimated the railway of course would command after construction, the Public pays a sum of not less than £ 44,000 at the present rates of carriage as follows:-

			£
17,000 tons of goods at Rs 4 -			5,800
3,000 " Parcels, luggage & furniture 8 Cu ft		36 -	10,200
1 - class Passengers	2500 at	20 -	5,000
2nd do	3500 "	12 -	4,200
3rd do	4000 "	2 -	800
			£ 44,000

Alternative Outlay for Railway Conveyance -

36 - It has been shown that there is every reasonable ground for assuming that while paying for maintenance & working expenses 6 per cent on the capital outlay the same traffic would be carried by a ghaut railway at a cost of from £ 17,360 to £ 21,070 according to the central rail system adopted - and it must be recollected that while every increase of traffic by bullock Cart or animal power represents a corresponding increase in the

charges it is not necessarily as in the case of the Railway which could carry double the quantity of goods & passengers with small proportionate increase of the annual outlay & which could after then reduce its charges while paying the established rates of interest or while maintaining them extinguish the capital debt by a sinking fund.

The safety, speed & freedom from exclosure of transit by rail would render it impracticable for the common carrier to compete with the railway even if the rates were the same in both the cases & as the latter can carry at a large reduction with profit it must absorb the traffic & drive carts off the road. The rate thus derived is, it will be seen for all but special classes which are now charged Rs 3-4 per ton, - Rs 6-1 to 7-5 per ton, and it is shown that although the first two Railway systems entered in the statement could not work at rates

naturally

materially lower than those already obtaining the others could do so easily and have it at their option to raise Charges so as to give a greater return than 6 per cent without losing command of the traffic.

Comparison of hill & low Country market rates -

37. Here European alone concerned in the traffic either as commerce travellers or consumers there might be cause, judging from experience of the usual behaviour of natives under such circumstances to suspect the possibility of undue inflation of rates by a system of combination amongst the

Natives Supplies of Carts
and the bringing out of
competitors for hire, but
on the contrary there is
a considerable native
population dependant
on the food supplies and
a comparison of the
prices in the Bazaars
at Cooner and Coimbatore
with those at Sirumlatore
shows that the increase
at the former places
corresponds with the
rates for carriage paid
(the current and adopted)
in this report - even as
regards the ordinary
food grains and other
articles of common
consumption by the
people.

Comparative price lists
for

52

for the principal articles
of sale of building materials
and labor are inserted
in the appendix* and
it will suffice to refer
to them to establish the
above mentioned fact.
Taking the food grains and
salt it will be seen
that the increase per
tow in the Neilgherries
is for.

Rice 1st quality	Rs	24.9
Do 2nd "	"	18.9
Horse gram	"	28.5
Cholum	"	10.4
Cumbus	"	21.6
Wheat	"	26.1
Salt	"	49.3
	1½	

And the average increase 22.9 per

It is probable that as
regards such commodities
in universal demand by

*Letters O and P

natives, competition has re-
duced the profits of the
carrier as well as the seller
to a minimum which is
much below the average
and it is certain that
as regards those of greater
intrinsic value used more
exclusively by other classes.
the charges are much
enhanced. For instance
the prices of meat, Poultry
bread, flour &c. compare
as follows.

	Dalacamund	Coimbatore	Increase per cent
Mutton	per lb 4 as.	2 1/2 as.	60
Beef	" 4 "	3 "	33 1/3
Pork	" 6 "	3 1/2 "	71
Chickens	each 2 2/3	2	33
Cocoanuts	" 7 1/2 pie	6 1/2 pie	16
Jaggery	maund Rs 2-6	Rs 2-0	18
Sugar	" " 6-0	" 5-8	9
Coffee	lbs 8 as.	as 6 2/3	21
Lamp oil	25 4 as.	" 3 1/2	14

53

As the above is a compari-
-son between Retail prices
at two different localities
and the vendors can
purchase wholesale
at equal prices on the
plains it seems fair to
attribute the enhanced
rates to the cost of trans-
-it from the plains
to the hills. If the articles
of Sugar Cocoanuts and
Coffee are taken the in-
-creased cost reduced to
per ton on the unit of rail
-way carriage would rep-
-present a charge of
from Rs 32 to .

The increase in the charge
for labor and building ma-
-terials on the hills of
course dependent on the

rate for carriage in the first
case as influencing the cost
of food and in the second
that of the materials themselves
The statement in the ap-
pendices to which reference
has been already made
shows that for labour of all
kinds the wages are from
20 to 200 per cent and the cost of
materials from 30 to 6800 per cent
more than the rates on the
railways

The influence of the present
cost of carriage is therefore
universally marked and
indicates a prosperous future
for any enterprise of which
the inherent principle is the
use of more economical power

It

Summary of Conclusions

36. It is believed that the
estimates which have
been made in this Report
of the present extent of the
traffic on the ghaut and
its rate of increase in
the past and for the future
of the charges with which
it is burdened, of the ben-
efits of the carriage, the
rates at which the several
systems of railway could
afford to carry goods and
passengers up the ghaut
with ample profit as
well as the cost of their
construction and main-
tenance, are based on
evidence which can
hardly be impeached
and which if anything

tends

tends to create a reasonable
doubt as to whether in re-
-gard to traffic and returns
present and prospective
they are sufficiently large.
It is very possible that
they are in this respect,
but I have been anxious
to avoid any appearance
of sanguine views ~~and~~
~~I am unable that I have~~
~~been rather forced to the~~
~~conclusion that a~~
~~plan to railway would~~
~~be a financial success~~
~~against preponderating~~
~~notions to the contrary.~~

To sum up - the following
facts appear to be
established -

I - That the present
charge on the annual
traffic between Inetta-
-bellin and Cainoor amou
to £44,000 at least.

II - That this traffic
has been increasing
during the last seven
years at an average
rate of nine per cent per
annum and that it
has doubled itself with
the last 12 years.

III - That a railway
could be constructed
between Inettabellin
and Cainoor sufficient
to accommodate the

present and any increased traffic which is likely to exist for £ 260,000 on the Fell system and for £187,000 on the Rejé system.

IV - That in order to yield a return of 5 per cent on the above capital outlay and pay all charges for maintenance and working expenses in carrying the existing traffic - the Fell Railways would require a return of £21,100 per annum only and the Rejé Railway £17,300 per annum only.

V - That the resulting rates per ton. and per passenger are such as to render impossible all competition with the Railways by existing modes of transit -

8/12.

Proceedings of the Madras Govt.

Read the following:-

From
The Under Secy. to Govt. 8/12
} (N.E. dated 24th Feb/75
G.O. No: 1213 of 30th April/75

These Statistics compiled by the under Secy to Government in the Dept. of Public Works in conformity with G.O. No 2564 K of 10th Sep. 1874 will be communicated to the Consulting Engineer for Railways to be dealt with practically as further detailed by the Agency of the Madras Railway. In that Order it was G.O. No 484 of 19th January, that Agency was apparently excluded from taking a part in the determination of the measures to be adopted for carrying out the earnest desire of His Excellency the

28/4
B.I.E.

Governor in Council that communication by Rail might be extended up to the Neilgherry Plateau. It was not at that time supposed that the financial prospects of a Railway up the Coonoor Ghaut were such as to make it likely that the Madras Railway would undertake its construction without guarantee (an apparently necessary condition to obtaining the Sanction of the Government of India). But the information now so carefully analysed by Major Scott appears to show prospects of such an excellent return that the offer of carrying into execution, a scheme likely not only to be profitable in itself, but to react profitably on the line already open, must be made to the Madras Railway Company. More especially since they are in the position to work it out at considerably less cost for maintenance than any separate body could possibly manage.

It is considered moreover that they will be able to obtain the most accurate information as to the relative merits and cost whether of construction or maintenance of the rival systems by which it is stated that such an ascent as that to Coonoor may best be surmounted.

2. The competition would appear to be limited between the Fell and Rigi systems, the Handyside system being apparently

undeveloped; and H.E the Gov.r C. being unwilling to allow this to be worked out as at all an experimental Line. The actual cost of construction and maintenance of the Fell system seems to be but imperfectly known; and that of the Rigi system to have been unduly enhanced by the shortness of the Lines on which it has hitherto been carried out. The Madras Railway Agency will be requested through the Consulting Engineer to communicate at once with the Board of Direction at Home with a view to the submission by them after reference to their Consulting Engineer of proposals for carrying

and one or other system for the actual Ghaut ascent in continuation of the ordinary Line extended from Mettapolium to Kullaur. It is essential that there should be no break of guage, and that the Engines used for the Ghaut ascent shall be capable of working also into Mettapolium, to avoid the necessity of having any thing more than a Roadside Shed at any such unhealthy localities as Kullaur or Burliar.

3. The Chf Engr. O.P.W. is relieved from the duty assigned him in G.O. No 484 19th Feb.

He will however hold himself in readiness at the end of his period of Home Leave, or about the middle of July, to attend to any demand for local information that may be made on him personally either by the Madras Railway Board, or by the India Office, to which these proceedings will be communicated

4. Very great interest has been shown in the investigation of this subject by the Commissioner, and Dist: Engineer of the Nellisherries, by the Collector of Coimbatore, and by the Under Secy P.W.D., which has been highly appreciated by

10 spare copies given to Mr R Parsons to be taken to Ooty 8-5-75

H.E. the Gov C. His best thanks are also accorded to messrs Haines & Rowe for the trouble which they have taken in supplying reliable information regarding existing traffics and rates.

Gov.

Con Engr Jor Rly. 1 18 @ 8c 90
Chf Sec P.W. Dept 1 — 2
Comm: of the Neilgherries 1 — 2
Dy Engr do 1 — 1½
Collector Coimbatore 1 — 1
Under Secy to Govt P.W.D.
Messrs Haines & Rowe.

dest 5/5/75.

These statistics
Compiled by the Under
Secretary to Government
in the Department Pub-
lic Works in conformity
with G. O. No. 2562 A. of 10th
Sep. 1874 will be communi-
cated to the Consg Engineer
for Railways to be dealt
with practically, as
further detailed, by the
Agency of the Madras
Railway. In that Order & in
G O No. 484 of 19 February
that Agency was ap-
parently excluded

from taking
a part in the determina-
tion of the measures
to be adopted for car-
rying out the earnest
desire of His Excellency
the Governor in Council
that communication
by Rail might be ex-
tended up to the Nilgherry
Plateau. It was not
at that time supposed
that the financial
prospects of a Railway
up the Coromandel Ghauts
were such as to make
it likely that the
Madras Railway would
undertake its con-
struction without guar-
antee (an apparently
necessary condition

to obtaining sanction
of the Govt. of India).
But the information can
be carefully analyzed
by Major Scott appears
to show prospects of such
an excellent return
that the offer of carrying
into execution a scheme
likely not only to be
profitable in itself,
but to react profitably
on the line already
opened, must be made
to the Madras Railway
Company. More espe-
cially since they are
in the position to work
it out at considerably
less cost for maintenance
than any separate body
could possibly manage.
It is considered moreover

that they will be able to obtain the most accurate information as to the relative merits and cost whether of construction or maintenance of the rival systems by which it is stated that such an ascent as that to Coonoor may best be surmounted.

2. The competition would appear to be limited between the Fell and Riggi systems, the Handyside system being apparently undeveloped; and His Excellency the Governor in Council being unwilling to

allow this to be worked out as at all an experimental line. The actual cost of construction and maintenance of the Fell system seems to be but imperfectly known; and that of the Riggi system to have been unduly enhanced by the shortness of the lines on which it has hitherto been carried out. The Madras Railway Agency will be requested through the Chief Engineer to communicate at once with the Board of Direction at Home with a view to the submission by them after reference

to their Engineers of proposals for carrying out one or other system for the actual Ghaut Ascents, in continuation of the ordinary line extended from Mettapollium to Kullaur. It is essential that there should be no break of gauge, and that the Engines used for the Ghaut Ascent shall be capable of working also into Mettapallium; to avoid the necessity of having anything more than a Road-side shed at any

such unhealthy localities as Kullaur or Burliar.

3. The Chief Engineer, D.P.W., is relieved from the duty assigned him in G.O. No 484 of 19th February. He will however hold himself in readiness at the end of his period of home leave, or about the middle of July, to attend to any demand for local information that may be made on him personally either by the Madras Railway Board, or by the India Office, to which these Proceedings will be Communicated.

4. Very great interest has been shown in the investigations of this subject by the Commissioner and District Engineer of the Neilgherries, by the Collector of Coimbatore, and by the Under Secretary, P.W.D., which has been highly appreciated by His Excellency the Governor in Council. His best thanks are also accorded to Messrs Stones and Rouse for the trouble which they have taken in supplying valuable information regarding

existing traffic and rates.

Govt.

S.R.O.

Proceedings Madras Govt.

Read the following

From

The Under Secy. to Govt. of Mad. } M. E. dy. 24th April 1875.

These statistics compiled by the Under Secretary to Govt. in the Department Public Works in conformity with G.O. No. 2564 of 10th September 1874 will be communicated to the Consulting Engineer for Railways to be dealt with practically as furthers detailed by the Agency of the Madras Railway. In that Order and in G.O. No. 484 of 19th February that Agency was apparently precluded from taking a part in the

3/5

30.4.75.

determination of the measures to be
adopted for carrying out the
earnest desire of His Excellency
the Governor in Council that
communication by Rail might
be extended up to the Neilgherry
Plateau. It was not at that
time supposed that the
financial prospects of a
Railway up the Coonoor
Ghaut were such as to make
it likely that the Madras
Railway would undertake
its construction without
guarantee (an apparently
necessary condition to ob-
taining the sanction of the
Government of India). But
the information now so care-
fully analysed by Major
Scott appears to show prospects
of such an excellent return
that the offer of carrying into
execution a scheme likely not
only to be profitable itself,
but to react profitably on the
line already open, must be
made to the Madras Railway
Company. More especially since
they are in a position to work
it out at considerably less
cost for maintenance than
any separate body could
possibly manage. It is
considered moreover that they
will be able to obtain the
most accurate information
as to the relative merits and
cost- whether of construction
or maintenance of the rival
systems by which it is stat

that such an ascent as that at Kannur may best be surmounted.

2. The competition would appear to be limited between the Fell and Riggi systems, the Handyside system being apparently undeveloped; and as his Excellency the Governor in Council being unwilling to allow this to be worked out as at all an Experimental line. The actual cost of construction and maintenance of the Fell system seems to be but imperfectly known; and that of the Riggi system to have been unduly enhanced by the shortness of the lines on which it has hitherto been carried out. The Madras Railway Agency will be requested through the Consulting Engineer to communicate at once with the Board of Direction at home with a view to the submission by them after reference to their Consulting Engineer of proposals for carrying out one or other system for the actual Ghaut Ascent as continuation of the ordinary line extended from Mettapalliam to Ootacamund. It is essential that there should be no break of gauge and that the Engines used for the Ghaut Ascent shall be capable of working also into Mettapalliam; to avoid the necessity of having any thing more than a

Road side shed at any such unhealthy localities as Kullair or Burbiar.

3. The Chief Engineer D.P.W. is relieved from the duty assigned him in G.O. No. 484 of 19th February. He will however hold himself in readiness at the end of the term of his Home Leave, i.e. about the middle of July, to attend to any demand for local information that may be made on him personally either by the Madras Railway Board, or by the India Office, to which these Proceedings will be communicated.

4. Very great interest has been shown in the investigation of this subject by the Commissioner, and District Engineer of the Nellgherries, by the Collector of Coimbatore, and by the Undersecretary in the P.W.D. which has been highly appreciated by His Excellency the Governor in Council. His best thanks are also accorded to Messrs Staines and Rose for the trouble which they have taken in supplying reliable information regarding existing traffics and rates.

Govt. W.

Reg deliberato No 2-24 Febj/75
" " 9 Febj/76 No 237 pt 237 J
" 20 Oct/1 " 531-532
" 19 Dec/1 " 1490
" 29 Oct/74 " 647-648
" 10 Sept/1 " 1945 1946

c. 29.4.75

Pol. of 1875 Madras.

PUBLIC WORKS.

2c

Issued

Recd.

G. O. 30 April 1875, No. 1243

Nos. 742 743

Forwarding ... charge on letter from the Under Secy. P. W. D. on the subject of the proposed Railway up the Coonoor Ghaut

Railway up the Coonoor Ghaut: Passing orders on the letter from the Under Secretary to Government P. W. D. on the subject of the proposed