

Dhananjayrao Gadgil Library



GIPE-PUNE-015944

MADRAS RAILWAY COMPANY

RETURN to an Order of the Honourable The House of Commons,
dated 12 April 1853,—for,

COPIES “of the CORRESPONDENCE between the PROMOTERS of the
MADRAS RAILWAY COMPANY and the COURT of DIRECTORS of the
EAST INDIA COMPANY; and of the CORRESPONDENCE between the
BOARD of CONTROL and the COURT of DIRECTORS; and of any
OFFICIAL REPORTS with reference to the same Subject.”

East India House, }
19 May 1853. }

JAMES C MELVILL

(*Mr. Bright*)

Ordered, by The House of Commons, to be Printed,
31 May 1853.

C O N T E N T S.

PART I.

Correspondence between the Court of Directors of the East India Company and the Promoters of the Madras Railway Company, between the 7th May 1849 and the 21st July 1852 - - - - - p. 3

PART II.

Correspondence between the Board of Commissioners for the Affairs of India and the Court of Directors of the East India Company, between the 1st June 1849 and the 5th June 1852 - - - - - p. 17

PART III.

Official Reports, &c., viz.

Copy Financial Despatch from the Court of Directors of the East India Company to the Governor-General of India in Council, No. 16, dated 15 May 1850, p. 25

Copy Public Letter from the Governor in Council at Fort St. George to the Court of Directors of the East India Company, No. 16, dated 7th June 1851, and accompanying Documents - - - - - p. 26

COPIES of the CORRESPONDENCE between the PROMOTERS of the MADRAS RAILWAY COMPANY and the COURT of DIRECTORS of the EAST INDIA COMPANY; and of the CORRESPONDENCE between the BOARD of CONTROL and the COURT of DIRECTORS; and of any OFFICIAL REPORTS with reference to the same Subject.

PART I.

Part I.
Correspondence.

CORRESPONDENCE between the Court of Directors of the East India Company and the Promoters of the Madras Railway Company

To the Secretary to the Honourable the Court of Directors of the East India Company.

2, Winchester Buildings, London,
7 May 1849.

Sir,

I HAD the honour of announcing to you on the 8th of July 1845, that a company had been formed in this country under the title of "The Madras Railway Company," the immediate object of which was to undertake, provided they should succeed in obtaining the sanction of the Honourable the Court of Directors of the East India Company, the construction of a railway from Madras to Wallajahnuggur and Arcot.

In a subsequent letter, under date the 23d May 1846, I took the liberty of intimating to you, for the information of the Honourable Court, that the organization of the company, as far as regarded the provisions of the English Legislature, were completed; and in the same letter I respectfully submitted for the consideration of the Honourable the Court of Directors, a copy of the report of proceedings of the first general meeting of the shareholders of the company, held on the 19th February 1846, showing that they were quite prepared to enter upon active operations should the concession of the line be granted to them, and so soon as the governing authorities in this country should have determined upon the general principles to be applied to railway undertakings in India, and on the degree of encouragement, in the shape of pecuniary support, which they might eventually see fit to accord to them.

Ulterior events, which it is unnecessary here to advert to, induced the shareholders, in compliance with the recommendation of the directors, to dissolve the company, the directors, however, being requested to retain possession of the records, which contain much useful information, in the hope that they might yet, under more favourable circumstances, be rendered available in carrying out the object for which that information had been collected.

The recent determination which has been made public, on the part of the Honourable the Court of Directors, to guarantee a dividend at the rate of five per cent. per annum on certain experimental lines of railway, has induced several of the gentlemen who were connected with the former undertaking to unite with other parties who take an interest in the subject, in adopting measures for the formation of a new association, having similar views and objects with those contemplated by the establishment of the Madras Railway Company.

As chairman of two meetings which have been held for the purpose of carrying out these views, I have been requested to address you, and to submit for the consideration of the Honourable Court a copy of the proceedings of these meetings, at which the formation of a new company was resolved upon, and certain progress made in the execution of the project.

It will probably be the duty of the directors who were then appointed, to address the Honourable Court on the subject of the proposed undertaking, I

Part 1.
Correspondence.

will therefore, in concluding this letter, merely state, that the formation of the former company was hailed with the greatest satisfaction by the community at Madras, who lost no time in appointing a local committee for the purpose of co-operating with the directors in this country, from whom we received much valuable information, both statistical and general, entirely confirmatory of the opinions entertained by the promoters of the undertaking, that, whether in the facilities for the construction of the proposed railway, or in the inducements to it in a commercial point of view, no line could be selected throughout India which would more completely fulfil the object expressed in the Honourable Court's despatch to the Supreme Government of India of the 7th May 1845, viz., "to suggest some feasible line of moderate length as an experiment for railroad communication," than the line from Madras to Wallajahnuggur.

I have, &c.
(signed) *J. A. Arbuthnot.*

At a Meeting of the Promoters of the New Madras Railway Company, held at No. 2, Winchester Buildings, on Tuesday the 1st of May 1849,

Present:

John Alves Arbuthnot, Esq., in the Chair.

Sir John Campbell.
Hon. Captain Hotham.
J. Scott, esq
John Sullivan, esq.

J. O. Walker, esq.
Henry Maltby, esq.
——— Bourne, esq.
——— Currie, esq.

It was Resolved,

1. THAT, considering the favourable modification recently made by the East India Company in the terms and conditions proposed for the introduction of railways into India, it is desirable that the Madras Railway Company be revived, with the view of securing to that Presidency a participation with the others in the advantages thus offered.
2. That the Company be accordingly forthwith recognised.
3. That in consideration of the expenditure incurred by the old company in collecting plans, surveys, sections, and other information, which will now, to some extent, be available for this company, it is fit that some preference should, on this account, be given to such of the old shareholders as shall now renew their interest in the undertaking.
4. That a communication be accordingly entered into through the chairman of the old company and of this meeting, with a view of obtaining the transfer of the records and interests of that company, and of arranging the terms on which its former shareholders shall be invited to join the new company.
5. That to enable the chairman to consult with such of his former colleagues as may be within reach, and obtain their concurrence, this meeting be adjourned till Monday next, the 7th instant.

At a Meeting of the following Gentlemen, convened by Mr. Arbuthnot, who were Directors of the late Madras Railway Company, held at No. 2, Winchester Buildings, 7th May 1849.

J. A. Arbuthnot, esq.
Colonel Duncan Sim.

John Sullivan, esq.
Major D. Montgomerie.

It was Resolved,

THAT in pursuance of the power vested in the late chairman of the company by the shareholders, at their final meeting held on the 10th June 1847, to make such use of the records of the company as might, at any future time, be deemed advisable by him, the gentlemen now present are of opinion that Mr. Arbuthnot will be acting in the spirit of that resolution by making over to the directors of the proposed new Madras Railway Company all the books, papers, and other records of the late company, under a stipulation that shares in the new company shall, previous to their issue to the public, be offered to those shareholders of the old company who paid the call of 18s., equivalent in value to double the number of shares which they held at the time of the dissolution of the company.

It was further Resolved,

That a list of the shareholders who paid the deposit only be furnished to the directors of the new company, with a recommendation that, in the issue of shares to the public, a preference be given to applications from them to as great an extent as may be practicable.

At an Adjourned Meeting of the Promoters of the New Madras Railway Company, held the same day,

It was resolved to accept the above proposals, and the following gentlemen having signified their willingness to become directors of the New Madras Railway Company, they were appointed accordingly, viz.:

Colonel Duncan Sim.
John Sullivan, esq.
Lord Alfred Hevey, M. P.
Honourable Captain Hotham, R. N.
John Scott, esq., Chairman East and West India Dock Company.
Major J. A. Moore.
Alexander Mackenzie, esq., late of the firm of Messrs. Arbuthnot & Co., Madras.
Patrick Robertson, esq., of the firm of Messrs. Small & Co., London.
Captain Bourne, R. N.
James O. Walker, esq., late of the Honourable East India Company's Service.
Colonel Cannon, Madras Army.

J. A. Arbuthnot, esq. } Auditors.
Sir John Campbell, }

It was further Resolved,

That Mr. Arbuthnot be requested to address a letter to the Honourable the Court of Directors of the East India Company, informing them of the reconstruction of the Madras Railway Company, and that the chairman of the company do afterwards, or, as soon as possible, enter into communication with that body, with a view to solicit from them the same terms of guarantee, and other advantages as have been granted to the East Indian and Great Indian Peninsula Railway Companies.

(signed) J. A. Arbuthnot.

To the Secretary to the Honourable Court of Directors of the East India Company.

Sir,

Madras Railway Company,
2, Winchester Buildings, 12 May 1849.

ADVERTING to Mr. Arbuthnot's letter of the 7th instant, to your address, I have the honour to acquaint you, for the information of the Honourable the Court of Directors, that the original Madras Railway Company, formed for the purpose of constructing a railway from Madras to Wallajahnuggur, has been revived, and a Board of Directors constituted, and that the preliminary step of registering the new company has been effected.

The Board conclude that the East India Company is now prepared to extend to the Madras Railway the same encouragement on a capital of 600,000*l.* (the sum fixed as necessary for the purpose by Mr. Simms), and on the same terms, which they have already granted to the "East Indian," and the "Great Indian Peninsula" Companies; but they think that it is necessary to obtain an assurance from the Honourable Court that they are correct in this expectation, before proceeding further with the undertaking.

I have, &c.
(signed) Duncan Sim,
Provisional Chairman.

To the Secretary to the Honourable the Court of Directors of the East India Company.

Sir,

2, Winchester Buildings, London,
10 August 1849.

REFERRING to Colonel Sims' letter of the 12th May, as acting chairman of the Madras Railway Company, I have now the honour, in the absence of that gentleman, to request that you will lay before the Court the accompanying copy of a letter from the honorary secretary of the railway committee at Madras, communicating the proceedings of a great public meeting, held there under the presidency of the Right honourable the Governor, on the 29th May last, and of the committee appointed to carry out the objects of that meeting.

The Honourable Court will perceive by these proceedings how strong and general is the feeling of the whole community of Madras in favour of this undertaking.

Part I.
Correspondence.

taking. It will also be observed, that instead of addressing the Court themselves in a separate letter, as was at first proposed, the committee, on learning the step taken here, resolved to unite entirely with this Board, and to place in our hands the advocacy of their interests, as representing the people of Madras, with the authorities in this country.

Strengthened by this support, we take the liberty of expressing a hope that we may be favoured with a speedy and favourable decision on the application which formed the subject of our former letter before referred to.

I have, &c.
(signed) *J. A. Arbuthnot.*

Dear Sir,

Madras, 16 June 1849.

By desire of the railway committee appointed at a general meeting of the inhabitants of Madras on the 29th ultimo, I have the pleasure to hand you a copy of the proceedings of the public meeting in question, and also of those of the committee at their sittings of the 2d and 15th instant.

You will observe, that our public was induced to assemble in consequence of the modification of the terms agreed to be given to certain Indian railway companies by the Court of Directors of the East India Company, and that they unanimously resolved to take measures for getting a railway company established for Madras under similar favourable auspices. The intelligence of the revival by yourself and your colleagues of the old Madras and Wallajah-nuggur Railway Company under a new form, has induced our committee to consider that they shall best follow out the views of the public meeting, by entering into prompt and cordial co-operation with your company.

The resolutions of committee will best acquaint you with the views entertained on this subject, and the proceedings already adopted.

I should explain to you, that in the survey undertaken of a line as far as Poonamalee (which must form a section of the main line), the object is to lay this down in a perfect manner, to estimate with elaborate care the expense of all work that falls to be executed entirely in this country, to determine the very best line that can so far be adopted, and thus not only to give you more exact views than perhaps you already possess of the actual cost of construction (so far as these particulars extend), as well as of the nature of this part of the country to be traversed, but also to pave the way for a more speedy commencement of the general work, when once the railway company shall have been finally and completely established.

The Madras committee are of opinion that it would be quite sufficient in the first instance to provide for the laying down of a single line of rails to Wallajah-nuggur.

They further think it eminently desirable in the interests of a company, that it should be sought to avail ourselves, in its requisite extent, of the services of professional engineers of the Madras service, because there are peculiarities of climate, and peculiarities of country, with which their local experience must render them the best fitted to grapple. They conceive also, that when the work of a railway comes fairly to be undertaken, it will be very necessary for a local Board to obtain the supervision of its details; for it is only when this is closely exercised, and by those interested in the work's success, that the interests of the general body concerned in the undertaking can be adequately cared for.

The committee expect that a considerable number of shares will be subscribed for in this Presidency, and they purpose sending you, from time to time, lists of such parties as may express their desire to take an interest in your proposed new company.

I am, &c.
(signed) *W. Ouchterlony,*
Honorary Secretary,
Madras Railway Committee.

Colonel Sim, Chairman *pro. tem.*
of the Provisional Committee for the proposed
New Madras Railway Company.

At a General Meeting of the Inhabitants of Madras on the 29th May 1849, the Right Honourable the Governor in the Chair, and most numerous attended by the principal Persons in the Presidency, including all the High Officers of Government, and the Members of the Mercantile Community, the following Resolutions were carried unanimously:—

1st. Moved by the Hon. D. Elliott, seconded by Mr. Arbuthnot,

THAT with reference to the information obtained by the late Madras Railway Committee, and to the various surveys and estimates by different competent parties of the cost of construction, amount of traffic, &c., which came under their notice, it is the opinion of this meeting that a line of railway proceeding from Madras to the interior, in a westerly direction, would prove highly advantageous to the country, and remunerative to the undertakers.

2dly. Moved by Mr. J. Thompson, seconded by Lieutenant-colonel Underwood,

That the terms proposed by the Honourable Court of Directors in support of the railways projected in Bengal and Bombay, afford, in the opinion of this meeting, a sufficient encouragement for such undertakings; and that any well-devised scheme projected for this Presidency is entitled to equal consideration.

3dly. Moved by Captain Biden, seconded by Major Reid, c. b.,

That a committee, composed of the following gentlemen, be appointed to communicate, by the earliest opportunity, with the Court of Directors, in furtherance of the preceding resolutions, and to prepare and digest a scheme for the formation of a joint-stock company, with power to add to their numbers, and to fill up vacancies.—

J. F. Thomas, esq.
Geo. Norton, esq.
W. U. Arbuthnot, esq.
Major Pears, c. b.
J. B. Key, esq.
Captain J. H. Bell.

J. Thomas, esq.
J. Ouchterlony, esq.
Captain Collyer.
J. B. Jauncey, esq.
E. F. Elliott, esq.
Lieutenant Hitchens

4thly. Moved by Mr. Mead, seconded by Mr. T. B. Roupell,

That the committee be instructed respectfully to solicit the local government to afford them the aid of the various civil and scientific officers employed in the provinces, with the view of procuring such information as may lead to the determination of the best line.

5thly. Moved by Mr. Norton, seconded by Mr. Roupell,

That the thanks of the meeting be respectfully tendered to the Right Honourable the Governor, for his able conduct in the chair, and for his considerate and unsolicited offer of the banqueting-room on the present occasion.

Sir Henry Pottinger briefly replied, and the meeting dissolved, amidst the loud cheers of its members.

RAILWAY COMMITTEE.

At a Meeting on the 2d June of the Committee appointed at the Public Meeting of the 29th May.

Present:

J. F. Thomas, esq.
G. Norton, esq.
W. Elliot, esq.
W. U. Arbuthnot, esq.
Captain Collyer.

J. Thomson, esq.
Captain Bell.
Captain Hitchens.
J. Ouchterlony, esq.
Major Pears, c. b.

RESOLUTIONS.

1st. WITH reference to one of the immediate objects enjoined upon the committee by Resolution 3 of the public meeting, viz, to prepare and digest a scheme for the formation of a joint-stock company, it is the opinion of this committee that as intelligence has reached Madras of active measures being taken in London to revive the old Madras and Wallajahnuggur Railway Company, to which the public of Madras formerly gave their adhesion, they will best follow out the designs of the meeting by entering into active co-operation with such revived company, and that steps be accordingly taken to enter into communication with its managing committee for that purpose.

2dly. That in the opinion of this committee it is essentially necessary, for the welfare of any railway company established, that the construction and working of the line should be under the supervision of a local branch committee of shareholders, and that such opinion be communicated to the above revived company.

Part I.
Correspondence.

3dly. That a letter be addressed to the Court of Directors, in conformity with the resolutions of the public meeting, soliciting the support of the Honourable Court, and dwelling upon the peculiar benefits to Madras of which a railway running to westward would be productive, the great natural advantages for construction offered in this line, and its value as a test of the remunerativeness of railways in favourable localities in India.

That it be represented further that it is deemed the interests of a company would be materially furthered by the local officers in India being allowed to give their temporary assistance to the undertaking, such being extended of course without involving any charge to the East India Company.

4thly. That, in communicating with the committee of the revived Madras and Wallajahnuggur Railway Company, they be informed that, in the opinion of this committee, a single line of rail should alone be constructed, in the first instance, leaving the formation of a double line to follow experience of the working of the railway, and sufficient land being taken up at once to admit of this extension.

Captain Collyer having volunteered his services to superintend a survey of a portion of the road--

5thly. That advantage be taken of Captain Collyer's obliging offer, and that funds be appropriated for completing the survey of about 15 miles of a line from Madras towards Wallajahnuggur.

6thly. That the following gentlemen be requested to join the committee:--

Major Smith, engineer, and T. Lushington, esq.

7thly. That the foregoing proceedings be published.

PROCEEDINGS of the Railway Committee at a Meeting held in the Polytechnic Rooms on
16 June 1849.

Present:

W. U. Arbuthnot, esq.
J. F. Thomas, esq.
G. Norton, esq.
Captain Hitchens.
T. Lushington, esq.

Captain Collyer.
Captain Bell.
Major Pears, c.B.
Walter Elliott, esq.
J. Ouchterlony, esq.

Mr. Ouchterlony is requested to take the office of corresponding, and Mr. Jauncey that of financial secretary.

Read the following papers, forwarded to Walter Elliott, Esq., by Mr. Walker, under date London, 7 May 1849.

(Here follow proceedings of the Home Committee of 1 and 7 May.)

Resolved, That this committee record their concurrence in the resolutions adopted by the proposed new railway company, but with the explicit understanding that Madras subscribers are to participate to the fullest extent in the preference for shares that is to be allowed subscribers to the old company.

Resolved, also, That this committee consider it due to parties in this Presidency willing to subscribe for new shares, that their applications should be treated on a footing of equality with those received in England on the organization of the company, in respect of the allotment of such shares.

Resolved, That with reference to the foregoing resolutions, subscribers to the old Madras Railway Company be invited to signify their desire to renew their interest in the proposed new company; and that all other parties desirous to subscribe be requested to notify their wishes without delay, all communications to be addressed to the honorary secretaries of the committee, and to be couched in the forms subjoined:--

Form of Applications to renew Shares taken in the old Railway Company in the proposed new Company.

Form of Application for new Shares in the proposed new Railway Company.

Resolved, That as the information received from England materially alters the former position when the revival of the company there was yet only in contemplation, that it seems unnecessary to forward the communications resolved upon at the last meeting, but that a letter be now addressed to Colonel Sim, as chairman *pro tem.* of the provisional committee for the new company, forwarding, for the information of that committee, and as a communication of the Madras committee's views, copy of the resolutions of the public meeting, and of this day's proceedings, as well as those of the 2d instant.

Resolved, further, That as the provisional committee of the proposed new company is understood to be already in communication with the Honourable Court of Directors, this committee

Committee desire that it would, under present circumstances, be superfluous on their part to address to that Honourable Board the letter which it was formerly agreed to despatch.

Part I,
Correspondence.

Captain Collyer explains to the committee the line that he thinks it best to adopt for a survey from Madras to Poonamallee.

Resolved, That a sub-committee of officers of engineers, consisting of Major Pears, Captain Bell, Captain Hitchens, and Major Smith, be requested to act in concert with Captain Collyer in determining this point, in framing estimates of cost for all work that has to be completed in this country for a railway over the line, and generally in completing all the useful information that can be gained in reference to the subject.

Resolved, In reference to the resolutions at the meeting of the instant, relative to a survey of the line to Poonamallee, that Messrs. Arbuthnot & Co, treasurers of the old railway company, be requested to honour Captain Collyer's orders for the expense of such survey from the funds remaining in their hands, and also the orders of the sub-committee of officers of engineers for the printing of documents, which work is left to their discretion.

Adjourned for three weeks, but to assemble earlier if necessary

Sir,

East India House, 2 October 1849

THE Court of Directors of the East India Company have had under their consideration the letters addressed to me by yourself and Mr. Arbuthnot, dated the 12th and 7th May last, intimating that the original Madras Railway Company has been revived, and expressing a hope that the same encouragement which has been conceded to the East Indian and the Great Indian Peninsula Railway Companies will be extended to this company.

In reply, I am commanded to acquaint you that, pending the result of the experiments which are now about to be made in India, under the encouragement of the East India Company, and of the working of the system which has been adopted for their superintendence and control, the Court regret that they are precluded from granting further pecuniary support to undertakings of this nature, and that, for the present at least, they must decline to comply with the request which you have preferred on behalf of the Madras Railway Company

I am, &c.

(signed) *James C. Melvill*,
Secretary

Colonel D. Sim,
Provisional Chairman of the Madras Railway Company

To the Chairman, Deputy Chairman, and Court of Directors of the
Honourable East India Company.

2, Winchester Buildings, London,
20 February 1850.

Honourable Sirs,

WE received with deep disappointment the unfavourable answer to our application for the admission of the Madras Railway to the same advantages of guaranteed interest on its capital as have been granted to those of Bengal and Bombay, your Honourable Court informing us that no further pecuniary support to undertakings of this nature can be granted till the result of the experiments already sanctioned is ascertained.

Relying too entirely, we fear, on your Honourable Court's recognition of the merits and claims of the Madras line, backed as they were by the unprecedented support of the whole Madras community, we did not enter, in our former letters, into the details which a full explanation of those claims requires. But if we may be now allowed to do so, we are confident of establishing so clearly the inexpediency of delaying the execution of this line, for the object assigned, the manifold advantages of its early construction, and the merely nominal nature of the support, in a pecuniary point of view, which the guarantee of five per cent. on its capital would entail, that your Honourable Court, we trust, will see strong grounds for reviewing the former decision, and for not postponing the extension to the Madras Railway of the same measure of support as has been given to the others.

We beg leave, in the first place, to submit that the two sections of lines already sanctioned in Bengal and Bombay can only be taken as experiments so far as regards the cost of construction in their respective localities. No expectation

tion is entertained, we believe, that in their isolated and fragmentary state, they will either pay, or can afford any criterion of the value of railways in India generally as a commercial speculation, or of their public utility. It does not appear, therefore, in what way the result of those experiments, whatever it may be, can bear on a line of entirely opposite character in the Madras Presidency, or why the introduction of railways there should be postponed on their account.

The great object, as it seems to us, to be held in view is selecting a line for determining experimentally the advantages of the introduction of railway communication into India, is to find one of moderate length, having well established termini, between which there already exists considerable traffic, running over a country that presents no considerable engineering difficulties, to be constructed therefore at a moderate cost, and with a fair prospect of paying well. To this important result, the absence of competing water carriage must greatly conduce. If to the foregoing conditions the line adds that of being fitted for eventual prolongation, so as to form one of the great arterial trunk lines of the country, it must be admitted to combine all the elements necessary for determining the question most satisfactorily and advantageously.

Now, without inquiring how many of those requisites, besides the last, the lines already sanctioned possess, we are prepared to prove that the line from Madras to Wallajahnuggur, for which we solicit the support of your Honourable Court, possess every one of them.

This line is 72 miles in length; it starts from Madras, the seat of Government, and the chief or rather sole port of Southern India, containing, with its suburbs, a population of 600,000 souls, and it ends at Wallajahnuggur, or Arcot, the latter a considerable military station, and the former a populous town, which is already the great entrepôt of the traffic between the Presidency and the Western Provinces. For its accommodation, and for the transport, more especially of salt, from the coast to the interior, the Madras Government proposed more than 10 years ago to construct a railway in supercession of the common road, which at present connects the two places, and is maintained at a very heavy cost to Government in a very imperfect condition, owing to the want of good materials. The surveys then made by the Government engineers established the fact that the line presented no engineering difficulties whatever, but, on the contrary, offered every facility for cheap and easy construction, from the dry and level character of the country, while it did not cross a single river or stream of any magnitude. And these results have been fully confirmed by two subsequent surveys made by other scientific officers. These, and still more recent investigations, have proved, beyond all reasonable doubt, that while the cost of constructing the line would be very moderate indeed, the amount of traffic, both in goods and passengers, would be such as to pay a very handsome profit on the outlay.

It can hardly be necessary to remark, that there is no competing water carriage whatever, nor ever can be. Until a railway is made, the whole intercourse between the coast and the interior of the south of India must continue to be carried on by the very imperfect, tedious, and costly modes of land conveyance at present in use.

With respect to the last point named as desirable in the line selected for experimental construction, *yiz.*, its fitness to serve as a main trunk line, and to be ultimately prolonged into one of the great arterial lines of the empire, we proceed to prove that our proposed railway possesses this requisite also in an eminent degree. A glance at the map will show that, however future lines may radiate from Wallajahnuggur, the traffic between Madras and nearly the whole of its inland territory would always flow along this line up to that point.

But this section, though complete in itself, is only, in fact, the first of a line to be carried eventually across the Peninsula, which, opening up the rich and fertile districts of the Cawvery, of Tanjore, Trichinopoly, and Coimbatore, would unite the two coasts of Malabar and Coromandel. For this great undertaking nature has made a remarkable provision, by the opening left at Paulghaut, in the otherwise continuous line of the great range of western ghauts. It would be superfluous to enlarge on the political and commercial importance of a line like this, abutting at one end on the western, and at the other on the eastern coast of the Peninsula. While it would shorten the communication materially between London and Calcutta, as well as between the two sides of the Peninsula, it would afford, with its branches, the means of cheap and rapid transit to
either

either coast for the valuable produce of the great cotton districts of the south of India, and thus secure for it uninterrupted means of shipment throughout the year, which it does not at present enjoy; the north-east and south-west monsoons shutting alternately the Coromandel and Malabar ports.

Having thus demonstrated the singular recommendations which this line possesses for adoption beyond any other that has yet been projected in India, we desire next to draw attention to the peculiar claims which Madras has as a Presidency, for her share, at least, of any encouragement that is to be given to the introduction of railway communication within our Indian dominions. She is, in the first place, devoid, it may be said, of inland water-carriage, which Bengal enjoys to so great extent, and of those facilities of communication by sea possessed by the Bombay territories, while her population appears to be more highly taxed than that of either. The population of the Bengal provinces is at least 30 millions; the revenue raised from them, exclusive of opium (which they do not pay), is 6½ millions sterling, or 4 s. 4 d. per head. The population of the Madras provinces is 13 millions, and the revenue 4½ millions sterling, or 6 s. 4 d. per head. This enormous disproportion in taxation is a strong reason in itself for affording to the people of Madras every aid to support it, and nothing can do this so effectually as cheapening the cost of transit of their produce by the introduction of railways.

Connected with this important point of revenue, is another reason, peculiarly applying to Madras. While in Bengal, the Government having no rights of revenue in the waste lands, can gain nothing, directly, by the extension of cultivation, in the Madras Presidency every additional acre that may be brought into cultivation by the stimulus which railway transit affords, will bring with it a corresponding increase to the public treasury, because, there, the Government have rights of revenue in all waste land brought under cultivation.

Again, in the important article of salt, which in the other Presidencies is cheaply, though slowly conveyed by water carriage, the price to the consumers at some of the stations of the Madras Presidency is actually sextupled by the enormous expense of the land carriage. The Government, as the monopolists of the supply of salt, has as deep an interest in diminishing the cost of transport as the people, and it was for its own financial advantage, as well as for the benefit of the people, that the Madras line, as we have stated, was originally projected. It was then calculated, that from the increased consumption of salt alone, under a reduced tariff, it would be worth the while of Government to construct the line.

We may here advert to another very important object to be attained by the execution of the Madras Railway, the development of the mineral resources of Southern India by the employment of native iron in its construction. We have reason to believe that parties engaged in the manufacture would contract to deliver this iron at prices not higher than those of English iron, on the spot, while its quality is so superior, that it has been proposed to use it in this country for veneering the common iron rails, to increase their durability.

The political importance of the line may, perhaps, have been to some extent under-rated, from an idea that, as the Madras army is, by its position, removed from the probable scene of important warfare, it is of less consequence to facilitate the transport of the troops, stores, &c., of that Presidency. But it must be evident that no movement of the other armies to the north-west frontiers can ever take place that is not attended with a corresponding move of the Madras army, to supply the stations vacated by the others; so that supposing, for instance, the line to be finished from Calcutta to Delhi, it would still be, as a military work, incomplete, without the corresponding facilities for moving up the troops from Madras.

But in addition to this, and the vast advantages in a political, economical, and strategical point of view to be derived from any railway in India, there are others attaching particularly to the Madras line which deserve attention.

It is to the army of this Presidency that we must henceforth chiefly look for service beyond sea, and the geographical position of its provinces permits, happily, of the safe withdrawal, on an emergency, of a very large disposable force for this purpose. By means of this railway, it could be at any moment concentrated and embarked, as we have before pointed out, either from the Coromandel or the Malabar coast, as the prevailing monsoon might dictate, and brought to bear on any given point where its services were required.

Part I.
Correspondence.

But no object of greater political importance to India can be found than the attraction of British capital to the construction of her railways; and the obvious course to attain it is, to bring out, by adequate encouragement, not such fragments of great lines as, from their inherent disadvantages, cannot be hoped to prove remunerative, but such a one as we have shown the Madras line to be. Although, in deference to the recommendation of Mr. Sims, we have taken 600,000 *l.* as the capital for its construction, the several estimates which have been made by other engineers of greater local experience, leave us no room to doubt that a capital of 400,000 *l.* would suffice for the completing of a single line, such as, in the first instance, we propose to lay down, with stations and rolling stock complete; and the estimates of traffic show very satisfactorily, that on this capital a remunerative dividend may safely be calculated on, after providing liberally for depreciation. The details of these calculations we are ready to lay before the Honourable Court, if required.

By guaranteeing the interest of five per cent. on the moderate capital required for this line, then, it is evident that the most important ends may be attained at no real pecuniary risk to the Government. We venture to assert most confidently, that no one who investigates the question can avoid the conclusion that the line, whatever more it may do, will at least pay five per cent. on its construction, and to do this, is to hold the guaranteeing party harmless, and at the same time to gain for it all the advantages, local and general, present and future, that we have pointed out, and that the formation of a real paying line in India must secure.

From the absence of all engineering difficulties, the Madras line may be completed and in operation in much shorter time than those of the other Presidencies, owing to the formidable obstacles in their way. Here we have no ghauts to tunnel and surmount; no great rivers with shifting beds to bridge; no extensive alluvial plains subject to inundation to traverse. If all this were familiarly known to the British public, as it is to us, we should have no occasion to come to the East India Company for any guarantee; but as this unfortunately is by no means the case, and the English capitalist, from want of local knowledge, is unable to discriminate sufficiently between one India line and another, it is not to be expected that he will subscribe to one which appears to be viewed with disfavour by the Government, and has been refused the guarantee accorded to others. It must be obvious to your Honourable Court, indeed, that after what has taken place, no capital can be raised in this country for making railways in India without the guarantee, until such time as the successful and remunerative working of one at least has demonstrated the substantive advantages of the investment. If the East India Company therefore desire to be relieved of the burden of future and heavier guarantees on this account, and to attract at the same time to Indian railways the capital by which alone they can be carried out to an adequate extent, they will no longer hesitate to concede to the Madras Railway that very moderate, or rather nominal pecuniary support, to which policy as well as justice appear to entitle it, and which the whole community of Madras, as well as those interested here in its welfare, now anxiously expect at their hands.

In conclusion, we shall only add, that having no personal interests to serve in the direction of the undertaking, we shall be quite satisfied if your Honourable Court will undertake the execution of the line by your own officers, should it be considered that the public interests will be better advanced by the adoption of that course.

We have, &c.
(signed) *Duncan Sim,*
J. A. Arbuthnot,

On behalf of the Madras Railway Company.

Gentlemen,

East India House, 23 May 1850.

HAVING laid before the Court of Directors of the East India Company your letter dated the 20th February last, repeating, on behalf of the Madras Railway Company, the expression of your hope that some encouragement may be granted to that company for the construction of a railway in the Madras Presidency, I am commanded in reply to inform you, that instructions have been sent to the Government of India to direct the survey by Mr. Simms, or by some competent engineer officers in the Company's service, of any proposed lines

lines of railway in the Madras Presidency, and that upon the receipt of the reports which will be made upon the relative advantages and expense of such lines, the Court will be prepared to enter into further consideration of the question.

Colonel D. Sim & J. A. Arbuthnot, Esq.
2, Winchester Buildings.

I have, &c.
(signed) *James C. Melville*,
Secretary.

To the Secretary to the Honourable the Court of Directors of the
East India Company.

Sir, Madras Railway Company,
2, Winchester Buildings, London, 17 August 1850

IN the absence of Colonel Sim, I am requested by this Board to address the Honourable Court in reference to the public meeting held at Madras on the 4th of May last on the subject of this railway, the Right Honourable the Governor in the chair.

To the resolutions passed at that meeting, and to the memorial agreed to be presented to your Madras Government, we respectfully solicit the favourable attention of the Honourable Court; and in the hope that these manifestations of the strong and continued interest taken by the Madras community in our proposed undertaking, may dispose the Honourable Court to accelerate its execution by granting, without longer postponement, the concession prayed for by this company; I am to state that by the receipt of additional documents from Madras, we are now in possession of such a body of reports, surveys, levels, and maps, and estimates by Captain Worster and by Captain Collyer, of your Madras Engineers, as would enable any engineer whom the Court may seem fit to appoint, to report to them satisfactorily on the merits, physical features, facilities of execution, and probable cost of the line.

I have, &c.
(signed) *J. A. Arbuthnot*.

Sir, East India House, 7 September 1850.

I HAVE laid before the Court of Directors of the East India Company your letter of the 17th ult., bringing to their notice the resolutions passed at a meeting held at Madras on the 5th May last, showing the interest taken by the Madras community in the proposed undertaking of the Madras Railway Company, and soliciting that the request for encouragement which has before been preferred may now be conceded.

In reply, I am commanded to inform you, that the Court are awaiting the receipt from the Madras Government of a communication upon the subject of a railway in that Presidency, and that until they are in possession of the information which they have instructed to be provided, they must refrain from entering into a further consideration of the question.

I am, &c.
(signed) *J. D. Dickinson*,
Deputy Secretary.

To J. A. Arbuthnot, Esq.,
Madras Railway Company, 2, Winchester Buildings.

Great St. Helen's, Bishopsgate-street,
29 October 1851.

Sir,
REFERRING to our previous correspondence on the subject of the Madras Railway, and understanding that a favourable report on the line has now been received from the Madras Government, we beg leave, on behalf of the company whom we represent, to renew our application to the Honourable Court for the concession of the construction of the Madras Railway, on the same terms and conditions

Part I.
Correspondence.

conditions as have been granted for the lines of Bengal and Bombay to their respective companies.

We trust we may be excused the liberty of soliciting as early a reply to this letter as may be convenient.

To J. C. Melvill, Esq.,
&c &c. &c

We have, &c.
(signed) *Duncan Sim.*
J. A. Arbuthnot.

Sir,

Great St. Helen's, 1 March 1852.

NOT having been favoured with a reply to the letter which we had the honour of addressing to you on the 29th October last on the subject of the Madras Railway, and having recently received from the committee at Madras an urgent appeal calling upon us to renew our efforts to obtain from the authorities in this country the same encouragement for the promotion of railways in that Presidency which has been accorded to Bengal and Bombay, we hope we shall be excused if we again solicit the favour of a reply to our above-mentioned letter.

To James C. Melvill, Esq.
Secretary to the Hon. East India Company.

We have, &c.
(signed) *Duncan Sim.*
J. A. Arbuthnot.

Gentlemen,

East India House, 25 May 1852.

THE Court of Directors of the East India Company having lately received from the Madras Government the information regarding a railway in that Presidency, referred to in my letter of the 7th September 1850, have had under their attentive consideration the application contained in your letter of the 29th October last, for the concession of the construction of that railway on the same terms and conditions as have been granted for the lines of Bengal and Bombay to their respective companies.

I am now instructed to inform you, that, upon being satisfied of the capability of the Madras Railway Company to raise a capital of 500,000 *l.*, the Court will be prepared to enter into an agreement with that company for the execution of a railway at Madras. Referring, however, to the present state of the money market, the Court are of opinion that an interest of 4 *l.* per cent. upon the above-mentioned capital will be sufficient inducement to the contracting parties to undertake the work, and they deem it right therefore to limit their guarantee accordingly. In all other respects the terms of the agreement will be similar to those which are contained in the contract with the East Indian Railway Company, copy of which I forward for your information.

To Colonel D. Sim and J. A. Arbuthnot, Esq.
5 ½, Great St. Helen's Passage.

I have, &c.
(signed) *J. C. Melvill,*
Secretary

Sir,

London, 1 June 1852.

WE have the honour to acknowledge the receipt of your letter of the 25th ult, intimating the disposition of the Court of Directors of the East India Company to guarantee interest at the rate of four per cent. on capital to be raised for the construction of a line of railway in the Madras territory.

The tenor of our former communications to the Court would have apprised them of the anxious interest with which we regard the introduction of railways into the Presidency of Madras, and they will not therefore need any assurance of our readiness to co-operate with them in the measures to be taken for that purpose.

Immediately on receipt of your letter we lost no time in communicating with parties whose experience was of a nature to guide us in determining whether the rate of interest offered by the Court was likely to afford a sufficient inducement to the public to subscribe for the capital necessary to the undertaking.

The tenor of their opinions is, that notwithstanding the value deservedly attributable to a guarantee of the Court of Directors, the rate suggested, taken in

in connexion with the contract proposed to the company, does not hold out such a prospect as to entitle the promoters to feel that confidence of success which could alone justify their submitting the scheme to the public.

Part I
Correspondence

The guarantee accorded to the two other railway companies, established for similar objects in the Presidencies of Bengal and Bombay, is at the rate of five per cent. The promoters of the Madras line feel that the present abundance of money and low rate of interest entitle the Court of Directors to expect that capital can be obtained under existing circumstances at a lower rate than that found necessary in less favourable times. But upon inquiry it appears that, notwithstanding the progress made towards completion of the other lines, the shares of those companies are to be bought at the present time to pay an interest exceeding four per cent., while their actual price is considerably enhanced by an expectation entertained of the necessity of a further issue of shares to the existing shareholders on the guarantee of five per cent, which is equivalent to a considerable increase in the rate of interest assumed in the value of the existing stock.

Under these circumstances, we are advised, and we deem it our duty to submit to the Court, that the proposed guarantee should be increased from four to 4½ per cent., at which latter rate we are informed that there is every reason to believe the capital could be raised. It is obvious that it would be detrimental to the great object which the Court and the promoters of the Madras line have in view, to introduce the scheme to the public on a basis not calculated to meet with favour. Upon the best information we can obtain, we are assured that the rate of interest we have suggested is not more than sufficient to effect the object, and in urging the Court to concede it, we have no desire but to obtain that measure of support which we believe to be necessary to give effect to the policy of the Court.

In confirmation of the conclusion at which we have arrived, we beg leave to enclose a certificate from some of the parties whose information we have sought, and whom we consider, from their position, to have the best means of forming a correct opinion on the subject.

To James C. Melvill, Esq.
&c. &c. &c.

We have, &c.
(signed) *Duncan Sim,*
J. A. Arbuthnot

We, the undersigned, are of opinion that a guarantee by the Honourable East India Company of four per cent. interest in the terms of the existing Indian railway guarantee would not be a sufficient inducement to the public to take shares in a company formed for raising 500,000 *l.* capital for a railway in Madras; and we are also of opinion that it might be done on a guarantee of 4½ per cent.

(signed) *James Capel Norbury Trotter & Co.*
William Hammond.
R. Hutchins & Harrison.
Foster & Braithwaite.

Gentlemen,

East India House, 7 June 1852.

I HAVE laid before the Court of Directors of the East India Company your letter dated the 1st instant, representing with reference to the measure of support which the Court have expressed their readiness to extend to a company for the construction of a railway at the Madras Presidency, that a guaranteed interest of four per cent. will not afford sufficient inducement to the public to subscribe for the necessary capital, and that after full inquiry upon the subject, you are of opinion that a lower rate than 4½ per cent. would not attain that object.

In reply, I am instructed to acquaint you that the Court have resolved to accede to your proposition, and will guarantee an interest of 4½ per cent. per annum upon the capital raised for the purpose above mentioned, so soon as they shall have been informed that the required amount (500,000 *l.*) has been subscribed for.

To Colonel Duncan Sim,
J. A. Arbuthnot, Esq.,
Madras Railway Company.

I have, &c.
(signed) *J. C. Melvill,*
Secretary.

Part I.
Correspondence.

Sir,

London, 12 June 1852.

WE have the honour to acknowledge the receipt of your letter of the 7th instant, informing us that the Honourable the Court of Directors had been pleased to accede to our proposition of making the guarantee $4\frac{1}{2}$ per cent., in place of four per cent. on the capital proposed to be raised for the construction of a railway from Madras.

We beg leave to state that we are now taking active measures for raising, through the instrumentality of a joint-stock company, the prescribed amount of capital, viz 500,000 *l.*, and that as soon as the requisite number of shares are subscribed for, we shall again have the honour of addressing you.

We are, &c.
(signed) *Duncan Sim,*
J. A. Arbuthnot.

To J. C. Melvill, Esq.,
Secretary to the East India Company

Madras Railway Company, 2, Moorgate-street,
London, 5 July 1852.

Sir,

WITH reference to your letter of the 7th ultimo, I have the honour to acquaint you, for the information of the Honourable the Court of Directors, that the required capital of 500,000 *l.* for the construction of a railway at Madras has been subscribed

I beg at the same time to state, that we are prepared to undertake the construction of the railway under the same conditions of supervision and control on the part of the East India Company and Local Government, as is exercised in the cases of the lines of Bengal and Bombay.

As time is of importance, instructions will be immediately given to our solicitors, Messrs. J. C. & H. Freshfield, to prepare, in communication with the solicitors of the Honourable Court, the required deeds which we are prepared to execute as soon as approved of by the Honourable Court.

To J. C. Melvill, Esq.
&c. &c. &c.

I have, &c.
(signed) *Duncan Sim,*
Chairman.

Sir,

East India House, 21 July 1852.

I HAVE received and laid before the Court of Directors of the East India Company your letter of the 5th instant, stating that the required capital of 500,000 *l.* for the construction of a railway at Madras has been subscribed, and that the Company which has been formed for that purpose is prepared to accede to the same conditions of supervision and control on the part of the East India Company, as is exercised in the cases of the lines of Bengal and Bombay.

I am now directed to inform you that a deed is in course of preparation by the East India Company's solicitor, which will contain precisely the same terms as those included in the contract with the East Indian Railway Company, copy of which I forwarded to you with my letter of the 7th ultimo, excepting as to the rate of interest guaranteed by the Court, which will be $4\frac{1}{2}$ per cent. instead of five per cent. per annum.

I have also to state that, in view to the early commencement of operations, the Court will take immediate steps for appointing the officer referred to in clause 10, to associate with your Board.

I am likewise directed to request that measures may be taken by the railway directors for the payment into the East India Company's treasury of the sum of 100,000 *l.* by the 1st October next. The further instalments of the capital will be provided for in the deed of contract.

I have, &c.
(signed) *J. C. Melvill,*
Secretary.

To Colonel Duncan Sim,
Chairman Madras Railway Company,
5 $\frac{1}{2}$, Great St. Helen's.

PART II.

CORRESPONDENCE between the Board of Commissioners for the Affairs of India and the Court of Directors of the East India Company, regarding the Madras Railway Company.

Part II
Correspondence

Sir,

East India House, 1 June 1849

I AM commanded to forward copy of a resolution passed by the Court of Directors on the 30th ultimo, in which it is proposed that terms corresponding with those which have been offered to the East Indian and Great Indian Peninsula Railway Companies be granted to the Madras Railway Company in respect of a capital of six hundred thousand pounds (600,000 *l.*), subject to the same conditions, except as regards the preliminary deposit, which shall be fixed at forty thousand pounds (40,000 *l.*); and I am desired to request that the said resolution may be submitted for the approbation of the Board of Commissioners for the Affairs of India.

I have, &c

James Wilson, Esq., M.P., &c. &c. &c.
India Board.

(signed) James C. Melvill,
Secretary

At a Court of Directors of the East India Company, the 30th May 1849.

RESOLVED, That the Court continuing to entertain the opinion that it would be just and expedient to extend the experimental introduction of railways in India to the Madras Presidency, terms corresponding with those which have been offered to the East Indian and Great Indian Peninsula Railway Companies be granted to the Madras Railway Company in respect of a capital of six hundred thousand pounds (600,000 *l.*), subject to the same conditions, except as regards the preliminary deposit, which shall be fixed at forty thousand pounds (40,000 *l.*), this resolution being submitted for the sanction of the Board of Commissioners.

Sir,

India Board, 17 August 1849.

YOUR letter of the 1st of June and the resolution of the Court of Directors contained therein, to the effect that similar terms as have been granted to the East Indian and Great Indian Peninsula Railway Companies should be conceded to a company, the object of which is to construct a railway in the Madras Presidency, in respect to a capital not to exceed 600,000 *l.*, have been submitted to the careful consideration of the Board of Commissioners for the Affairs of India, who regret that they feel compelled, after a careful review of the circumstances of the case, to take a view of the application of the Madras Railway Company different from that adopted by the Court; and for the present, at least, to withhold their sanction from the proposal contained in the Court's resolution.

In the first place, the Board would wish it to be distinctly understood that they have not come to this decision from any misgivings as to the great utility of railways to India generally, or from any feeling that they would be less advantageous in some of their most important features in Madras than in the other Presidencies of India, or that they think Madras less deserving of every encouragement in the development of its commercial and industrial resources than the other Presidencies of India; on the contrary, they at once admit that if their decision had been governed only by these considerations, they would have felt no difficulty in acquiescing at once to the views taken by the Court.

But the Board cannot overlook the fact that the conditions on which the experimental lines in Bengal and Bombay are to be made, impose on the Government of India a heavy responsibility; in fact, the whole risk of the undertaking; and while they think the risk so undertaken is justifiable by the greatness of the object in view, yet they would not have felt such to have been the case had they not been placed in possession of much more perfect information in relation to the projects of the two companies to which those conditions have been extended, than they have yet been in relation to the Madras proposal.

In referring to the correspondence which took place in relation to the

companies in 1847, the Board took the opportunity on several occasions, but particularly in their letter of the 27th of July in that year, to call the attention of the Court not only to the fact, that before the original terms given to the East India Company were entertained, the East India Company was in possession of the opinion of an eminent engineer, deputed by the Court, as to the result of his actual surveys and inspection on the spot, as to the practicability of the undertaking as well as the best route to be taken for the accomplishment of a clear and well-defined object combining great political and commercial objects, but also to the fact, that it was laid down as a principle on which the aid of the East India Company should be given, that such preliminary surveys and information should be possessed by the East India Company, before such heavy responsibilities were undertaken.

At that time the East India Railway Company had been fully reported upon by Mr. Simons, the engineer of the company; and the reports and surveys of the company itself had been completed, tested, and reported upon. The Bombay Company was not then in the same position, and the sanction of the Board to place it in the same position as the East Indian Railway Company was withheld for that reason, and it was not till it was shown that the Bombay Company had made adequate surveys and plans, and that the East India Company was satisfied not only on that score, but also in relation to the undoubted propriety of adopting the proposed line, as a beginning, that similar terms were conceded to that company.

At that time the Madras Company was dissolved, and had ceased to exist from the beginning of June in the same year, and when it was last proposed to the Board in the Court's letter of the 26th August 1847 to extend the same terms to a railway company at Madras, the Board declined to consider it on that account; but even had the company still existed, the same reasons so clearly laid down in the Board's letter of the 27th July would have then been equally strong, namely, the entire absence of such information as could justify the East India Company in incurring so much risk as the proposal involved. From that day to the present that company has been defunct, and no steps appear to have been taken either by the Government of India or by private individuals, to procure that information which was absolutely necessary to reconcile all the conflicting opinions and calculations which were entertained in relation to the project abandoned in 1847, and now again revived.

The chief distinction, therefore, which the Board is desirous of drawing between the present application and those in relation to the East Indian Railway Company and the Great Indian Peninsula Company, is that while in both those cases careful surveys and plans had been completed, and no doubt existed as to the direction and course which the lines should take, and the whole had been carefully reported upon, there is, up to the present time, no such sufficient information before the East India Company in relation to Madras.

But independent of this important difference, there is another reason which weighs considerably with the Board at the present moment, which has no peculiar application to Madras or any other part of India. The Board feel strongly the great novelty of the undertaking, not so much perhaps in itself, as in the mode in which it is to be carried into effect. In India railways themselves are great experiments; not less so is the novel connexion between the railway companies and the Government of India. Great pains have been bestowed in framing the contracts between the East India Company and the railway companies, in order to secure a successful and harmonious fulfilment of the great objects in view; and the Board are of opinion, that before the East India Company determines to increase its risks in these undertakings, it would only be common prudence to have some experience of the practical operation of the system adopted.

Indeed, the Board are ready to admit that they would rather have confined so novel an experiment in the first instance to a single undertaking, had not the peculiar circumstances of the two companies now sanctioned, the great amount of labour and money which they had both expended, the exactness of the surveys, plans, and reports which they had both produced, the perseverance which they had equally shown, and their continued negotiations with the East India Company, rendered it impossible to treat them differently; but no such reasons exist for including the revived Madras Company immediately in this experiment.

On these grounds, the Board have come to the conclusion that it is a sound policy to defer for the present complying with the request of the Madras Railway Company,

Company, for the twofold reason; 1st, that much more exact information is required as to the merits of the particular line proposed, not only as to its engineering facilities, but more especially as to its position in relation to the great political and commercial objects which a railway in Madras should possess, as well as to any general system of railways in India of which it should hereafter become a part; and, 2d, that at least some experience should be obtained of the working of this new system of performing public works in India, before it is further embarked in, and the Board feels that it can adopt this course without inflicting any hardships or cause of complaint on the individuals constituting this new company.

In conclusion, the Board regret the delay which has occurred in making this reply, which has arisen from a desire to give so important a subject the full consideration which it deserves.

J. C. Melvill, Esq.,
&c. &c. &c.

I have, &c.
(signed) *James Wilson*

Sir,

East India House, 16 August 1849

ADVERTING to the resolution of the Court of Directors of the East India Company forwarded with my letter of the 1st June last, proposing to extend assistance to the Madras Railway Company in view to the construction of a line of railway at that Presidency, I am commanded to forward, for the purpose of being submitted to the Board of Commissioners for the Affairs of India, copy of a letter from Mr. Arbuthnot, the acting chairman of the railway company, in which he encloses copy of a report of proceedings which have taken place at Madras in connexion with the projected undertaking, and expresses a hope that a speedy and favourable decision may be passed upon the application from the railway company to which the proposition now before the Board has reference

I have, &c.
(signed) *James C. Melvill,*
Secretary

James Wilson, Esq. M.P., &c. &c. &c.
India Board.

Sir,

India Board, 30 August 1849

IN reply to your letter of the 16th instant, enclosing the copy of a letter, with other papers, received from Mr. Arbuthnot, the acting chairman of the Madras Railway Company, I am directed by the Commissioners for the Affairs of India to inform you, that Mr. Arbuthnot had before transmitted a copy of the above correspondence to this office, and that it had been duly considered by the Board, before my letter of the 17th instant was despatched.

J. C. Melvill, Esq
&c. &c. &c.

I have, &c.
(signed) *Hugh Stark.*

Sir,

East India House, 30 August 1849

1. THE Court of Directors of the East India Company have had under their consideration your letter of the 17th instant, expressing the sentiments of the Board of Commissioners for the Affairs of India upon the terms which the Court, in their resolution of the 30th May last, proposed to offer for the construction of a railway in the Madras Presidency.

2. The Court much regret that these sentiments are not in accordance with their own, as they cannot admit that the reasons adduced by the Board constitute a valid objection to their proposition to extend to Madras the benefits which have been conceded to the other Presidencies.

3. With respect to the objection that more perfect information is required as to the physical aspect of the country through which the proposed railway will pass before encouragement should be given to the undertaking, the Court desire me to observe, that they are fully sensible of the necessity of taking every due precaution in the selection of the best route, and of ascertaining the true nature of any difficulties which may present themselves in the line to be adopted, but

Part II.
Correspondence.

they would at the same time submit that a large amount of information on the subject has already been obtained, at considerable expense, by those who were first associated for the construction of a railway in the Madras Presidency, and the surveys and investigations which were made formed the foundation for estimates, which show that the line of country between Madras and Wallajahnuggur possesses facilities for the construction of a railway far greater than those of the Bombay Presidency, the estimated expense at Madras being 600,000 *l.* for 70 miles, and at Bombay 500,000 *l.* for 35 miles. It will be in the recollection of the Board that this information was submitted by the Government of India, in the shape of documentary evidence, to Mr. Simms, for his examination and opinion, in 1845, and that his report thereon was confirmatory of the views which have been taken as to the practicability, expediency, and cost of the undertaking.

4. The Court, however, do not mean that an unreserved support should be given to the specific line now proposed. Their sanction to the undertaking would be given, subject to the decision of the local Government as to the necessity of a more exact survey being made, and to the ultimate selection by them of the line which should be adopted. The late proceedings at Madras, accounts of which were forwarded with my letter of the 16th instant, manifest the great attention which has been drawn to the subject, and the strong feeling which exists upon it; while it shows also what is the opinion of those whose local knowledge and experience best qualify them to form a judgment as to the practicability and desirableness of the proposed undertaking.

5 The Court submit that, if the Madras Railway Company had not been dissolved, it would have been unjust to withhold the extension to it of the same advantages as have been conceded to the other companies. The dissolution of the company was the consequence of the delay of the authorities in coming to a decision upon the subject. One result has been, that the preliminary expenses have been defrayed by the shareholders of the defunct company, and it appears to the Court that this circumstance furnishes a stronger reason for extending the assistance of Government to the revived company, the parties being understood to be the same

6. The second objection which the Board entertain to the Court's proposition is, that sufficient for an experiment of railway undertakings in India has already been authorised. The Court would, however, as they did in the correspondence on the subject in the year 1847, again urge that the result of an experiment in one Presidency cannot be regarded as a criterion of the probable success of a similar attempt in another, and the fact that Bombay has been allowed the advantage of an experimental line, before that in the Bengal Presidency has been tested, would seem to admit that this position has been recognised by the Board; and the Court would submit that the same views which led the Board to acquiesce in the proposal to sanction the construction of a railway at Bombay will justify the adoption of a like course in regard to Madras. Further, between Madras and the other Presidencies there appears to be a marked distinction, and one which is highly favourable to the claims of the former; for whilst facilities exist which would allow of the construction of a railway at Madras at an expense of little more than one-half that required at Bombay, Madras has a more urgent call for the establishment of the modes of internal communication, from the absence of water carriage. This want of competing modes of transit thus opens to the experiment an additional element of success, while it will render the establishment of a railway a far greater boon to the inhabitants than the same accommodation can be in those parts of India which possess greater advantages for transport.

7. In conclusion, I am commanded to state, that feeling, as the Court strongly do, that it is due to the interests of the Madras Presidency to facilitate, as far as is consistent with a due regard to caution, the construction of a work which is universally recognised as the source of political, commercial, and agricultural improvement, they feel it their duty again to bring the subject to the favourable consideration of the Board.

I have, &c.
(signed) *James C. Melvill*, Secretary.

Sir,

India Board, 17 September 1849.

Part II.
Correspondence.

YOUR letter of the 30th August, in which you inform the Board that the Court of Directors was desirous that its resolution of the 30th May last, by which it was proposed to extend to a railway company in Madras the same privileges as had already been given to the East Indian and Great Indian Peninsula Railway Companies, should be reconsidered by the Board, has received that attention from the Board which its great importance deserves.

In my letter of the 17th August I expressed in the most ample terms that the Board was not actuated in the decision to which it had come by any feeling that the Presidency of Madras was less entitled to encouragement at the hands of the Government than those of Bengal and Bombay. The Board is again desirous of repeating this feeling, while it is compelled to adhere to its former decision, to suspend, at least for a time, its approval of any proposal for further extending the construction of railways in India on so novel a principle as that which (as an experiment) has been adopted.

The Board have very carefully considered the additional reasons urged in your letter of the 30th August in favour of the resolution of the Court, but they have not removed the chief objections entertained by the Board against sanctioning any further risk of this kind, until some experience shall have been obtained as to the working of a plan tried for the first time. The grounds upon which the objections of the Board rested were so fully explained in the Board's letter of the 17th August, that it is not felt to be necessary to repeat them.

The Board would, however, remark, in reply to the reference made in your letter to the report of Mr. Simms, that that report was so much qualified (being founded merely on documentary evidence, to the value of which he could not speak), as to be insufficient data for any actual proceeding to be founded upon it.

The Board is unwilling to enter into the subject of comparing the respective claims of the different Presidencies, referred to in the Court's letter, as it is not on such considerations that its conclusion has been formed, it having been actuated only by a desire that, in incurring such larger risks as these undertakings involve, every possible precaution should be taken which prudence can dictate.

In conclusion, the Board desire to express a hope that additional information from India, and experience of the successful result of the plan adopted in its practical working with the companies to which it has already been extended, may enable the Board, at no very distant day, to concur in the propriety of further extending the same principle to a railway company in Madras.

I have, &c.

(signed) *James Wilson.*

J. C. Melvill, Esq., &c. &c. &c.

Sir,

East India House, 14 March 1850.

I AM commanded by the Court of Directors of the East India Company to forward to you, for submission to the Board of Commissioners for the Affairs of India, a further letter which has been received from Colonel Sim and Mr. J. A. Arbuthnot, soliciting, on behalf of the Madras Railway Company, the Court's encouragement to the construction of a railway in that Presidency.

Dated 20 Feb 1850.

The Court desire me to state, that they continue to be strongly of opinion that some encouragement should be given to the construction of an experimental railway in the Madras Presidency, and they request to be favoured with the views which the Board now entertain upon this question.

I have, &c.

James Wilson, Esq., M. P., &c. &c. &c.,
India Board.(signed) *James C. Melvill.*

Sir,

India Board, 19 April 1850.

THE Commissioners for the Affairs of India have had under their consideration your letter of the 14th ultimo, transmitting a letter from Mr. J. A. Arbuthnot, again soliciting the encouragement of the Court of Directors of the East India Company to the construction of a railway at Madras.

Part II.
Correspondence.

My letters of the 17th August and 17th September last, explained at much length the reasons which induced the Board to postpone giving their present assent to a similar application, and as nothing has occurred since then to alter the views of the Board with respect to this subject, I am commanded to refer the Court to those letters, as representing the ground upon which the Board feels compelled to adhere for the present to that decision.

But with respect to a necessary preliminary measure, adverted to in the same letter, I am directed to suggest to the Court that it is very desirable that instructions should be sent to the Indian Government to despatch Mr. Simms to Madras, the moment he can be spared from Bombay (which the Board hope will be very soon), in order to make such preliminary survey of, and report on, the proposed lines, as the Board consider it to be essential that the authorities at home should possess, prior to coming to any decision in respect thereto.

J C Melvill, Esq

I have, &c.
(signed) *James Wilson*

Sir,

East India House, 23 April 1850

I HAVE laid before the Court of Directors of the East India Company your letter of the 19th instant, stating, in reply to my letter of the 14th ultimo, that the Board still adhere to their determination to postpone for the present giving their assent to the grant of encouragement to a company for constructing a railway in the Madras Presidency, but suggesting that Mr Simms should be directed to survey and report upon the proposed lines in that Presidency, as an essential preliminary step, before coming to any decision in respect thereto

In accordance with this suggestion, I am commanded by the Court to submit, for the Board's approval, the draft of paragraphs to India in the Financial* Department herewith transmitted. The Court desire me, however, at the same time, to observe, that after a perusal of the reports which have been received (including one from Mr Simms) upon the subject of a railway at Madras, they never entertained any doubt as to the practicability and advantage of executing such a work; and as to the necessity of ascertaining the line which it would be most desirable to adopt, before encouragement is given to any company, they would refer to the cases of the existing companies, neither of whose lines have at this moment been selected, the question having been left for the determination of the local Governments, who, being in communication with the officers of the railway companies, have the benefit of their opinions. With this experience, the Court were of opinion that time would be gained in effecting this important object by recognising a Madras Railway Company, and affording them sufficient encouragement

I have, &c

(signed) *James C. Melvill,*

James Wilson, Esq, M P., &c &c &c,
India Board.

Secretary.

Sir,

India Board, 4 May 1850.

THE Commissioners for the Affairs of India direct me to return Draft No. 285, to the Government of India in the Financial* Department, which accompanied your letter of the 23d ultimo, to the first paragraph of which they have added a passage, because they consider it important more fully to explain the object to which Mr. Simms' attention should be directed in making a survey of the proposed lines of railway at Madras.

With reference to the concluding remarks in your letter, the Board direct me to observe, that there appears to be a misapprehension as to the position of Madras regarding the line of railway to be adopted, which is different from that of the other Presidencies.

As to the latter, although the precise lines of the experimental railways have been left to the local Government, so far as engineering facilities may regulate them, yet their general course, with a view to reach fixed points, has been determined by the Court. But at Madras, so far as the Board are aware, no line has been proposed or surveyed since the more extended introduction of railways into India has been contemplated, and the Court have yet no information before them to decide whether or not it would be expedient to construct a railroad first

* See Financial Despatch to the Governor general of India in Council, No. 16, dated 15 May 1850.

* See Financial Despatch to the Government of India, No. 16, dated 15 May 1850.

first in the direction of Wallajahnuggur in order to its connexion with the general scheme of railway communication in India which is now in progress.

Such a preliminary survey and report as are now proposed, are therefore necessary, before the authorities at home can come to any satisfactory decision with respect to railways in the Presidency of Madras, the absence of which alone would be a sufficient reason for delaying any such decision in the meantime

But the Board must refer the Court to other important considerations, which are stated in their former letters on this subject, for their reasons why it is desirable to postpone any determination with regard to the application of the Madras Railway Company at present, to which reasons the Court have not referred in their letter now under reply.

James C. Melvill, Esq.
&c. &c. &c.

I am, &c.
(signed) *James Wilson.*

Part II
Correspondence.

Sir,

East India House, 14 April 1852

THE Court of Directors of the East India Company having lately received from the Madras Government the required information regarding a railway in that Presidency, have had under their attentive consideration the application contained in a letter from Colonel D. Sim and J. A. Arbuthnot, Esq., dated the 29th October last, for the concession of the construction of that railway on the same terms and conditions as have been granted for the lines of Bengal and Bombay to their respective companies; and I am commanded by the Court of Directors to forward to you, for submission to the Board of Commissioners for the Affairs of India, a copy of a resolution passed by the Court on the 13th inst., proposing that, as they contemplate a great extension of the railway system in India, they should adopt the present opportunity of testing the cheapest and most efficient mode of constructing such works, by taking the present work on themselves; and that, with the sanction of the Board of Commissioners for the Affairs of India, instructions be issued to the Government of Madras to prepare to undertake the work accordingly.

C. L. Cumming Bruce, Esq. M. P.
&c. &c. &c.
India Board.

I have, &c.
(signed) *James C. Melvill,*
Secretary.

Sir,

India Board, 18 May 1852.

THE Commissioners for the Affairs of India have had under their consideration the resolution of the Court of Directors of the East India Company enclosed in your letter of the 14th April, proposing that the construction of a railway at the Presidency of Madras should be undertaken by the Government

I am directed to observe, with respect to the resolution referred to, that no other ground is alleged for that resolution than the expediency of "testing," by the method of execution now proposed, "the cheapest and most efficient mode of constructing railway works, in the contemplation of a great extension of the railway system in India."

The Board have had the subject very fully under its consideration in connexion with the several despatches received from the Government of Madras, and also with reference to the letters from Colonel Sim and Mr. Arbuthnot to the Court, dated 29th October and 1st March last, of which copies have been forwarded to the Board; and, notwithstanding the disposition of the Board to attach due weight to the judgment expressed in a formal resolution of the Court of Directors, they do not find in the ground above-mentioned sufficient cause for acceding to the views of the Court in the present instance.

The mode adopted for the construction of the two railways in India now in progress was selected after due consideration of the relative advantages of executing such works either with the public money and under the direction of the local Governments, or through the medium of contracting companies competent to undertake them. The arrangements now in force were framed for carrying out the latter system, and under them the works appear to have been conducted hitherto successfully and economically

As it must ever be an object of very high importance to attract the investment

Part II.
Correspondence.

ment of British capital, skill, and enterprise to undertakings for the improvement of our empire in India, the system of contract is the more eligible, as being eminently conducive to that end. It appears, moreover, inadvisable to have recourse to a new experiment while the system now in operation seems to have been attended with success.

The Board also feel themselves bound to state that they entertain considerable doubts whether an equally effective control over the expenses of such works could be maintained in India, under general instructions from the Home Authorities, as that which is now exercised through the Railway Boards meeting in London, under the constant and immediate supervision of the Court.

It ought also to be observed, that the Madras Railway now projected would afford a very imperfect test of the cost of execution of other railways in India, inasmuch as it is one which offers very peculiar facilities of construction.

Entertaining these views of the subject, the Board, although reluctant to insist upon their opinions in opposition to those of the Court of Directors, feel it necessary to communicate their dissent from the conclusion expressed in the resolution of the Court transmitted with your letter, and they trust, that after this explanation of their views, the Court will proceed to adopt the proper measures for negotiating and contracting with a company, competent to the undertaking, for the construction of a railway at Madras, in the same manner as has been done with respect to the East Indian and the Great Indian Peninsula Railway Companies, now engaged in the construction of railways in Bengal and at Bombay.

J. C. Melvill, Esq.

I am, &c.
(signed) C. L. Cumming Bruce.

Sir,

East India House, 20 May 1852.

I HAVE laid before the Court of Directors of the East India Company your letter dated the 18th instant, expressing the views of the Board with reference to the means by which the proposed railway in the Madras Presidency should be constructed.

The Court desire me to express their regret that the Board do not concur with them in opinion as to the expediency of committing the execution of this work to the local Government; but while they continue to entertain the views upon the subject which were embodied in their resolution submitted with my letter of the 14th ultimo, they will abstain from causing any further delay in the commencement of the railway by additional representations in support of their opinions, and beg to submit for the approval of the Board of Commissioners the accompanying letter to Colonel Sim and Mr. Arbuthnot, proposing the terms on which the Madras Railway Company shall undertake the execution of the railway.

I have, &c.
(signed) James C. Melvill, Secretary.
C. L. Cumming Bruce, Esq., M. P., &c. &c. &c.
India Board.

Sir,

India Board, 24 May 1852.

THE Commissioners for the Affairs of India observe with satisfaction from your letter of the 20th instant, that the Court of Directors have determined not to press further their opinions with regard to the mode of constructing a railway at Madras, but to adopt the method which the Board have pointed out as, in their view, the most desirable; and I am directed to return, with the Board's sanction, the proposed letter to Colonel Sim and Mr. Arbuthnot, signifying the terms on which the Court are prepared to authorise the execution by a railway company of the projected work at Madras.

I have, &c.
(signed) C. L. Cumming Bruce.
J. C. Melvill, Esq., &c. &c. &c.

Sir,

East India House, 2 June 1852.

Part II
Correspondence.

WITH reference to the correspondence which has passed upon the subject of employing a company as the means by which a railway should be constructed in the Madras Presidency, I am instructed by the Court of Directors of the East India Company to forward a further communication which has been received from Colonel D Sim and Mr. Arbuthnot, who represent that company, stating that a guaranteed interest of four per cent. does not afford sufficient inducement to the public to subscribe for the capital required for the undertaking, and that an increased measure of support, to the extent of one-half per cent, will be necessary to effect the object.

The Court desire me to state, that after a consideration of the circumstances represented by these gentlemen, they are prepared, with the sanction of the Board, to offer a guaranteed interest of $4\frac{1}{2}$ per cent. on capital to be raised for the construction of a line of railway at the Madras Presidency.

I have, &c.

(signed) *James C. Melvill*, Secretary.

C. L. Cumming Bruce, Esq., M. P.
India Board.

Sir,

India Board, 5 June 1852

I AM directed by the Commissioners for the Affairs of India to request that you will signify to the Court of Directors of the East India Company that they have considered the communication in your letter of the 2d instant, stating that the gentlemen to whom the proposition was forwarded for constructing a railway at Madras by means of a company, have represented that a guaranteed interest of four per cent. per annum does not afford sufficient inducement to the public to subscribe for the capital required, and that an interest of $4\frac{1}{2}$ per cent. will be necessary to effect that object, to which amended terms you intimate that the Court are prepared to accede.

The Board presume that the Court have fully satisfied themselves, by a careful consideration of all the circumstances of the case, and of the present state of the money-market, that it is impracticable to obtain the capital for the purpose required at a lower rate than for a guaranteed interest of $4\frac{1}{2}$ per cent., and under that persuasion they consent to the proposition which the Court have placed before them.

I have, &c.

(signed) *C. L. Cumming Bruce*.

J. C. Melvill, Esq., &c. &c. &c.

PART III.

OFFICIAL REPORTS, &c., on the subject of a RAILROAD in the *Madras* Presidency.

Part III.
Official Reports
&c.

FINANCIAL DESPATCH from the Court of Directors of the East India Company to the Governor-General of India in Council, No. 16, dated 15 May 1850.

Para. 1. WE are desirous, before the termination of Mr. Simm's engagement, that his services should be made available for the inspection and survey of any proposed lines of railway in the Madras Presidency, having reference, as in the case of his survey of the proposed railway in Bengal, not to an experimental portion only, but to the ulterior destination of such a mode of conveyance as, forming part of a general system, the object of which would be to facilitate communication for political as well as commercial purposes, and to effect more ready intercourse with other Presidencies.

2. We desire therefore, as soon as Mr. Simms has concluded his duties at the Bombay Presidency, you will place his services at the disposal of the Government of Madras for that purpose.

3. In the event of Mr. Simms being prevented from proceeding to the Madras Presidency, you will direct the employment of some of our engineer officers by the Madras Government, who, we doubt not, will adopt every means in their power for securing an efficient survey, and will transmit to us, without delay, any reports which they may receive, in order that we may judge with accuracy of the expense and advantages of a railway undertaking in that Presidency.

PUBLIC LETTER from the Governor in Council at *Fort St. George* to the Court of Directors of the East India Company, dated 7 June, No. 16, of 1851.

Para. 1. IN para. 44 of our despatch dated 12 November, No. 34, of 1850, we intimated having appointed Major T. T. Pears to survey and report upon the lines of railway that might be proposed in this Presidency.

2. We have now the honour to lay before your Honourable Court the accompanying copy of that officer's valuable and interesting report on the subject, in which the importance and feasibility of constructing a railway from Madras westward, we consider have been clearly shown, as also the beneficial results, direct and indirect, which must follow the introduction of railroads into this Presidency.

3. It will be seen that Major Pears, in the first instance, applied himself to the determination of the best line for a railway between Madras and Wallajahnuggur, as the points contemplated by the Madras Railway Committee, and has submitted the above report in anticipation of his surveys and estimates, which are not yet ready, in order to lay before us as early as possible the information he has obtained, and the conclusions he has arrived at, in regard to the expediency of adopting the line proposed by the railway committee, or rather of confining it within the limits contemplated by the committee.

4. We fully concur in the views expressed by Major Pears, that the proposed railway (para. 83) should be a Government undertaking; that a single line, with the means of laying down a double line (paras. 76 to 79), will be sufficient for the present; and that it is not necessary to adopt the highest rates of speed attained in England.

5. With regard to the direction of the line, there can be no doubt that it should be westward, but to what point, is a question of considerable importance.

6. Major Pears expresses strongly his conviction that the line to Wallajahnuggur is too short to furnish a satisfactory experiment, or to produce any marked improvement. He notices as an unfavourable circumstance that the proposed terminus falls short of two rivers, the Ponay and the Palar, both unbridged.

7. He thinks that the railway should be extended to (Vaniambady as a terminus) Vaniambady as the line upon which there is the greatest amount of traffic, and one which, from the favourable circumstances under which it might be constructed and worked, is most likely to exhibit favourable results. Vaniambady, he observes, has a population of from 6,000 to 8,000, including the suburbs. It is situated at a point where the traffic from Madras branches into two channels, towards Salem, Coimbatore, and Malabar by the one, the Mysore territories and Canara by the other. The advantages of this line, according to his view, are a greater amount of traffic in proportion to its extent than any other that could be selected, and greater cheapness of construction, as involving fewer works of magnitude, the bridges across the Ponay and Palar being the only works of magnitude, and those attended with no difficulty, and no expense that would not be amply counterbalanced by the cheapness of the line, and the importance which the railway would derive from the passage of those two rivers.

The population of Wallajahnuggur and the town of Raneepet and Arcot, within two miles of it, amounts to 44,000.

8. He asserts that (para. 61) the traffic over each mile of this extended line is even now not much below that on the shorter one; but the longer line would exercise a far greater influence on its amount, and the profits arising from it would probably be greater, while its usefulness would be much more extended. Already, he observes, there is a considerable traffic by the trunk road from the districts of Trichinopoly, Madura, and Dindigul, which would be increased by a railway terminating at Vaniambady. Major Pears reckons that at present by far the greater part of the traffic which passes from Wallajahnuggur to Madras, comes from Vaniambady, while there is between the latter place and Vellore an additional amount not far, if at all, short of that which joins the present at Wallajahnuggur from other channels. The railway being extended to Vaniambady, Major Pears assumes troops and military stores for the southern division of the army would be sent by this route. As regards passengers and the conveyance of troops and stores, he remarks, that a line starting at Madras that would place them 130 miles on their road to Bangalore, Salem, Coimbatore, Malabar, the Neilgherry and Sheewaroy Hills, would afford greater accommodation than any other line of equal length. Finally, he observes, that this would derive additional importance from the town of Vellore, with a population of 120,000 (83 miles from Madras), far surpassing Arcot in political and military importance.

9. Major Pears proposes Vaniambady, but perhaps Gorriattum or Vellore would be a more advantageous position for the terminus.

10. Bangalore is slightly to the north of a line running due west of Wallajahnuggur, while Vaniambady is 17 or 18 miles to the south of it. Gorriattum and the Old Nackanarry Pass are pretty nearly due west. The road by Vaniambady to Bangalore is disapproved, both on account of the additional distance caused by the line trending so far to the south, and also on account of the difficulties from the natural features of the country between Vaniambady and Ossoor, which render it the least eligible way of access to the Mysore territories. It is therefore in contemplation to change the line of the high road from Madras to Bangalore, and to carry it by Chittoor and the Moogly Pass. When the road to Chittoor is made and the Moogly Pass improved as proposed, there can be no doubt that the most part of that main portion of the traffic by Vaniambady, which Major Pears speaks of as branching off at that point to the Mysore territories and Canara, will cease to pass that way.

Gorriattum as a terminus

11. For this reason, while Vaniambady would probably be a good terminus for traffic to and from Salem, Coimbatore, Malabar, &c., it might not answer so well for Mysore, &c. Major Pears himself shows that the extension of the railway to Vaniambady would not benefit the Ceded Districts, nor the western talooks of North Arcot above the Ghauts. Bellary, he observes, might be benefited by its being carried across the Ponay River six or seven miles west of Wallajahnuggur, but not further.

12. The point which he last indicates (a place called Trivellum) is that at which the new road by Chittoor and the Moogly Pass, into Mysore, and towards the districts of Cuddapah and Bellary, is to commence, by which no doubt a large part of the exportable produce of Mysore, Bellary, Cuddapah, and the Balughat Talooks of North Arcot, in which sugar is now growing into importance, will in future pass coastward. Trivellum is a small place, with a population numbering only 1,357, but it is the chief station of a talook, and would therefore not be ineligible for a railway station, if there were not a better further on. Perhaps a better place for a station, if not a terminus, in this line, would be the point of junction between the railway and the road from Vellore to Chittoor, with which the road from Trivellum is to be united. This extension would carry on the railway 15 miles, to the vicinity* of Vellore, the importance of which is not overrated by Major Pears; but it might be carried on further for the sake of the traffic by Vaniambady, in the direction of Salem, if at the same time it could be made serviceable to that of Mysore and the Ceded Districts, &c.

About four miles from Vellore, but on the opposite bank of the river.

Population, 120,000

* Four miles distant.

13. Under this view, Gorriattum would appear to be an eligible place for the terminus, if, as Major Pears thinks not only possible but very likely, a pass can be formed instead of that of Nackanarry, leading directly above the Ghauts, and

About 104 miles from Madras, and 34 or 35 from Wallajahnuggur.

Part III.
Official Reports,
&c.

* On No. 78 of Arrowsmith's Atlas, there is the trace of such a road.

issuing between the head of the Old Pass and Palmanair, or otherwise if a road* could be made easily from Gorriattum to fall into the road from Chittoor at the foot of the Moogly Pass, the distance being apparently much the same as from Vellore to Chittoor, say 20 miles. Gorriattum is a fit point of divergence and conveyance for the traffic by Vaniambady; it is a more considerable place than Vaniambady, the population numbering 10,788, and it is not far from Amboor, which has a population of 11,000. It is, as before observed, nearly due west from Wallajahnuggur, and if, failing a better pass by which eventually the railway might be carried above the Ghauts, and forward to Bangalore, or towards Bellary, a road could be made to Moogly, of not greater distance than the proposed one from Trivellum, or that from Vellore to Chittoor, every desideratum would apparently be obtained in fixing the terminus at Gorriattum. It would command all the traffic from Mysore and the upper talooks of North Arcot, Bellary, and Cuddapah, which would otherwise go by Trivellum, and it would command the traffic from Vaniambady, while the line so far would be an excellent commencement for an extended railway to Bangalore, or by Salem towards Malabar.

Vellore as a terminus.

14 On the other hand, by fixing the terminus at Vellore, the rail would traverse the Palar River with its wide and sandy bed, and do away with one great and serious obstacle to the traffic from the Western Districts and Mysore. The terminus, too, would be at a large and important town, united by a good road with Chittoor and the Moogly Ghaut, and leading thence to Bellary and Cuddapah. Vellore would also be a good terminus, as connected with the direct lines into the Mysore; whether through the Satghur or other more eligible pass, as well as with the line through Vaniambady to Bangalore.

15. But a chief reason for naming Vellore is, that it is the point, rather than Arcot, at which the large traffic of the Western Districts and the Mysore would naturally rest.

16. It would not only be a greater distance from Madras, but the carts would avoid the heavy and trying drag across the bed of the Palar, at all times severe upon the bullocks, and the river itself is occasionally impassable. It may be therefore reasonably supposed that if the terminus were fixed at Vellore, the cart traffic would stop at that point.

17. It may also be found that the traffic from Madras westward would seek the railroad to Vellore more readily than to Arcot, for the same reason that whilst the road from Madras to Arcot offers no impediment to carts, and they would therefore probably continue to work and compete with the rail, they could not readily compete with it to Vellore, so long as the Palar is unbridged.

18. But as the fixing on a place for the western terminus is a point deserving of the fullest inquiry, we have deemed it advisable to call for the opinions of Major Cotton, now at Madras, and of Captain Best, superintendent of roads, upon the question where, supposing it to be determined to carry the railway further to the westward, but short of the Ghauts, the terminus ought to be fixed with particular reference to the above suggestions touching Gorriattum and Vellore. A similar reference has been made to Mr. Bourdillon, who, as Collector of North Arcot, must be well acquainted with the line of country, and the particular localities.

19. We have requested Major Pears to furnish as early as possible the estimate promised in his report, with a complete survey of the line to Wallajahnuggur, deferring till further instructions the survey and estimate for his proposed extended line, and afterwards to submit a full and minute survey of the first five miles of the line to Wallajahnuggur in its course to Poonamallee, accompanied by a full statement of the probable cost of every yard; the price of land, the earth-work, the tunnels for water channels, boundary banks, or hedges, laying down the rails, &c. &c., estimating for every item of local expenditure, with a rateable charge for supervision per mile.

20. With a view of our availing ourselves of the experience of the Bombay Company, which has already entered into contracts for the supply of rails, &c. to a great extent, we have applied to that Government for all the information obtainable on this head.

21. We solicit the attention of your Honourable Court to our several minutes recorded on this subject, and shall lose no time in forwarding to you, when received, the estimates expected from Major Pears.

Part III
Official Reports,
&c

From Major *T. T. Pears*, c.B., Engineers, to Sir *H. C. Montgomery*, Bart,
Chief Secretary to Government, Fort St. George; dated 5 March 1851

Sir,

IN accordance with the instructions conveyed to me by an extract from Minutes of Consultation, No. 853 in the Public Department, dated the 24th September 1850, I addressed a letter to the honorary secretary to the Madras Railway Committee requesting that I might be put in possession of the plans, estimates, and other papers connected with that project.

2. From that gentleman's reply I learned that the whole of the original papers connected with the Madras and Wallajahnuggur Railway had been sent to England, no copies having been kept, and that the only information the committee could furnish me with at present was that contained in a pamphlet published at Madras last year. I was also informed that the line of railway contemplated by the Madras Committee was one connecting Madras and Wallajahnuggur.

Appendix (A)

APP (A) (B)

3. Under these circumstances, having neither plans nor estimates before me, I considered it proper to make application to the Board of Revenue for the services of two surveyors, to proceed with the determination of the best line between those two points, and prepare for submission to Government complete surveys and estimates of the same.

4. The documents are not yet completed, but as the most important points to be considered on this occasion are the propriety of selecting this particular line and the probable amount of traffic thereon, I take the earliest opportunity of submitting to Government the information that I have obtained, and the conclusions to which I have arrived on these two points.

5. In attempting to fix upon a short line of a railway that may serve at once as an experiment and as the most suitable commencement of an extended system, we have this difficulty to contend with, viz., that while the experimental line must necessarily be dependent for its traffic upon the highways of the country, as they already exist beyond its terminus, the direction of a trunk line as the basis of a general system of railways would be determined with reference to the requirements of the country at large, and to the consequent arrangement of that system.

Difficulty in selecting a line to serve both as an experimental line and as the commencement of a system, &c

6. The great bulk of the traffic between Madras and the interior passes over one or other of three trunk roads; the northern, southern, and western or central; of these three, the latter is, as might be expected, by far the most important, not only because the other two, being coast lines, have to compete with the coasting trade, which is carried on here under many advantages, but because the topographical character of the country, as well as its former political divisions, have led to a system of roads which throws the whole of the traffic of the most populous and important inland districts into the Carnatic, by the passes of North Arcot, towards the ancient capital of that name; thus concentrating the trade with Coimbatore, Salem, Mysore, Bellary, Cuddapah, and North Arcot itself, upon the high road between Madras and Wallajahnuggur.

Course of the bulk of the traffic with Madras.

7 Such being the case, there could be no doubt as to the general direction which the first line of railway from Madras should take, and considering it as an experimental line, it was natural enough that the town of Wallajahnuggur, a suburb of Arcot, but situated on the northern bank of the Palar, should be selected as the first terminus.

8. Considering this line with reference "to the ulterior destination of such a mode of conveyance as forming part of the general system," it will be well to take a brief glance forward to the probable arrangement of the most important lines of railway within the limits of this Presidency.

Honourable Court's
Despatch, Financial
Department,
No. 16, 15 May
1850.

Part III.
Official Reports,
&c.

9. In the accompanying sketch* I have attempted to show the general direction of the lines which would probably be considered the first in importance within the limits of this Presidency. The particular course which they should follow would necessarily form the subject of subsequent careful consideration. Of these lines it is to be observed, that such portions as serve to connect any populous and important town near the middle of the Peninsula with either coast, may be considered as constituting lines complete in one sense, commercially; a railway from the same spot to the opposite coast completes in a similar manner another line, while the two together, accomplishing certain political ends, form one line complete in all respects. In the arrangement here shown, it will be seen that the most important lines connected with Madras itself would probably fall into one trunk line at a point about 60 or 70 miles from that town, and that the most direct and obvious course for this is nearly central, or due west from Madras. The exact course of such a line would, however, depend upon the ascertained best localities for a passage up the Eastern Ghauts. The character of the intervening country, highly favourable to the construction of a railway, and the position of the present passes, would point to the neighbourhood of Sholingur as the direction for this first line, and the spot from whence others would diverge to Vellore and the Amboor Valley on the one hand, and to the Mooglee Pass on the other. Such a line would, however, pass clear of Wallajahnuggur, and would be only adopted under a determination of disregarding that and seeking another terminus for our experimental line.

Prospects of the proposed line.

10. Having thus pointed out the most suitable line as the commencement of a general system of railways, I come to consider the prospects of that proposed to Wallajahnuggur as an experimental line, and though not perhaps the best, as forming a very convenient basis for the construction of a complete system.

Situation of Wallajahnuggur.

11. The town of Wallajahnuggur is by the present high road 68 miles from the Fort of Madras; it is two miles short of the cavalry cantonment of Raneepet, and stands on the left, or northern bank of the River Palar, nearly opposite the town of Arcot. The combined population of these three places is estimated at 54,000, but it is in Wallajahnuggur alone that this population is calculated to afford any employment to a railway beyond that arising from its own immediate wants.

Its population.

12. The population of Wallajahnuggur amounts to 20,000, consisting almost wholly of people actively engaged either in manufactures or commerce. Though in many respects offering a convenient temporary terminus for a railway, the importance of this town as a "great entrepôt of traffic" has been overrated, though not perhaps to so great an extent as that of the considerable military station of Arcot.

Its importance overrated as an entrepôt.

Nature of the traffic.

13. The amount of traffic of which Wallajahnuggur may be considered as the source, is that which is derived in the shape of agricultural produce from its own and the neighbouring talooks; from its own manufactures, and also from the cotton of the Ceded Districts, and the betel-nut of the North Canara, both of which are, according to a practice of long standing, carried on chiefly by means of agents at Wallajahnuggur. With these exceptions, the traffic passing into Madras along the Western road, comes for the most part through Wallajahnuggur; this constitutes a very important feature in the character of this town as an entrepôt, or as the proposed terminus of a railway.

Wallajahnuggur an entrepôt of trade as regards the countries to the westward.

14. It will be observed also, that the trade, such as it is, comes to Wallajahnuggur from the westward for dissemination through the Carnatic, while the traffic, on the other hand, passing over the road from Madras to that town is utterly insignificant. As far, therefore, as Wallajahnuggur is an entrepôt of trade, it would affect a railway running into it from the westward, rather than that portion of the line which lies on this side.

The subject divides itself under five heads.

15. In considering the prospects of a railway between Madras and Wallajahnuggur, we find that the subject naturally divides itself into the following heads:

1st. The

* The effect of an electric telegraph to Cochin or Mangalore in expediting communication with Aden, will not fail to be noticed.

1st. The nature and amount of the traffic.

2dly. The cost at which that traffic is carried on at present, and the maximum charge that can with safety be calculated upon for the railway.

3dly. The cost of construction of a railway adapted to the requirements of this traffic, the interest on which we consider as constituting a fixed annual charge.

4thly. The cost of working and maintaining the railway with such an amount of traffic.

5thly. The financial results.

16. 1st. The present amount of traffic is not only the most important, but it is unfortunately the most difficult point to ascertain with any degree of accuracy. Prior to the year 1844, the returns of the Land Custom-house at Madras showed the nature and amount of imports by land as far as they were recorded in that office; and from these returns we may safely take a minimum amount for that day. The Collector of Madras has obligingly furnished me with information on this head; and it will be seen from his letter, that while the annual value of the imports by land was gradually increasing, it amounted in the year 1842-43 to 96,52,266 rupees.

1st. Present amount of traffic.

Appendix (C.)

17. Detailed statements furnished me by the same gentleman show that of the above, the districts of Coimbatore, Salem, North Arcot, Bellary, and Cuddapah, with the province of Mysore, yielded traffic to the extent of 58,05,053 rupees, the estimated weight of which is 20,284½ tons, to be assumed as having passed over the road in question, since whatever portion of the imports from Cuddapah might have entered Madras by a different route would probably not exceed that which would have passed over this from districts which I have not noticed. In 1841-42, the amount, ascertained in the same manner, was 52,70,332 rupees, or 184,370 tons.

Imports.

Appendix (D)

18. Regarding the exports by land, our information is more unsatisfactory, and less to be relied upon. The declared value of these exports entered at the Custom-house in 1842-43 was 13,41,240 rupees, exclusive of the value of salt, transactions in this article between Madras and the districts in the interior, having only commenced to any considerable extent in 1847

Exports.

19. The value of exports for the preceding year, 1841-42, was 12,45,350 rupees, and from this return, the latest which I have had an opportunity of seeing in all its details, I find that the value of goods of every kind exported to the above districts, and supposed therefore to pass over the Western road, was 6,52,532 rupees, and has been estimated at 931 tons.

Appendix (E)

20. It will be seen by the letter from the Collector of Madras that the amount of salt annually exported for inland consumption has been regularly increasing, and is estimated for the past year at from 2,500 to 3,000 gārces, or about 12,400 tons.

Appendix (C)
Salt.

21. By a return which I have received from the principal commissary of Ordnance, I find that the amount of military stores which have been despatched from the arsenal of Fort St George, and have passed over the road between Madras and Arcot, has been on an average of five years,

Military stores.

Imports	-	-	-	-	-	-	-	-	tons.
Exports	-	-	-	-	-	-	-	-	135 tons.

22. I have been favoured with a similar return by the commissary-general, which shows the annual average amount of stores despatched in that department by the road in question to be,

Commissariat stores.

Imports	-	-	-	-	-	-	-	-	43 tons.
Exports	-	-	-	-	-	-	-	-	343 tons.

23. We have thus far our minimum traffic in goods.

The amount of imports from the districts immediately concerned, as reported at the Land Custom-house, in the year 1842-43, 20,284½ tons.

The amount of salt exported during last year, 12,400 tons.

Part III
Official Reports,
&c.

Average annual amount of military stores passing and repassing upon this road, 135 tons.

And the same for stores despatched by the Commissariat Department, 386 tons.

And, lastly, the amount of exports, according to the official returns of 1841-42, 931 tons.

Total of traffic as
taken from official
returns.

Making a total of 34,136 tons annually passing, one way or the other, over the whole distance between Madras and Wallajahnuggur.

24. The reports of the Land Custom-house, from which the above information was derived, were, however, confined to those articles (36 in number) enumerated in a Government proclamation of the 17th July 1837. A reference to the number and names of articles exported by sea at the same time will show that the Western road must have given passage to many commodities not included in the above list, and therefore not noticed by the Collector.

Probability of its
having increased.

25. Of the above amount, then, we may feel fairly assured, and little less certain, that it has experienced very considerable increase since that time. The Collector of Madras in forwarding a statement of imports by land from the year 1838-39 to 1842-43 inclusive, observes, "It may fairly be supposed that the actual value of the goods imported was considerably higher, and the amount has undoubtedly increased since the abolition of the transit duties." Moreover, the construction of a good high road, such as now exists between Madras and Wallajahnuggur, must have tended materially to promote an increase, which would be at the same time a natural consequence of continued peace and good government.

Appendix (F.)

26. There is certainly a very general impression on the minds of those who have had opportunities of observing, that the traffic upon this Western road has increased very considerably during the last few years. Of the probability of the exports from Madras having increased in amount we may form some idea from the annexed statement, by which it will appear (assuming the imports by land in 1848-49 to have been 100 lacs of rupees, rather more than they were in 1842-43, the difference between the total imports by land and sea) in the year 1842-43 and the exports by sea for the same year was 1,09,22,914 rupees, while the same difference calculated for 1848-49 was 1,52,92,544 rupees. It has been seen that the declared value of exports by land for 1842-43 was 13,41,210 rupees, which would leave out of the above balance the sum of 95,81,674 rupees, as the value of the consumption of Madras itself for that year. Allowing an addition of 20 per cent. on this last item, we should have for the value of the local consumption in 1848-49, 1,15,00,000 rupees, and consequently for that of the total exports by land 38,00,000 rupees.

Present exports
estimated

Traffic statements.

27. Further, in considering the probable augmentation in the amount of traffic during the past eight years, we have the help of certain returns which have been from time to time drawn up under the authority of various public officers for the express purpose of ascertaining this amount. These returns consist of tabulated statements, showing the number of persons and conveyances of every description that have been observed to pass each way at certain points on the road. They are not entitled to much credit, I fear, as returns of the real amount of traffic; but knowing under what circumstances and by what class of men they are taken, and on which side they are most likely to err, we may make use of them as checks upon estimates framed from other data.

300 loaded bandies
pass daily.

28. The traffic statements for the Western road, with which I have been favoured by Captain Best, superintendent of roads, an officer who of late years has paid very close attention to this subject, exhibit the returns taken at various points during different years, and at different seasons of the year; and the conclusions to which I have been led by a careful examination of these papers (making no allowance for errors, which would be in most cases those of omission) is, that the average traffic over every mile of road between Madras and Wallajahnuggur may be safely taken at 300 loaded bandies per diem, after striking out all those which thron through the road in the neighbourhood of Madras laden with straw, fuel, &c., which though calculated to yield a considerable profit to a railroad, it will be as well to leave out of our calculations for the present. Similar statements

ments with which I have been favoured by the collector of Chingleput, confirm me in my opinion that the above is a fair and safe estimate.

Part III
Official Reports,
&c

29. The annual amount of this traffic would be $300 \times 365 = 109,500$ loads, or about 54,000 tons, being an excess of 19,864 tons over that deduced from the imperfect official returns of 1842-43, and the salt and Government stores of later years.

I have no hesitation in adopting 50,000 tons as a fair approximate estimate of the present annual traffic; the difference being, in my opinion, not more than may be reasonably attributed to the causes already mentioned. Assuming the distance by rail to be 64 miles, this would give us a total mileage of $64 \times 50,000 = 3,200,000$.

Assumed traffic,
50,000 tons
Total mileage,
3,200,000

30. The passenger traffic is now carried on in such a manner as to render it impossible for us to ascertain its amount; but we may conclude that it is considerable, since by this road is carried on all communication between the Central and Western Districts and the town of Madras, the latter being the seat of Government, the chief port on the Eastern coast, and having a population of 700,000 souls. It is, however, vain to attempt to estimate this traffic; it will be better to consider it as one of the sources to which we may look to make up, in a measure, whatever deficiencies there may be in the receipts on account of goods.

31. Secondly, the present charge for a bandy, a pair of bullocks and driver, from Wallajahnuggur to Madras, is four rupees. In the Salem district, it will be seen by Mr. Phillips' letter that the ordinary charge is rather lower than this; nor is it on this road by any means the lowest, but it is about the average. The distance from Wallajahnuggur to Madras is 68 miles, and as these carts certainly carry, when required to do so, half a ton, and frequently more, the cost of carriage will not exceed *as.* 1. 10. per mile per ton. This is the rate of working towards Madras, but as our object is to discover the average rate at which these people can afford to carry goods, we must take into consideration the charge the other way; and I find that they will return, conveying a similar load, for about *Rs.* 2. 12.; the average rate thus becomes half a ton, carried 136 miles for *Rs.* 6. 12., or about *as.* 1. 6. per ton per mile. Such is the case under present ordinary circumstances without any serious competition, but we should not be justified in assuming that the above rates are susceptible of any further reduction.

2dly The present
cost of carriage
Appendix (G)

Present charge to
Madras, 1 10 anna
per mile per ton
Charge the other
way, cheaper
Present average
rate

32. It must not be forgotten that the cost of the road itself ought to be thrown in here, since the charges on the railroad are expected to provide for all expenses. Captain Best estimates the expense attending the maintenance of the Western road, inclusive of interest on the original outlay, at 33 per cent. on the present charge for transport, which would raise the actual average cost of conveyance on the present system to two annas per ton. But though this be the real state of the case, the opposition which the railroad would encounter from the native bandies remains the same; for it is difficult to see how the Government could avoid keeping up the present road, or how they could, to ensure fair play, exact from those using it a charge for its maintenance without the introduction of a system of tolls bearing upon different portions of the road, as well as upon the whole line.

Cost of present
road should be
added
Report of the Su-
perintendent of
Roads for Sept.
and Oct. 1849
The present actual
cost becomes two
annas per ton per
mile.

We must therefore assume that the railroad would have to compete with the native carts now carrying on the traffic at an average rate of *as.* 1. 6. per ton per mile. For this, and other reasons to be hereafter noticed, I consider that the maximum charge by the railroad should not exceed one anna per ton per mile.

Proposed charge
by railway, one
anna per ton per
mile.

33. Thirdly, with regard to the cost of construction, I hope to be able to submit very shortly an estimate for a line which I have selected as appearing to me the most direct and the cheapest between Madras and Wallajahnuggur. In the meantime, it will be sufficient for the object of this Report if I adopt the estimate of the Madras committee for a single line, which has been framed upon liberal data, and which I think likely to prove amply sufficient.

3dly. Cost of con-
struction.

Estimate by
Captain Collyer,
framed on liberal
data.

Part III.
Official Reports,
&c

34. According to this, the following items, which constitute the railway proper, determine the permanent charge upon its revenues.

	Rs.
Earthwork - - - - -	2,13,819
Bridges, drains, &c. . - - - - -	1,40,000
Ballast - - - - -	1,29,096
Rails, sleepers, &c. - - - - -	13,20,700
Laying rails, &c. - - - - -	29,000
Total - - - Rs.	18,32,615

Permanent annual charge, Rs 91,630. On which interest at 5 per cent., 91,630 rupees, as a permanent annual charge.

4thly. Cost of maintaining and working.

35. 4thly. The cost of maintaining and working the railway with the above amount of traffic. Under this head I shall include the interest on the cost of buildings and carrying stock, these being dependent on the nature and extent of the traffic.

	Rs.
Cost of six engines with tenders - - - - -	1,10,000
Waggons (150) - - - - -	1,05,000
Buildings, offices, sheds, workshops, &c - - - - -	1,15,000
Total - - - Rs.	3,30,000

Appendix (H.)

Interest on the above, at 5 per cent. . - - - - -	16,500
Maintenance of way, 64 miles, at 700 rupees - - - - -	44,800
Locomotive expenses, at 8 annas per train, per mile, four trains daily, for 313 days - - - - -	40,060
Management and police - - - - -	40,000
Repairs to waggons, at 10 per cent. - - - - -	10,500
Repairs to buildings, at 5 per cent. - - - - -	5,750

Total annual expenses, Rs 1,57,610.

Total Annual Expenses - - Rs. 1,57,610

Lastly, Financial results.

36. 5thly. *Financial Results.*—The expense of maintaining and working a single line of railway with a traffic of 50,000 tons over its whole length, is estimated at - - - - - Rs. 1,57,610

While that traffic, at the rate of 1 anna per ton per mile, would yield - - - - - $\frac{32,00,000}{16} = 200,000$

Leaving a balance to meet the interest on capital of - - - - -	42,390
Against the actual amount of interest - - - - -	91,630

Deficit on goods traffic.

And showing a deficiency of - - - - - 49,240

To be met by the profit on passenger and other traffic

37. To meet this apparent deficit, we have the profits arising from the passenger and parcels traffic, the mails, conveyance of troops, and all the many indirect advantages which the Government itself, no less than the people of the country, may be expected to derive from the introduction of railways.

Mails, their present cost.

38. With regard to the mails, I find that the present cost of conveying tappal and banghy between Madras and Arcot is about 9,600 rupees per annum, and that, as an experimental measure, the conveyance of the mails upon this road, by means of horses, has been sanctioned by Government, at an increased cost, raising the expense between Madras and Arcot to 12,000 rupees per annum. This can scarcely be looked upon as a standard by which to measure the service rendered to Government in providing the means of conveying the mails regularly, and to any amount, at the rate of 20 miles an hour, their present pace being, on an average, four miles, their regularity greatly affected by the state of the weather and other causes, and their bulk limited by the number of men available as carriers.

39. The quartermaster-general of the army has been good enough to furnish me with a return, showing the total number of troops that have passed over this road during the last 10 years. The annual average is 2,336 men of all ranks, to which we may add 11,680 followers, at the rate of five per fighting man.

We may assume that troops would on all occasions be moved by the railway, not only with a view of saving their batta and the wear and tear of camp equipage, but also as a means of economizing their services, and of avoiding the risk (unhappily in this country too near a certainty) of exposing them to sickness and suffering. In order to simplify the calculations, I will take the above 2,336 men as third-class passengers, at six pice per mile each; and the 11,680 followers, as fourth class, at two pice per mile. The sum they will contribute to the railway will stand thus:

$\frac{2,336 \times 6 \times 64}{12 \times 16}$	=	<i>Rs.</i> 4,672
$\frac{11,680 \times 2 \times 64}{12 \times 16}$	=	7,786
Total		<u>12,458</u>

40. If the above calculations are correct, the several sources of revenue already enumerated would leave the sum of 24,782 rupees to be realized among the various classes of passengers from parcels, from the several descriptions of short traffic, or from an increase in the goods generally arising out of the operations of the railway. At the same time it may be observed, that the above estimated deficiency would amount to rather less than 410 rupees per mile per annum. The cost of the present high road has been estimated by Captain Best to amount to 813 rupees per mile per annum.*

Troops and followers.

Appendix (P)	
	<i>R.</i>
Dept	- 49,240
Mails and	} 24,450
Troops	
Balance,	<u>24,782</u>
To be made up by passengers, &c	

41. The circumstances under which this railway would be constructed and worked are so exceedingly favourable, that there can be little difficulty in demonstrating the probability of its proving a remunerative undertaking, but even while so doing, one cannot but lament that the question of "Railways for India" should have been brought forward burdened with all the conditions which the fortuitous circumstances of their origin, and the peculiar state of society in England have given rise to. We are in danger of doing great injustice to the people of this country by looking upon these great works as mere commercial speculations, and by meeting every railway project with the condition that it shall at once pay its own expenses, together with the interest of the money laid out on its construction. There may be some few instances, as the present, in which they will do so; but my impression is that they would not, and that it would be unreasonable to expect they should, if generally substituted even for the present trunk roads. I think it will be found that, of the railways yet constructed, very few indeed would have paid by the traffic existing before they came into operation. A railway must do its work before it can earn its own support, or defray all the expenses connected with its construction. So well, however, are we warranted by experience in believing that a railway placed judiciously, constructed and worked with care and economy, will extend its influence far beyond that of the common road which preceded it, that we fall into error when we frame our calculations from the amount of traffic already existing, and disregard that increase which forms part of the necessary results of railway operations; an error at least as pernicious (since it tends to the discouragement of important public works) as that more frequently met with of insufficient estimates and exaggerated results.

Circumstances favourable to this railway

Railways in India should not in reason be required to pay at once

42. It will be useful to consider the nature of the more important portion of the traffic on this line, and the probability of its amount being affected by the railway. With this view, I consulted the collectors of the several districts concerned, and sought advice from gentlemen engaged in mercantile pursuits, by addressing the chairman of the Chamber of Commerce at Madras in a letter, which will be found in the Appendix. The replies with which I have been favoured by the Collectors, will be read with much interest; but I regret to say that

Nature of the present traffic, and probability of increase

Appendix (I)

* Report of the Superintendent of Roads for September and October 1849 (par. 19).

Part III.
Official Reports,
&c.

1st. Salt.
Appendix (O.)

Quantity sent inland at present, insufficient.

App. (K.), par. 10,
Reduction in price
sure to be followed
by increased consumption.

9 Nov. 1836.

Retail price of
salt, how composed.

* Fort St. George
Gazette, 24 Jan.
1851.

that my letter to the chairman of the Chamber of Commerce has met with no reply whatever.

43. The principal articles which constitute this traffic are, first, salt, as an export from Madras. The total amount of salt supplied, during Fusly 1259, to the districts likely to be affected by the proposed railway, was 10,283 garces; viz., from the Eastern Coast 8,090, from the Western 2,193. Of this, nearly 3,000 garces were disposed of at Madras, and it is more than probable that the whole of this was conveyed on the Western road; a small portion perhaps stopping short of Wallajahnuggur. The price of this salt at the pans is 120 rupees per garce. Taking the aggregate population of the above districts at eight millions, it needs no argument to prove that the quantity of sea salt now supplied is insufficient to meet a demand from that number of people. On the other hand, it would be very unsafe to assume that, in the present state of the country, sea salt could by any possibility be placed within such easy reach of all classes of the inhabitants, at a distance of 300 or 400 miles from the coast, as to supersede the earth salt which abounds in some parts of the country, and which, though commonly considered a very noxious article, is certainly in general use among the poor in those parts.

44. That any reduction in the price of this, however effected, would at once increase the amount consumed, there cannot be the least doubt; but the extent to which the depôt price might be reduced in dependence on this anticipated increase, without involving loss to the public revenue, can only be determined by actual experience. It appears from a Minute written in 1836, by Mr. D. Elliot, third member of the Board of Revenue, that the price was, at least on one occasion, reduced with this view; but the experiment, perhaps only a partial application of a general principle, was not followed by encouraging results. It is no easy matter to determine in such cases the exact point to which the price may be determined without loss of revenue, or to which it must be reduced in order to attain (if such be the object) a maximum revenue; but it must be borne in mind that we are more likely to err in keeping the price too high than in reducing it too much, considering the people as divided, so far as worldly means are concerned, into several classes numerically varying. The object in reducing the price of sea salt would be not so much to cause an increase of consumption among those who already use it, as to place it within the reach of other classes of people sufficiently numerous to make up for the reduction of price by a large increase in the demand.

45. The price of salt in the interior is made up of three distinct elements, the original cost, the carriage, and the profits. It is obvious that any reduction in one of these can only affect the ultimate selling price in a diminished ratio; 33 per cent., for example, on the prime cost (120) would effect a reduction of little more than 13 per cent. on the retail price at Bellary (291).* An instructive and rather curious fact is noticed in the above Minute by Mr. Elliot, viz., that an increase of 20 per cent. in the average retail price was immediately followed by a decrease in the amount sold for inland consumption in exactly the same ratio.

46. Another feature in this question deserves notice, viz., that while under present circumstances the effect of a reduction in the depôt price would be to increase the amount sold, this very increase would tend to raise the cost of carriage, a circumstance which, combined with the natural effect of a sudden increase in the demand, might help to explain the fact noticed in the Minute above quoted, viz., that the retail price in Fusly 1244, when the depôt price was 105, was in some places lower than that of 1237, when that price was 70.

47. It is one of the most remarkable characteristics of a railway distinguishing it from a common road, that the cost at which any unit of work can be performed decreases as the number of those units is augmented, so long as the amount of work keeps within the limits of its capacity. The effect of a reduction in the depôt price of salt therefore would be to increase the amount of traffic on the railway, and at the same time to diminish the cost of transport, and, as a necessary consequence, to lower the retail price and increase the consumption; thus conferring a great benefit on the people, contributing to the profits of the railway, and very probably augmenting the revenue by a large increase

increase in the quantity of salt sold. Assuming, however, that the price of salt remains the same, it is to be feared that a railway of 60 or 70 miles in length, with the proposed charge of one anna per ton per mile, would produce little effect on the retail price in the more remote districts.

Part III.
Official Reports,
&c.

48. The annexed Table shows the average price of salt in some of the principal towns in the district of North Arcot from Fusly 1255 to 1259 inclusive, with the distance from Madras of each town; from which it will be seen, allowing 10 per cent. for profits, and deducting the prime cost (120 rupees), that the cost of carriage, even to places beyond the reach of the high road, seldom exceeds *As.* 1. 4. per ton per mile. To Arcot itself, the point to which it is proposed to carry the railroad, the charge calculated by this process is only 11 pice per ton. These calculations, however, have been made upon the assumption that the whole of the salt retailed in North Arcot has been purchased at the depôt prices; but as there can be no doubt that under the present system smuggling is carried on to a considerable extent, it will be safer to take as our guide the present hire of a bandy to Arcot, which has been already stated to be *Rs.* 2. 12. The saving on the carriage of salt by railway at one anna per ton would then be 22 per cent.; the reduction in the retail price at Arcot about 35 per cent.

Appendix (L)
Average price in
North Arcot, from
A D 1845 to 1849,
inclusive.

49. It is probable, however, that the proposal made to establish salt depôts in the interior might, under such circumstances, receive favourable consideration. A reasonable reduction in the depôt price, and at the same time in the cost of transports, would under such arrangements tend greatly to increase the consumption, and contribute largely to the health and comfort of the people, but in this, as in all similar cases, we must make sure of the general principles upon which we are acting, carry them out with confidence, and wait the results with patience.

Effect of salt
depôts in the in-
terior.

50. Another article of growing importance in this Presidency is sugar. The cultivation of sugar, encouraged by the presence of intelligent and enterprising European merchants, has been gaining ground of late years both in Mysore and the western talooks of North Arcot. Mr. Bourdillon informs me that, during Fusly 1259, 3,59,712 maunds were exported from his district to Madras. This circumstance is not so remarkable in the amount as it is encouraging from the great increase that has taken place during the last few years. This traffic, carried on now under many difficulties, would fall upon the proposed railway at Wallajahnuggur. The present cost of carriage from Palmanair is about two annas per ton per mile, a portion of the road being very bad. The saving on a ton by adopting the railroad from Wallajahnuggur to Madras would be *Rs.* 3. 12, in addition to the advantages derived from a safe, regular, and speedy mode of transport, and the convenience offered to the resident merchants by the establishment of an improved means of communication with the coast.

2dly. Sugar.

Appendix (K)

51. The cotton brought by land to Madras for export is derived chiefly from the districts of Cuddapah and Bellary. The total amount annually exported from hence has fallen off very much during the last ten years; but this is chiefly owing to the circumstance of the cotton from the southern districts (Madura and Tinnevely), formerly brought to Madras for export, being now shipped at the local ports. At the same time, though we have no returns since 1842-43 of the amount actually brought from Bellary and Cuddapah, it appears certain that it has been on the decline, a circumstance that may be in some measure attributable to the improvements which have been made in the means of communication between the Ceded Districts and the Western Coast. A railway carried into those districts would doubtlessly tend greatly to the encouragement of this product, not more by cheapening its transport than by facilitating communication, and promoting among our European community a more intimate acquaintance with the country and its capabilities; but the line now projected, running 64 miles towards Bellary, could not be expected to produce any marked effect upon a field so remote. Cotton is, however, brought in smaller quantities to Madras by land from North Arcot, Salem, and Coimbatore; and as the railway advances into or towards any of these districts, its beneficial effects upon this product will be felt, since there are few articles likely to be so much affected by a railway when brought once within its influence. Its bulk, its liability to injury from accident or exposure, render its transport by land a point of peculiar difficulty and importance. The charge for carriage to the coast, independent of the loss arising

3dly. Cotton.

Part III. Official Reports, &c.	from the above cause, bears at present a high ratio to its market value. The introduction of railways appears likely to operate greatly to this branch of agriculture. Whether they will supply all that is required to place it on a satisfactory footing, is a question which does not fall within the limits of this Report.
Indigo, and other articles.	52. We have, then, indigo, chiefly from Cuddapah (grain, oils, and oil seeds from Salem), timber, saltpetre, piece goods, &c. &c. The effects of a railway, considered solely as an improved and economical mode of transport, would be inversely proportioned to the distance of the place of production beyond the terminus of the railway, and to the intrinsic value of the commodities themselves. The effect thus produced upon indigo, for example, would be very small, while the contemplated reduction in the cost of transport might be expected to exercise a marked influence on the consumption of the less valuable products.
Probable effect on the less valuable products.	A writer in the public papers, well informed apparently on these subjects, has lately furnished me with an illustration in the case of linseed, the land carriage of which is estimated by him at about 29 per cent of the total cost at which it can be landed in England. The effect of railway carriage on such an article would be very important. In regard to grain, timber, hay, straw, firewood, &c., could these latter articles, by a judicious arrangement of the tariff, be brought on to the rail, a fall of nearly 50 per cent. in the cost of transport could not fail to increase greatly the demand, while it would necessarily extend the influence of our local market in the direction of the railroad to districts now beyond its reach.
New kinds of traffic may be expected.	53. To the well-known examples presented to us in the large increase of traffic which has in every case followed the construction of railroads in Europe, I shall only now refer as justifying the expectation, that traffic of various kinds, now unknown, might be expected to follow the construction of this railway, in the same manner that personal intercourse, on occasions when such had been previously unthought of, has proved to be another invariable result. I shall mention merely as an illustration of this, that hay of a very superior quality is occasionally brought from North Arcot to Madras, at a cost of from 35 to 40 rupees per ton, while on the other hand, the refuse from this, the most populous town in India, has not only not been applied to its proper purpose, that of fertilizing the soil, but continues to the present moment a constant source of discomfort and suffering to its inhabitants.
Additional traffic to be expected, drawn away from other lines.	Lastly, I would observe, that independent of any increase on the present aggregate amount of traffic, the construction of a railroad, or of any improved means of communication, must necessarily draw from competing lines a portion of their traffic. There are even now certain lines of road which, though far inferior in construction, do, during a great part of the year, compete with the high western road; the traffic upon these I have not taken into account, but there can be no doubt that they would yield to the superior advantages offered by a railroad.
Sufficient traffic to make this line pay, if we could ensure the whole passing over it.	54. We are thus, I think, clearly justified in anticipating an increase on the present amount of traffic amply sufficient to cover, with the moderate charge of one anna per ton per mile, every expense connected with the construction, maintenance, and working, of the proposed railway, if we could ensure that traffic passing over it.
Remarks on the sufficiency of the proposed line.	55. We are thus led to a consideration of the sufficiency of the proposed as an experimental line, and the propriety of selecting Wallajahnuggur as its terminus. Sixty-four miles would be considered a respectable length for a railway in England, but as the commencement of a line destined to extend from 500 to 1,000 miles, it can only be considered, and must be expected, to operate as a mere fragment. The disadvantages of a short and incomplete line of railway are those which attach to all experiments made with imperfect instruments, their results must necessarily be partial and unsatisfactory.
Disadvantages of an incomplete line.	A railway is incomplete so long as it fails to reach the source or sources of its anticipated traffic. The annexed Table shows some of the principal products constituting this traffic, the distance from Wallajahnuggur of the sources from whence they are derived, and the saving which would be effected by the adoption of the railway from that place.
Appendix (M.)	The question is, then, whether the advantage here gained will be sufficient inducement

ducement for the traders of Coimbatore, Salem, Mysore, Bellary, and Cuddapah to establish agencies at Wallajahnuggur, and incur the risk and cost of transshipment at that place; the greater, and in most cases the worst portion of the journey having been accomplished, the rivers crossed, and only three days' march on a good road remaining. Considering these circumstances, remembering also the efforts that would be made by those interested to secure the load for the native bandies the whole way, I am strongly impressed with the conviction that the line proposed to Wallajahnuggur would be found too short either to furnish a satisfactory experiment, or to produce any marked improvement in the state of the country. Another peculiar and unfavourable feature in the proposed terminus is, that it falls short of two rivers, the Pooney and the Palar, both unbridged, and both therefore remaining between the railway and the great bulk of the traffic, very serious obstacles.

Appears insufficient

Falls short of two rivers of importance

56. A complete line of railway, such as I have defined it, having Madras for a terminus, and some port on the western coast or important town in the heart of the peninsula for the other, would offer perhaps too costly a work to be undertaken at first; but we may at all events provide, in selecting a portion to be carried out as an experiment, not only that the line is judiciously laid down with reference to the existing state of commerce, but that the ratio which its length bears to the distance between Madras and the sources of that commerce, is such as to justify us in expecting the people of the country will readily avail themselves of it. I consider, therefore, that the proposed line should be carried further; and the only questions which remain are how far, and in which direction.

Points to be considered in deciding on an experimental line.

Proposed line should be carried further

57. The most important line, as far as the interests of the country or of Government are concerned, is that from Madras to or towards Bellary, touching upon North Arcot, Mysore, and Cuddapah, and having in view ultimate connexion with the Bombay railways. Such a line, however, though indisputably the first in importance to this Presidency, does not hold out as an experimental line, even taken as a whole, still less if constructed only in part, such good promise of immediate results as another of less ultimate importance. I think the proposed railway should be extended to Vaniambady, as the line upon which there is at present the greatest amount of traffic, and one which, from the very favourable circumstances under which it might be constructed and worked, is more likely than any other in this Presidency to exhibit favourable results.

Most important line that to Bellary

Not favour to an experiment

A line to Vaniambady preferred

58. Sketch No. 2 shows the course and extent of this line, the chief towns through or near which it passes, and the points at which the traffic from remote districts would fall into it. The question of the Cuddapah and Bellary traffic taking advantage of it would remain nearly the same, except that a station at Trivellum, the point of junction for the latter, would be six or seven miles west of Wallajahnuggur, and on the right or western bank of the Pooney River. With regard to the sugar of North Arcot, a pass which should, and probably will under any circumstances, be opened near Sautgur, in lieu of that fallen into disrepair (the old Nackinaig), would bring much if not the whole of the sugar from the talooks above the Ghauts on to the railroad near Policondah, 100 miles from Madras.

Its effect on the traffic from Bellary,

And the sugar of North Arcot.

59. The town of Vaniambady, described by the Collector of Salem as being on the high road from Madras to Bangalore and Salem, a rich and thriving town, closely inhabited; it is on the bank of the Ponneear and Jonnapar rivers, is the principal entrepôt of trade of this district. "Its population is given, in the same letter, as 6,078, with Amboorpettah;" but Mr. Phillips has since favoured me with a supplementary statement of the population of the suburbs, which raises it to 8,000. I am inclined, however, to think this a low estimate of its present condition, drawn probably from returns of not very recent date. It will be seen that this town is situated at a point where the traffic on the great trunk road from Madras branches into two channels, towards Salem, Coimbatore, and Malabar by the one road, the Mysore territories and Canara by the other.

Vaniambady Appendix (G)

Its population.

Position.

60. A line of railway carried up to this point would possess the following advantages. It would have a greater amount of traffic in proportion to its extent, than any other line that could be selected in this Presidency. It would be easier of construction, involving fewer works of magnitude than any line of

Advantages of this line,

In traffic,

Cheapness of construction.

Light slopes.

Cheap in the working.

Fall one way.

equal length ; the bridges across the Pooney and the Palar being the only works of importance, and those attended with no difficulty and no expense that would not be amply counterbalanced by the cheap rate at which the rest of the line could be constructed, and by the greatly-increased importance which the railway would derive from the passage of those two rivers. Although the earth-work would be remarkably light, so favourable are the natural features of the country, that the steepest slope throughout the whole line would probably not exceed 16 feet in the mile, a peculiarity which materially affects the questions of the weight of rails and the size and power of engines, and is calculated to exercise a most favourable influence on the cost of working the line. It may be further noticed, as a remarkable feature in this project, that the fall, moderate as it is, characterizes its whole length in that direction (*viz.* from west to east) in which the tide of traffic runs at present, and in which it is likely to continue.

Appendix (G.)

61. The traffic passing over each mile of this line will be found, even now, to be not far below that on the shorter line ; while, as I shall presently show, the longer line would exercise a far greater influence on its amount ; and we might therefore reasonably expect, the cost of construction being relatively the same, that the profits arising from it would be greater, while its usefulness would be so much more extended. From a passage in the letter from the Collector of Salem, it appears that a considerable traffic between the districts of Trichinopoly, Madura, and Dindigul, and the Presidency is even now carried over this road. There cannot be the least doubt of the tendency of a railway terminating at Vaniambady to increase this traffic. It would thus immediately affect three entire districts beyond its terminus, besides those which now communicate with Madras wholly by this road, and would probably draw a large portion of their traffic with the Presidency into itself. I shall offer perhaps a better illustration of the effects of a prolonged line, by referring to the movement of troops and military stores. If the line be made to Wallajahnuggur, we may calculate that the same number of troops which have up to the present time annually passed over the western road will be conveyed in future by the railway, no more ; extended to Vaniambady, the southern division of the army comes within its influence ; and there can be little doubt that every man and every barrel of powder would be sent from Madras to Trichinopoly by this route.

62. My reasons for concluding that the traffic per mile is now nearly as great upon the whole as upon the shorter line, are, that by far the greater part of the traffic which now passes over the road from Wallajahnuggur to Madras comes from Vaniambady ; while there is over that portion which lies between the latter place and Vellore, an additional amount, not far if at all short of that which joins the present road at Wallajahnuggur from other channels.

Proposed line consists of two distinct portions.

63. A railroad to Vaniambady would thus consist of two portions, having a great amount of traffic in common, but each possessing some peculiar to itself. That in common would be the trade between Coimbatore, Salem, part of Trichinopoly, Dindigul and Madura, the Mysore territories and the Malabar coast, with Madras. The portion of the line which lay between Vellore and Madras would also have the trade between the latter place and North Arcot, part of the Mysore country, Bellary, and Cuddapah ; while that between Vellore and Vaniambady (48 miles in length) would facilitate the intercourse carried on to some extent between the Western Districts and those of Chittore, Nellore, Guntoor, and Cuddapah.

Probability of the trade between Salem and the Northern Districts passing over this line.

64. It may be argued that the doubts already expressed regarding the distant traffic passing on to a short line at Wallajahnuggur would apply equally with respect to that between Vaniambady and Vellore ; and so they would if that were the only line ; but as the town of Vaniambady, under the influence of the longer line, would become a large and important entrepôt, affording every facility for the custody or transshipment of goods, I think it probable that the people of Salem and Coimbatore would avail themselves of the railway in their intercourse with the Northern Districts, by which a saving of Rs. 2. 8. per ton would be effected in the transport of their goods.

65. As regards passenger traffic, whether we consider the servants of Government, the conveyance of troops and stores, or the convenience of the community at large, a line starting at Madras that would place them 130 miles on their road to Bangalore, Salem, Coimbatore, Malabar, the Neilgherry and Shevaroy Hills, would, without doubt, afford a greater amount of accommodation than any other line of equal length that could be selected.

Passengers	From Madras by present road to	
	Bangalore	- - 219 miles.
	Salem	- - 210 "
	Coimbatore	- - 300 "
	Calicut	- - 425 "
	Ooticanund	- - 330 "

66. A line extended as here proposed would derive additional importance from the town of Vellore (83 miles from Madras), a place which far exceeds Wallajahnuggur in population (that of Vellore having been lately estimated at 120,000), and as far surpasses Arcot in military and political importance. Both Vellore and Vaniambady would form excellent positions for salt depôts.

Importance of Vellore

67. I conclude, therefore, upon the above considerations :

Conclusions.

1st. That the proposed railway from Madras to Wallajahnuggur would ultimately pay, if we could insure the whole of the traffic in that direction passing over it.

2dly. That it would be wiser to extend the experimental railway across the two rivers Pooney and Palar, and even to carry it on to Vaniambady

3dly. That the maximum rate of charge in this part of India should be one anna per ton per mile.

68. Of the desirableness of introducing railways into this country there cannot, I presume, be two opinions; it may also be taken for granted that the doubts once entertained of the practicability of constructing or maintaining them have been dispelled, and that we are more disposed now to recognise their remarkable adaptation to the peculiarities of the climate, as well as to the social necessities of the people. We must, however, be careful not to expect too much as their immediate consequences, or look to the supposed absence of all competition and the evils attendant on the present system of transport for the realization of their most important results. It has been seen that we must come down at once to a low scale of charges if we wish to cheapen the present cost of transport; and although much may be said of the risks and difficulties attendant on the present mode of carriage, we must not forget that these are attributable to the defective state of the roads (which are being improved every day) rather than to evils in the carriage itself.

Applicability of railways to this country

Must not expect too much as their immediate consequences

The greatest evils in the present state of things attributable to the roads.

69. There are some points which demand in this place a passing notice, as likely to affect in a measure the operations of a railway in the outset. In the first place, we have no such thing as a carrying system; the nearest approach to it is to be found in the man whose stock consists of a bandy and pair of bullocks, which, together with his own services, he lets on hire for a given distance; but the business of carrying is not confined to this class. In many cases petty traders and others keep their own carts and cattle, finding them generally useful for domestic as well as commercial purposes. In like manner, the ryot will keep his cart and a pair or two of bullocks, which, when not required at home, he employs on a carrying job, satisfied if they earn their own keep in the performance of it. Another curious fact has come to my notice, showing that the demand for cattle in the town and port of Madras influences the cost of carriage from the interior. It is by no means uncommon in those parts of the country where the requisite material is cheap, for men to construct the common wudder bandy to bring a load down to Madras, and there dispose of bandy and bullocks to advantage. Again, the Bringarries are to be still found pursuing their vocation, and carrying goods from one end of the country to the other at a remarkably cheap rate. These people generally prefer the less frequented roads. Their cattle find a livelihood by the way side; the expenses of their drivers are confined to a mess of bagi; and as long as the country continues in its present state, it will be difficult to find a cheaper mode of transport than this. Though cheap, however, in one sense, this carriage is of the very worst description. It is remarkably slow, and attended with considerable risk. Their employment in this part of India appears to be confined at present to a few articles, of which salt and betel-nut are the most important. It is not to be expected that such a system, if system it can be called, will adapt itself so readily to a new state of things as a more regular carrying trade would be found to do. Had we at the

Peculiarities in present mode of carriage.

Bringarries.

Part III.
Official Reports,
&c.

present time an India Pickford on the Arcot road, he would feel it to be his interest to co-operate with the railway, and would at once become its feeder instead of its competitor.

70. The observations I have made on the extent to which the native bandies might compete with the railway are based on the supposition that an opportunity would be afforded them of entering into fair competition, carrying ton for ton, on a clear stage. I am at the same time quite aware that if a railway were once established, circumstances might arise, or arrangements be made, that would, once for all, drive the native carts off the field. If, for example, the Government, as proprietors of the railway, were to carry by it the whole of the salt from hence to a depôt in the interior, this alone would serve as a discouragement to the native bandies, compelling the drivers to raise their charge for carriage in the opposite direction, and diminishing by so much their chance of employment.

Native travellers.

71. Doubts have been entertained as to the extent which the natives of this country are likely to avail themselves of the railroads as travellers. There may be at first some difficulty in providing for the social distinctions and the domestic habits peculiar to the people; but the difficulty will be overcome, and the question will depend in this, as in every other country, upon the charges being so framed and such arrangements made as to place the railway within the reach of the great mass of the people. We hear it said the natives do not know the value of time. Be it so; the railways will teach them; though it would be more correct to say that time is to them of less value than it is in Europe, remembering that it was of much less value there in 1750 than it is now. The natives of this part of India, when duty, social or religious, calls them, will undertake journeys that many Europeans would shrink from; but, though they are not wanting in intelligent curiosity, travelling for its indulgence has been prohibited hitherto by the numberless risks and difficulties attending it.

Natives undertake arduous journeys when necessary.

Management of railways.

Tariff

72 In the management of railways there are few points which require more careful consideration than the tariff. In most cases one uniform rate, whether for passengers or goods, would be inadmissible. If the predominant feeling be a desire for extension of their beneficial influence among the people, the charges will be kept as low as possible. Where the work is the property of Government, it will be its policy to effect this even, if necessary, by an annual charge on the revenues of the country.* A private company will lower their rate of charges until they arrive at a maximum divided on their capital, but no further.

Limits to a tariff.

73 There are two well-defined limits to a scale of charges on a railway. The maximum is, that beyond which the road would come into unfavourable competition with other existing means of transport; the minimum, that within which the unit of traffic will do no more than pay its own proper expenses. These expenses are found by experience to be remarkably small; so that a railroad once established, it will be to its interest so to regulate the charges, whether on passengers or goods (within the above limits), as to induce traders and travellers of every description to avail themselves of it. It is hardly probable that there would be found any class of persons beyond absolute paupers, or any description of goods that might not thus be conveyed by railroad with advantage to both parties, though the profits upon each class would necessarily vary according to circumstances.

In some cases it might be expedient to charge less than one anna.

Passengers divided into four classes.

74. I have fixed on one anna per ton as maximum charge for goods. In some cases, as for example, on the shorter traffic where the country carriage would come into competition, it might, perhaps, be found advantageous to reduce it still lower. With respect to passengers, I would divide them into four classes (at least), at the following rates, the fourth class to be conveyed by the goods train.

	<i>As. p.</i>	
1st class	- - - -	2 - per mile.
2d "	- - - -	1 - "
3d "	- - - -	6 "
4th "	- - - -	2 "

It

* "For after we have ascertained the safety of the undertaking with this highest practicable charge, we may then have to go over the subject again for the purpose of judging whether that charge, or one still lower, will most conduce to the prosperity of the railway." Letter to Government from the Chairman of Bombay Railway Committee, 13 October 1846. Appendix (E).

It will convey a better idea of the probable working of this scale if I add, that the whole charge to Vaniambady and Vellore would be as follows :

<i>To Vellore.</i>				<i>To Vaniambady.</i>			
Class.		<i>Rs.</i>	<i>a.</i>		<i>Rs.</i>	<i>a.</i>	
1st	- - -	10	-	- - -	16	-	
2d	- - -	5	-	- - -	8	-	
3d	- - -	3	8	- - -	4	-	
4th	- - -	-	12	- - -	1	5	

75. The principles upon which our railway should be constructed have given rise to some difference of opinion. I think it will be admitted as a general rule, that our strength should be put forth as it is required, and no more. To construct any machine of a magnitude and capacity beyond that for which we can find work, is to insure a certain amount of clear loss. The first thing to be done in projecting a railway is to ascertain the nature and amount of work likely to be required of it, the next is to make such arrangements in the construction and subsequent maintenance of the work, that the whole annual charge, including interest on capital and working expenses, may be a minimum. The resolution of this problem will determine every point connected with the subject, as the question of single or double line, the character of the slopes, the size and power of the engines, and the weight of rails.

Principles of construction

76. The Honourable Court have determined, for reasons given in their letter in the Financial Department, No. 27, 14th November 1849, that the lines in Bengal shall be laid at once with a double way. It will be found, I think, that the same reasons will not hold good here. In the first place, our estimated traffic is much smaller, and moreover, the cost of the rails, instead of forming a small portion of the capital required, constitutes on a single line more than one-half of the estimated cost of the railway proper. There would thus be an addition of 50 per cent. to the first outlay, and to the annual interest charged on the traffic, with the certainty either that Government must bear that loss, or that to meet the additional burden a higher scale of charges must be established, greatly to the prejudice of the interests of the country, probably also to the cause of railway extension.

Single or double way

77. It must be remembered that in a single line we possess a work having all the important characteristics of a railway, all that distinguishes it, and renders it so far superior to other yet discovered modes of transport. We have the iron road, the easy slope, the means of applying steam power. The question of single or double line is one of quantity, not quality of accommodation, and ought in reason to be made dependent on the amount of traffic.

Single line possesses all the important characteristics of a railroad

78. We see that the whole of the present traffic on this road, although in all probability sufficient even now to render it a paying line, might be conveyed by one train each way daily; such trains as travel constantly on the English roads I propose two lighter trains each way. What difficulty or danger can there be in working such a line, though single, with the necessary sidings?

There is much connected with the management of railroads in England that we should endeavour to forget, or remember only to avoid, when applying them to a country so differently circumstanced as this. There a railroad is associated in men's minds with frequent trains, high speed, enormous loads, express-trains running down the first-class, and these again driving the goods trains at the rate of 30 miles an hour before them.

Different circumstances here and in England

It is forgotten, too, that the present state of things, even in England, is now very different from what it was when first these roads gave their impulse to trade and commerce. The following statement, which I have extracted from a very valuable report by a committee of which Captain Mark Huish was chairman, in 1849, shows the extent to which business has increased on some of the principal lines.

In England the amount of business has increased very much

Part III.
Official Reports,
&c.

	LIVERPOOL AND MANCHESTER.		GRAND JUNCTION.		LONDON AND BIRMINGHAM.	
	1831.	1848.	1837.	1848.	1837.	1848.
Number of trains to and from principal terminus or station in 24 hours - -	26	90	14	38	19	44
Average weight of engines - - -	<i>Tons. Cwt.</i> 7 0	<i>Tons. Cwt.</i> 15 7	<i>Tons. Cwt.</i> 15 7	<i>Tons. Cwt.</i> 17 3	<i>Tons. Cwt.</i> 12 7	<i>Tons. Cwt.</i> 18 13
Average speed of goods trains - - -	<i>Miles per Hour.</i> 10		<i>Miles per Hour.</i> 17		<i>Miles per Hour.</i> 16	
		19		19½		20
Average weight of goods trains, with engines and tender -	<i>Tons.</i> 52	<i>Tons.</i> 126	<i>Tons.</i> 133	<i>Tons.</i> 176	<i>Tons.</i> 124	<i>Tons.</i> 160

Railroads here might work up and down on alternate days

The line should be single.

79. There can be little doubt that any one hitherto accustomed to such things as these, would be astonished at a proposition to work a railroad each way on alternate days. Nevertheless, there would be nothing unreasonable in proposing such a system here, were it considered in any degree conducive to safety; nor will there be found a man among us to deny that trains for goods and passengers travelling at the rate of 10 and 20 miles an hour respectively, arriving from Vaniambady one day and returning the next, would exhibit an unprecedented stride in the way of improvement. I would therefore earnestly deprecate the laying down the double line till we have tried the single. I would say to a railway company, If you can afford a second line, you would better consult your own interest, and those of the country, by putting it down in continuation of the present single way, or forming another line in connexion with it. A bridge of 15 feet wide from bank to bank is better than one of 30 half way across. I should say, therefore, that the wisest plan would be to content ourselves with a single line until the whole of the principal railways in this part of India have been completed, or until actual experience has in any case shown its insufficiency. I would apply the same line of argument in determining the weight of our rails, remembering that if the heavier and more costly have the advantage of lasting longer, they also impose from the first an additional annual charge on the work, in the shape of interest.

Speed.

80. The question of speed has also led to some discussion. There can be but one opinion as to the propriety of our adopting the higher rates of speed which have been introduced (and it is believed at a positive loss) on many of the principal lines in England; but we need not run into the opposite extreme, or propose to construct our lines upon such a refined system of economy as to render them unsuited to a higher speed than 10 or 12 miles an hour. Kept within the limits of safety, speed is a mere question of expense, and, up to 20 or 25 miles, not one of much importance; but the railway once constructed, should be capable of bearing any speed required, and paid for, within the first mentioned limits. My own impression is, that it will be chiefly as an improvement on the means of personal communication that railways will affect this country, whether in its social intercourse, its commercial and manufacturing prosperity, or in the development of its agricultural resources.

Chief importance of railways in promoting personal intercourse.

Towards Madras, see para. 31.

81 A reduction of 10 pice per ton per mile in the carriage of goods will doubtless do much; the provision made for their safe and speedy transport will do perhaps more; but it will be by inducing the inhabitants of the several districts and provinces to mix freely and become acquainted with each other, by their operation, in fact, upon the national mind, that railways will realize our highest expectations. Our territories in this part of India consist of districts differing widely in climate, soil, and natural products; peopled by classes of

men

men also differing in language, manners, and creeds ; knowing, and contented to know, nothing of each other.

Part III
Official Reports,
&c

82 There is no doubt that the present imperfect means of communication have the effect also of preventing a more general application of European capital and agency in this country, an effect much to be regretted, for wherever Europeans of intelligence and respectability have settled, they have exercised a marked influence for good. We might expect, as a consequence of the introduction of railways, that the enterprize and capital of our countrymen would find their way more generally into the interior, and that the men themselves, no longer deterred by distance and the difficulties attendant on an imperfect and expensive mode of communication with the coast, would settle among the people, would make common cause with them, would learn something of their character, their pursuits, and the difficulties with which they have to contend ; points on which most Europeans not connected with the public service are now very ignorant. The results of such intercourse could not but prove in the end highly favourable to the best interests of this country.

Effect of railways
in promoting an
influx of Euro-
peans

83. This line of railway will, if undertaken, be considered as an experiment, and if the further progress of these works is to depend upon its result, the importance of carrying out the experiment fairly cannot be over-estimated. Its success, as well as the degree of satisfaction to be derived from its result, depends upon the work being executed with the utmost regard to economy, and the railway subsequently managed with the same scrupulous care and integrity. The surest guarantee for a fair experiment will be found in the Government executing the work by its own servants ; and the interests of the people will be best consulted by the same authority either retaining the management entirely in its own hands, or at all events securing the exercise of a decided influence in that management.

Success depends
on the work being
carefully carried
out

Better that Go-
vernment should
do it, and exercise
a decided influence
in its manage-
ment

84. Such is the state of society here, and such the position of Government, that no public work of this nature can be successfully prosecuted without the active support of the local authorities. Not only is the Government in a position to carry out these works with a greater degree of facility and economy than any private individual or company, but if it be, as it seems, most desirable that they should be executed and brought into operation with a single eye to the interests of the country, none are so likely thus to view them as those who feel their own personal interests identified with their success as works of national importance. Experience has shown that there may be in private companies directors or managers possessed of an amount of shares sufficient, as it is supposed, to enlist their services on behalf of the work itself, who may, nevertheless, attach much greater importance and devote much more of their attention to the fluctuations of the share market than to the ultimate success of the railway. Experience has also shown that the state of society in this country is unfavourable to the successful working of such companies.

Directors in joint-
stock companies
not necessarily
interested in the
success of the
undertaking

85. The terms granted in Bengal and Bombay, and solicited here, are chiefly remarkable for the guarantee of five per cent. on the capital, and the privilege conceded to the railway company of surrendering the undertaking after giving six months' notice to the East India Company. It is also provided that the Government should have the power, when the dividends exceed 10 per cent. to demand a reduction in the scale of charges ; but it is at the same time determined that such interference should not really take place until those dividends have reached 12 or 13 per cent.

Terms granted in
Bengal and Bom-
bay

86. I should hope that in this Presidency the Government might see fit to make the first railway experimental in another sense, and try to what extent the people may be benefited by making the line a national work. By the above conditions, it seems that the risk of ultimate failure falls on the country, while, on the other hand, should it prove successful, a tax, amounting to five or six per cent. on the capital invested, will be levied in favour of the shareholders in the shape of tolls, beyond that which is required to meet the ordinary interest of that capital. It appears at first sight that such a dividend can only be reasonably expected as a return for the risk incurred ; and it would appear also in this case clearly the interest of Government to raise the money, and take the work into its own hands. It is, at all events, due to the country that we should exercise a very strict supervision of works executed literally on its responsibility,

Desirable to make
the Madras line
experimental in
another sense.
Risk ultimately
falls on the coun-
try.

Part III.
Official Reports,
&c.

Difficulty to do so
by merely appoint-
ing an inspecting
officer

to be thrown upon its hands if they prove (from whatever cause) failures; and destined, if successful, to lay a burden on the traffic proportioned to the cost of their original construction.

87. With a Board of directors seated in London, and all the chief executive officers appointed from thence, it is to be feared that the control exercised by a Government officer would be little more than nominal, or if called into active exercise would prove in too many cases a source of dissatisfaction and embarrassment. Under such circumstances, every question relating to the amount of expenditure, or to the proceedings of individual servants of the company, would become the subject of reference home; and it seems not too much to prognosticate that arrangements of this nature, for the exercise of authority on the part of Government, would become almost if not altogether inoperative.

Indo-Britons and
natives soon ac-
quire a knowledge
of the duties con-
nected with the
locomotive depart-
ment.

88. With the exception of the rails and engines, with which we should in the first instance be provided from England, there is none but the most commonplace work to be met with on the proposed line. This railway might thus be constructed and worked by means within our reach, with this one exception, that we should at first require men accustomed to the locomotive department from home. In a very short time we should be independent even of these, and find among Indo-British and natives, substitutes fully equal to the performance of those duties, and better able to bear unavoidable exposure to the sun.

89. In the event of this work being carried out, the question will arise in what direction our next line shall proceed, whether towards Bellary, Bangalore, or Salem. There can be no doubt of the practicability of laying down a railway to either of these places, nor is any difficulty to be apprehended in selecting the best line in one direction, that of Salem; but a very careful examination of the chain of ghauts from Naggery to Sholagherry would be necessary before we can determine in a satisfactory manner the best line in the other cases. I have ascertained, by personal observation, that there would be no difficulty in carrying a line up to the foot of the Palmanair Pass (Mooglie); but I would not hastily assume that this, though the best and easiest of the ordinary passes, is the most favourable for a railway; nor do I see any reason to doubt the possibility of passing up those ghauts by a line practicable for locomotive engines.

Probable capital
required for this
line.

90. In considering the propriety of sanctioning under the above circumstances the longer line, it will be sufficiently near the truth if we assume that the capital will be double that required for the shorter line to Wallajahnuggur. The distance in the one case would be about 130 miles; in the other 64. The two bridges on the extended line would add from 120,000 to 150,000 rupees to the entire cost; but the expense attendant on stations and stock would be relatively less. The first cost, estimated for the shorter line in round numbers at 22 lacs of rupees, or 220,000 £., would thus for the other be 440,000 £. The plans and estimates which I shall have the honour of submitting shortly, will be confined to the projected line to Wallajahnuggur. Should the Government, after weighing the above statements, consider it desirable that plans and estimates should be prepared for a line to Vaniambady, it can be soon done, and at a very small cost.

91. In conclusion, I must apologize for the very great, and I fear inconvenient length to which this Report has extended. We are not yet very familiar in this country with the consideration of such questions; the subject is one of such vital importance to the people of India, that I considered not only that it demanded most careful consideration in all its bearings on my part, but that I should do well to submit the information I have received in the most detailed form, in order that Government might have the means of judging of the sufficiency of the data upon which I have based my calculations, and the soundness of the conclusions at which I have arrived.

I have, &c.,
(signed) T. T. Pears,
Major, Engineers.

Madras, 5 March 1851.

A P P E N D I X.

Part III
Official Reports,
&c.

Appendix (A.)

Sir,

Madras, 30 October 1850.

I HAD the honour to receive your letter of the 30th ultimo, to which a reply has not been earlier sent, as I wished to ascertain whether you could be put in possession of copies of certain plans and surveys, the originals of which were sent to the railway committee in London in the month of May last.

I am sorry to find that I cannot at present furnish you with these, no copies having been retained in this country; but as the London committee was requested to send out copies, it is hoped that these may be shortly available for your service.

Meanwhile, however, I beg to forward to you a printed pamphlet, which contains the proceedings of this committee, and the reports and estimates possessed by them. The older reports and surveys of Captain Worster, Colonel Cotton, and Captains Smith and Collyer, it is presumed you will obtain from the Government reports.

I would beg to observe, that the railway contemplated by the Company projected in London, and which is represented by the Madras committee, is the line from Madras to Wallajahnuggur.

Major Pears, c. B.

I have, &c.
(signed) *J. Ouchterlony*, Honorary Secretary,
Madras Railway Committee.

Appendix (B.)

Sir,

Madras, 25 November 1850

IN reply to your letter of the 15th instant, I have the honour, by desire of the Madras railway committee, to inform you that the immediate object in view is to connect Madras and Wallajahnuggur by a railway, and that the committee conceive that what may prove to be the shortest and cheapest line will be the most expedient to adopt for that object.

Major Pears, c. B.

I have, &c.
(signed) *J. Ouchterlony*, Honorary Secretary,
Madras Railway Committee.

Appendix (C.)

From *J. A. Huddleston*, Esq., Collector of Madras, to Major *T. T. Pears*, c. B., Engineers.

Sir,

Madras, 23 December 1850.

I HAVE the honour to acknowledge the receipt of your letter of the 19th October last, requesting to be furnished with certain particulars connected with the land trade of this Presidency.

2 I regret that the information I am able to afford on the subject is not so complete or satisfactory as I could wish, the records on this subject extending no further than the year 1844, when the customs and town duties were abolished

3. The following entries show the declared valuation of the goods imported into Madras, or upon which duty was paid during each of the five years preceding 1844.

Part III.
Official Reports,
&c.

I.—IMPORTS BY LAND.

1. <i>Extent of Trade.</i>		<i>Rs.</i>
1838-39	- - - - -	75,18,635
1839-40	- - - - -	85,50,598
1840-41	- - - - -	72,33,338
1841-42	- - - - -	94,26,686
1842-43	- - - - -	96,52,266

4,25,81,523

Average - - - - - *Rs.* 85,16,304

The average value it will be seen is *Rs.* 85,16,304. It may fairly be supposed that the actual value of the goods imported was considerably higher, and the amount has undoubtedly increased since the abolition of the transit duties.

2. *Principal Ports.*

4. During the years above noted, the entire import trade of Madras, with some few additions, was supplied by the following districts, in the proportions given in the annexed Statement.

DISTRICTS.	1838-39.	1839-40.	1840-41.	1841-42.	1842-43.
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
Masulipatam - - -	1,42,736	1,37,922	1,58,953	4,77,102	1,74,100
Guntoor - - -	2,20,295	2,37,325	1,44,700	2,77,492	1,94,744
Nellore - - -	8,35,340	9,18,691	7,57,933	8,86,085	9,80,527
Cuddapah - - -	7,01,874	14,25,410	13,15,736	18,71,170	25,43,357
Bellary - - -	1,02,783	1,01,371	2,21,102	4,79,248	2,81,676
North Arcot - - -	16,50,616	17,49,060	13,15,736	19,15,494	18,48,995
Chingleput - - -	9,10,651	7,52,955	6,85,054	7,95,809	7,50,386
South Arcot - - -	11,93,651	12,52,440	6,81,649	13,82,825	11,58,921
Coimbatore - - -	1,55,520	1,16,801	2,06,266	1,22,186	1,14,169
Madura - - -	2,04,748	1,18,116	1,02,363	2,71,909	2,91,538
Salem - - -	6,85,126	7,89,861	7,81,247	7,78,357	8,33,033
Madras - - -	4,05,059	4,10,119	3,74,569	2,83,289	2,83,242

1 - 25,43,357
2 - 18,48,995
3 - 11,58,921
4 - 9,80,527
5 - 8,33,033
6 - 7,50,386

81,15,119

5. It will have been observed, that by far the greater portion of this traffic is confined to the districts of Cuddapah, North Arcot, South Arcot, Nellore, Salem, and Chingleput. The aggregate value of their imports for 1842-43, the last year in our accounts, being *Rs.* 81,00,000, or thereabouts.

3. *Nature of the Trade.*

6. The subjoined statement indicates the relative valuation of the chief articles of commerce imported during the five years under review, from which a general idea may be formed of the nature of the import trade of Madras.

YEARS.	Piece Goods.	Grain.	Cotton	Indigo	Betel	Betel Nut	Ghee.	Sugar	Oil	Leather
	Rs.	Rs	Rs	Rs	Rs	Rs	Rs	Rs	Rs	Rs
1838-39 - - -	27,60,384	14,33,743	2,33,100	10,85,249	1,29,716	2,36,841	3,08,406	1,11,466	3,23,149	73,409
1839-40 - - -	29,62,404	9,56,012	2,32,855	23,24,070	1,17,713	2,80,782	3,80,345	1,26,009	3,45,500	10,526
1840-41 - - -	27,91,734	5,97,565	2,21,320	15,87,461	1,19,121	2,02,242	5,04,700	1,65,280	3,22,074	3,85,501
1841-42 - - -	23,96,727	4,48,933	7,14,120	30,32,512	61,088	2,63,682	4,15,769	2,04,809	4,53,013	1,00,765
1842-43 - - -	23,91,716	6,53,066	6,40,600	32,53,593	77,413	2,84,051	5,41,550	2,61,080	3,20,704	1,23,349

7. The foregoing two articles form the chief staple productions of the country, both raw and manufactured, of which this branch of the inland traffic is composed. The rest of the import trade during the period under consideration was made up of articles of a miscellaneous character, such as redwood, &c, which being comparatively of trifling value do not call for further notice.

4. Mode of Conveyance.

8. It is only necessary to add, that the entire inland commerce of the Presidency is carried on by means of the country carts and bullocks.

II.—EXPORT BY LAND.

1. Extent of Trade.

9. With respect to the question of exports from Madras by land, I regret to say that the records of my office supply very insufficient data; I am enabled, however, to extract the following entries, which may prove of some utility, from the printed statements of the trade of Madras, which were furnished by this office to the collector of sea customs.

	Rs.
Amount of exports in 1836-37 - - - -	19,73,299
" " 1840-41 - - - -	13,67,325
" " 1841-42 - - - -	12,45,350

2. Chief Marts.

10. The countries that formed the principal marts for this traffic are enumerated below.

	1836-37.	1840-41.	1841-42.
	Rs.	Rs.	Rs.
Mysore - - - - -	2,37,166	2,61,121	2,27,099
Nizam's Dominions - - - - -	1,30,118	82,156	69,744
North Arcot - - - - -	3,14,622	2,50,179	1,74,125
Bellary - - - - -	2,65,051	1,10,303	1,43,420
Masulipatani - - - - -	96,339	39,714	27,854
Cuddapah - - - - -	63,390	26,736	35,509
Chingleput - - - - -	1,05,375	91,533	35,597
South Arcot - - - - -	1,33,386	69,978	73,340
Tanjore - - - - -	2,61,482	1,33,964	1,02,867
Salem - - - - -	52,707	54,011	81,853

Mysore	- 2,37,166
Nizam	- 1,30,181
North Arcot,	3,14,622
South Arcot,	1,33,386
Bellary	- 2,65,051
Tanjore	- 2,61,482
<hr/>	
	15,41,875

11. From the foregoing figures it will be observed, that the export trade by land is confined chiefly to the countries noted in the margin, value in 1836-37 aggregating to 15,41,875 rupees.

3. Nature of the Trade.

12. The articles forming the commerce with these countries are of a varied nature, such as drugs, metals, oils, oilman's stores, piece goods of British and country manufacture, both of cotton and silk; spices, timber, &c.

Those occupying the largest portion of the trade may be seen from the following Statement:

Y E A R S.				Piece Goods.	Liquers.	Cotton Twist.
				Rs.	Rs.	Rs.
1836-37	-	-	-	1,52,737	2,96,724	3,99,774
1840-41	-	-	-	2,73,506	1,32,262	1,03,779
1841-42	-	-	-	3,14,349	81,546	94,583

III.—SALT TRADE.

13. On the subject of salt, my information is limited to the transactions at the Madras depôts.

1. General Trade.

14. It is not in my power to give any details connected with the salt trade of this Presidency generally; but I believe that the entire revenue derived by Government from the monopoly of this article may be estimated in round numbers at 50,00,000 rupees.

15. It is hardly necessary to observe, that the manufacture and sale are conducted at all the maritime districts under this Presidency; the monopoly price being 120 rupees per garce, or one rupee per Indian maund.

16. The surplus over the quantity required in each district for home consumption, is sold for the inland trade, and when conveyed into the interior the price to the consumer rises above the rate prevailing at the place of manufacture, in proportion to the distance of the various markets from a maritime district.

2. Madras Trade.

1. Extent.

17. The amount of salt exported by land from Madras is annually increasing, and may be estimated at from 2,500 to 3,000 garce, the value in rupees being from 3 lacs to 3,60,000.

2. Inland Sales.

Chief Depôts, Fusly 1260.

Average Selling Price for Home Consumption..

Maximum :	Minimum :
166 10 8 per garce.	133 5 4 per garce.

18. The sales at Madras for inland consumption date only from 1847, prior to which period the entire quantity manufactured at the pans of this collectorate was set apart for the consumption of the town and suburbs, and for exportation by sea to Calcutta. The following statement shows the extent of salt-export trade from Madras for the last four years.*

* A small quantity of salt was annually sold for inland consumption up to the year 1823, but the average value at the then monopoly price, 75 rupees the garce, did not exceed 20,000 rupees.

—	1847			1848.			1849.			1850.		
	G.	m.	m.	G.	m.	m.	G.	m.	m.	G.	m.	m.
Chingleput - -	215	290	-	170	100	-	317	170	-	192	10	-
Chittoor - - -	287	183	2½	150	50	-	256	50	-	183	250	-
Salem - - - -	187	10	-	58	50	-	45	120	-	30	210	-
Coimbatore - -	24	370	-	2	300	-	2	40	-	9	220	-
Verdachelum - -	11	270	-	1	370	-	3	360	-	2	270	-
Trichinopoly - -	5	120	-	-	-	-	-	-	-	-	-	-
Cuddapah - - -	36	320	-	7	230	-	21	310	-	12	220	-
Bellary - - - -	1	310	-	-	-	-	-	390	-	-	380	-
Bangalore - - -	961	330	-	730	90	-	443	380	-	337	170	-
Mysore - - - -	552	70	-	389	220	-	1,534	380	-	1,769	100	-
Total Garces -	2,284	273	2½	1,510	210	-	2,626	200	-	2,538	230	-
Indian Maunds -	274,162			181,263			315,180			304,629		

19. It will thus be seen that the traffic in this article is chiefly directed towards Chingleput, North Arcot, Bangalore, and Mysore; the two latter being the principal marts of the salt exported from Madras.

3. Means of Transit, Route pursued, and Hire of Conveyance.

20. The means of transit adopted by the traders in this article are, as in other cases, common carts and bullocks. The former are capable of carrying from 30 to 40 marcals (9 to 12 Indian maunds), and the latter from 4 to 6 marcals (1½ to 1½ Indian maunds), according to the size and strength of the animals. The route pursued is chiefly by Poona-mallee, through North Arcot, and the time occupied in the conveyance of this article to Mysore is on an average 16 days, the hire for a cart being from 10 to 12 rupees *

21. Whether, therefore, we consider the saving of time, expense, and of wastage to the trader, the probable cheapness of this necessary of life to the consumer, or the additional security it would afford to the interests of Government, the value of a railway communication, viewed with reference to this article alone, can scarcely be overrated.

IV.—CONSUMPTION OF MADRAS.

22. I have no means of ascertaining the annual consumption of the principal articles of traffic within the limits of Madras, but as a general idea, that consumption may be estimated at about 50 lacs of rupees, this result being obtained by deducting the total value of the trade exported from Madras from the quantity imported both by sea and land; the details of this calculation being seen in the margin.

	For 1840-41	
Total Imports -	-	2,01,000 703
„ Exports -	-	1,48,238 27
		<u>52 71,063</u>

V.—SALT FISH TRADE.

23. I am unable to state to what extent a trade in salt fish is at present carried on between Madras and the other districts. An entry in the accounts of 1836-37, shows that about 1,400 rupees worth of this article was exported from Madras, which was chiefly consumed in Mysore, Bellary, North Arcot, and Tanjore.

VI.—CONCLUSION. THE ADVANTAGE OF RAILWAY COMMUNICATIONS.

24. With reference to the concluding paragraph of your letter under acknowledgment, it is hardly necessary to observe that, in my opinion, the probable effects of the establishment of railway communications with the interior will be to the advantage of the trade and general prosperity of the town and neighbourhood of Madras, while, from the statistical data given above of the inland trade of this Presidency, it would appear that the contemplated experimental line to be laid down from Madras to Wallajahnuggur has been judiciously selected in a commercial point of view.

I have, &c.

(signed) J. A. Hudleston,
Collector

Madras, 23 December 1850.

* The trade of Mysore is not carried on by means of hired bullocks.

Appendix (D.)

VALUE and ESTIMATED WEIGHT of IMPORTS into Madras, by Land, in the Year 1842-43, from the undermentioned Districts.

IMPORTS.	MYSORE.		BELLARY.		CUDDAPAH.		NORTHERN DIVISION OF ARCOT		COIMBATORE.		SALEM.		TOTAL.	
	Quantity	Value.	Quantity	Value.	Quantity	Value	Quantity	Value.	Quantity	Value	Quantity.	Value	Quantity	Value.
	Cwts.	Rs. a. p.	Cwts.	Rs. a. p.	Cwts.	Rs. a. p.	Cwts.	Rs. a. p.	Cwts.	Rs. a. p.	Cwts.	Rs. a. p.	Cwts.	Rs. a. p.
Chaya Root							8	223					8	223
Coosomba Powder			136 1/2	3,056	226 1/2	5,082	9	203					372 1/2	8,341
Bengal Gram			391 1/2	1,050	391 1/2	1,050							783	2,100
Condooloo Dhall			183 1/2	399			218 1/2	475					402	874
Grain of sorts							982 1/2	1,265					982 1/2	1,265
Horse Gram			4,958 1/2	7,875	4,892 1/2	7,500	3,282 1/2	5,031					13,133	20,406
Natcherry							4,170	5,050					4,170	5,050
Paddy							40,834	51,750					40,834	51,750
Rice			19,759	35,550	35,015 1/2	63,000	38,670	69,575					93,444 1/2	1,68,125
Wheat			750 1/2	2,925	733	2,855							1,483 1/2	5,780
Nuts			25	875	220 1/2	8,171	7,810 1/2	2,74,445					8,056 1/2	2,83,491
Coche Nuts						50	27	3,106					27 1/2	3,156
Cardemoms							2 1/2	224					2 1/2	224
" Seeds														
Cocoa Nuts					2	19		5					2 1/2	24
" Dry														
on			14,183	1,58,850	22,187 1/2	2,48,500	10,553 1/2	1,18,200	3,192	35,750	2,933	32,850	53,049	5,94,150
min Seeds			23	447	309 1/2	7,785	357 1/2	6,965					780 1/2	15,197
jah	18 lb.	4					8	1,208					8	1,208
ery Oil Seeds			3,872	11,287	1,095	3,190	968	25,126	8,593	2,23,038	9,937	257,932	19,711	5,11,635
go			17 1/2	3,894	7,078 1/2	17,87,223	536	1,563			206	599	5,709	16,639
ery					1,612 1/2	7,769	1,019	2,23,218			195 1/2	43,814	9,210 1/2	20,63,149
Palmyra							18,757	90,356					20,369 1/2	98,125
p Oil Seeds							1 1/2	8					1 1/2	8
her			16	423	175	4,474	24 1/2	649			30 1/2	1,047	255 1/2	2,655
Oil Augutty					15 1/2	138	3,109 1/2	29,024	347 1/2	3,054	3,342 1/2	29,362	6,815 1/2	61,578
" Gingely					145	2,596							145	2,596
" Lamp					258	3,082	1,255	14,994	56 1/2	677	6,606 1/2	78,924	8,176 1/2	97,677
" of sorts							3,197	32,185	550 1/2	5,608	16,605 1/2	167,172	20,353	2,04,965
m								199				112		537
Milk					1	576	1	629					2	1,105
Wood					17 1/2	9,218	4 1/2	2,215					22	11,433
alwood					1,299 1/2	2,057	29,164 1/2	46,169					30,464 1/2	48,226
etre						21	6	149	2 1/2	55	2,454 1/2	61,084	2,463 1/2	61,309
Thread					260	2,756	8	83	1,195	12,169	3,110	31,770	4,573 1/2	46,778
ra Thread					3 1/2	1,810							3 1/2	1,810
r							5	3,497					2	5,072
Candy					2,871	72,074	6,877	1,72,652					4 1/2	114
ries					11 1/2	308	116	3,060					2 1/2	67
arind						68		100						
er (assumed weight)	97 1/2	264			18,426 1/2	1,25,077	8,008 1/2	60,409			6,128 1/2	41,598	33,463 1/2	2,27,147
cco					69 1/2	187	3,064 1/2	8,271			1,352	3,040	4,583 1/2	12,302
Cheroots					50	2,076	7,708	2,69,789			37	1,270	7,804	2,73,144
Powder									32 1/2	1,159	1	41	33 1/2	1,300
Candees											245 1/2	7,367	239	8,636
Catovvah				32		1,293		165		9,164		36,662		47,316
Cases		18						1,267						1,267
Chlutz				4,484		22,703		104						132
								50,144						77,331

CORRESPONDENCE, &c., RELATING TO

Piece Goods.

Cholies		252	403	1,241			1,896
" Laced		80					80
Cloths	14	22,816	13,843	40,293	16	148	77,130
" Laced	174	372	1,018	526		48	2,138
Cochilas				2,500			2,500
Blue Cumblico		11,793	613	23,086		1,058	12,406
Cumbbas, Blue				883			25,044
" Checked				24,871			883
" Red				48,194	07	22,948	24,871
Dovettles		231	4,595	780	70	2,543	76,065
" Laced			43	102			3,441
" Silk	10			4		7,776	112
Dungries			896				7,780
Duttles				15		16	890
Ginghams		88		6,823			119
Blue Handkerchiefs		58		9,076		6	6,881
Checked Handkerchiefs		70		2,826			9,152
Red		258	31				3,115
Lace Bundles			209				269
" Knivary							
" Nuckey							2,330
Elephant Jools			2,330				2,330
Loongies		5,584		991			6,575
Moories				192			192
" Blue				167			167
Muslins			98,803	6,574			1,05,377
Palampores				10,718			10,718
Bunjam Cloth							
Purses			958	1			959
Roomals of sorts		120	1,240	1,753	11		3,124
" Laced			158				158
Salempores				777		424	1,201
" Blue							
Sarasa				60,515			60,515
Sashes		49	4,439	237			4,725
" Laced	60		100	45			225
Soosees		8,201	299	609			9,109
Silk Cloth	44	150	204	2,216		35	2,649
" Cholies	13			920			933
" Coottoomes			109	1,749			1,858
" Kancobs	2,185		1,703				3,888
" Soosees				350			350
Shawls	594		50	40			634
Table Cloth							
Towels			12	15			27
Tuppies			37	1			38
Cat Lace				4,277			4,277
Gunnies			2,190	1,654			3,844
Gumarcolam		317	185	2,858	700		4,060
Turbands			816	4,817			5,633
" Chintz			11,084	485			11,569
" Laced							
" Tent Rope				2,537			2,537
Piece Goods of sorts	48	60	1,450	523		120	2,201

TOTAL	401,877 1/2	
TOTAL Estimated Weight of Piece Goods	3,800	
GRAND TOTAL	405,686 1/2	58,05,053
Or Tons	20,284 1/2	

(signed) T T Pears, Railway Commissioner

Appendix (E.)

VALUE and ESTIMATED WEIGHT of EXPORTS from Madras, by Land, into the undermentioned Districts, in the Year 1841-42.

EXPORTS.	MYSORE		BELLARY.		CUDDAPAH		NORTHERN DIVISION OF ARCOT		COIMBATORE		SALEM		TOTAL.	
	Quantity	Value	Quantity	Value.	Quantity.	Value	Quantity	Value.	Quantity	Value.	Quantity	Value	Quantity.	Value.
	Cwt.	Rs. a p.	Cwt.	Rs. a. p	Cwt.	Rs a. p.	Cwt	Rs a p.	Cwt.	Rs. a. p.	Cwt.	Rs. a. p	Cwt.	Rs. a. p
Alum								650				10	364 1/2	1,060
Benjamin		300						100					15	460
Books -		2,177		3,350		190		140		105		380		6,342
Corks -		677		420		20		107						1,224
Cotton Thread, Twist, &c.		4,840		13,530		50		3,247		2,900		12,115	409 1/2	36,682
Drugs. Camphor		240						1,325					17	1,565
" Musk		270		100		320		760						1,450
Dyes, Indigo			96 1/2	18,696			29 1/2	5,625					126 1/2	24,261
" Munjesty							17 1/2	450					17 1/2	450
Fruits: Coconuts		33						252					91 1/2	285
Glass ware		1,025		1,932		4,500		70						7,527
Carpets				150		312		300					59 1/2	762
Jaggery							16 1/2	151					16 1/2	151
" Palmyra				34				854					227 1/2	888
Arrack		48,598		3,668				8,395					2,908 1/2	60,059
Beer		12,442		9,749		2,611		5,692		468		347	3,131	31,309
Brandy		14,064		5,670		1,581		5,319		1,419		282	809 1/2	28,335
" Sherry		249		240				160					8 1/2	649
Champagnes		2,296		1,080		180		875					59 1/2	4,431
Claret		764		758		200						28	45	1,750
Gin		594		316		306		1,910		330		444	16 1/2	3,900
Liquors of sorts		9,120		658		3,591		2,722				1,032	331	17,129
Sherry		8,873		9,770		4,581		5,757				180	641 1/2	29,161
Wines of sorts														
" Madeira		4,937		2,272				1,952				1,158	119 1/2	10,319
" Port		4,577		2,292		2,011		1,032		234			281 1/2	10,146
Copper		3,400						3,200					28	6,690
Iron		1,201		4,534		1,797		8,616		1,984		6,540	7,105 1/2	24,672
Tutenague								490					49 1/2	490
Millinery		175				670		650		50		100		1,645
Oil, Gingely						364		148					42 1/2	512
" Lamp				348		104		174					57	628
" of sorts		40				38		313						389
Cheese		380		964		50		248		44			15 1/2	1,695
Hams		280		1,086				272					14 1/2	1,044
Oilman's Stores														
Sauces		149		200				595						944
Plated Ware		2,402		750										3,152
Chintz		150		1,100		500		200		150				2,106

545	Long Cloth -	2,742	5,080			2,891					10,713
	Muslins			172		307					479
	Cauhy					553					553
	Chintz	84				280	40				404
	Cholies	57		90		88		178			413
	Comboy Blue	135				4,871					5,006
	Cloth of sorts	614	115	257		1,209	108		208		2,509
	" Laced										
	Dowties	220	1,413	20		637			112		2,402
	" Laced										
	Handkerchiefs	96	120	1,603		1,715	4		172		3,710
	" Blue										
	" Checked	260	440			220					920
	Moories		1,389			2,763					4,152
	Muslins	98		176		51					325
	Piece Goods of sorts	109		148		346		60			603
	Rumals of sorts	8	30	6		150					194
	Salampores					6,752					,752
	Soosies	86	125			391		18			620
	Tafta	110	64			175	250	24			623
	Tupples	22				1,994					2,016
	Turbands of sorts	56		96		41					193
	Cloth, Silk					440					440
	Keencobs					240					240
	Moonga Cloth	147				187	140				474
64	Provisions, Ghee					46					46
	Raw Silk		840			30		60			930
	Saddlery	440		625		250					1,315
	Stationery		200	200		18					478
	Snuff	207	45			3,125					3,377
	Sugar			17		118	36	16		13 1/2	187
	" Candy					144	401	48		21	593
	Stick Lac					1,200		840			2,130
	Cardamum Seeds	915	683	8		1,053	132	351		8 1/2	3,142
	Pepper	25	100	282		12,249		250		633	12,906
	Sundries, Europe	92,642	46,108	6,328		61,896	9,553	28,580			2,45,105
	" Country	1,078	72	61		2,636		30			3,875
	Tea	350	378	200		260	20	50			1,348
	Timber	140		200		1,161					1,501
	" Reapers		400			137					537
	Wearing Apparel	1,240	2,215	890		100					4,445
	Wax Candles	180				100				3 1/2	280
	Shawls	207								1	207
	Woollens	469				400					569
										18,272	-
										352 1/8	-
										18,624 1/8	6,52,532
										931 1/2	-

(signed) T. T Pears,
Railway Commissioner

Appendix (F.)

STATEMENT showing the IMPORTS and EXPORTS to and from Madras Port, by LAND and SEA, for 11 Years.

YEARS	Total Imports by Sea from Foreign and Home Ports, exclusive of Treasure	Total Imports by Sea from Subordinate Ports, exclusive of Treasure.	Total Imports by Land, exclusive of Treasure.	Grand Total of Imports, exclusive of Treasure.	Total Exports by Sea to Foreign and Home Ports, exclusive of Treasure.	Total Exports by Sea to subordinate Ports, exclusive of Treasure.	Total Imports Re-exported by Sea.	Total Exports by Land, exclusive of Treasure	Grand Total of Exports, exclusive of Treasure.
	Val. Rupees.	Val. Rupees.	Val. Rupees.	Val. Rupees.	Val. Rupees.	Val. Rupees.	Val. Rupees.	Val. Rupees.	Val. Rupees.
838-39	65,74,531	49,89,600	75,18,635	1,90,82,766	62,60,378	7,50,875	none	14,71,938	84,83,191
839-40	72,24,004	46,58,123	85,50,598	2,04,32,725	87,20,698	7,07,097	"	13,67,859	1,07,93,654
840-41	69,94,311	36,83,970	78,33,338	1,85,11,619	64,79,165	8,46,379	"	13,67,325	86,92,809
841-42	62,97,791	40,81,265	94,26,686	1,98,05,762	83,61,091	6,40,498	"	12,45,350	1,02,46,939
842-43	56,01,140	43,08,582	96,52,266	1,95,61,988	80,10,280	6,28,794	"	13,41,240	99,80,314
843-44	-	-	not printed.	—	—	—	—	—	—
844-45	1,00,68,349	39,16,946	-	-	1,03,85,661	6,80,605	—	—	—
1845-46	80,43,649	31,93,418	-	-	73,69,008	8,61,211	—	—	—
1846-47	83,88,587	33,47,855	-	-	68,17,719	11,53,348	—	—	—
1847-48	78,58,946	26,97,484	-	-	44,88,864	4,35,650	16,85,029	—	—
1848-49	77,85,979	31,88,204	-	-	42,92,958	12,09,573	1,79,108	—	—

(signed) T. T. Pears,
Railway Commissioner.

Appendix (G.)

From H. D. Phillips, Esq., Collector of Salem, to Major T. T. Pears, c.B., Engineers, Madras.

Salem District, Yathapoor, Collector's Cutcherry,
30 January 1851.

Sir,

1. I HAVE the honour to transmit the information requested in your communication dated 24th October, and beg to express regret that it has not been in my power to furnish it at an earlier period.

2. The present population of the Salem district is reckoned at, males, 494,267; females, 447,677: total, 941,944.

3. The revenue drawn from this collectorate, as shown in the accounts last submitted to the authorities at Madras, was, for the Fusly year ending on the 11th July 1850, Rs. 19,13,316. 2. 2.

4. I enter below the names of the cusbahs and large towns of the district, with their population:—

	Population.		Population.
1. Salem	25,227	13. Yathapoor	1,370
2. Raizepoor	4,790	14. Trichingode	3,738
3. Namgherrypttah	1,971	15. Darampoory	4,415
4. Namcul	3,500	16. Palcode	2,463
5. Thathiengarpettah	1,635	17. Kistnagherry	3,273
6. Moraputty	3,230	18. Cauvaryputnum	2,305
7. Saynthamungalum	4,316	19. Tripatoor	7,810
8. Vayloor	1,339	20. {Vaniembaddy, with Am-}	6,078
9. Ahtoor	5,019	boopettah	
10. Yadapaddy	1,919	21. Denkencottah	5,081
11. Pullepolliem	875	22. Ossoor	5,401
12. Senkerrydroog	1,351		

5. Salem.—

5. *Salem*.—The situation of the above town is understated; is in a flat, open, but rocky country, with a small river passing through it; the Shevaroy Hills being distant five miles.

Raizepoor—Namgherrypettah.—Partially encircled by hills, in an undulating plain.

Namcul.—Towards the west of the Collymally Hills; a partially rocky, flat country

Thathiengarpettah.—In a rocky plain, about 16 miles from the main road, between Salem and Trichinopoly, near the Collymally Hills, from which various agricultural productions are brought down, and exported to Trichinopoly.

Moraputty.—A small place near the above.

Saynthamungalum.—Seven miles from the road on the Trichinopoly side of Namcul, also near the Collymally Hills.

Fayloor.—Twenty miles from the road, on the bank of the Cauvery, by which certain local produce, chiefly paddy, is carried on basket boats to Trichinopoly.

Ahtoor.—On the high road from Salem to Cuddalore and Madras, a river passing close to it, 31 miles from Salem and about 80 from Cuddalore; a very fair traffic is carried on here in iron. Stony country, near a range of hills.

Yadapaddy.—In a flat, open country, 20 miles from Salem, and 10 miles from the road between Salem and Coimbatore; of little importance.

Pullepolliem.—On the bank of the Cauvery, and on the road from Salem to Coimbatore, from the former of which it is 35 miles distant; a sandy soil with stones; rather undulating plain.

Senkerrydroog.—On the Coimbatore road, 24 miles from Salem, in an undulating, rocky plain.

Yathapoor.—Twenty miles from Salem, and two from the road between Salem and Cuddalore; of little consequence.

Trichingode.—Seven miles from Senkerrydroog; is the cusbah of the talook, and an important place; in a rocky plain.

Darampoory.—On the high road from Madras and Bangalore to Salem, &c, about 27 miles from the Topoor Pass; a thriving trading town; in an open plain.

Palcode.—On the road from Bangalore to Salem, 14 miles on the Bangalore side of Darampoory; in an open plain.

Kistnagherry.—On the high road from Madras to Bangalore, in an open stony country, its principal trade is in oil and paddy.

Cavaryputnum.—Eight miles from the above, on the bank of the Pennar River.

Tripatoom.—On the high road from Madras to Salem, 15 miles from Vaniambaddy, at the foot of the Javady and Yalagherry Hills; in an open country.

Vaniambaddy.—On the high road from Madras to Bangalore and Salem, a rich and thriving town, closely inhabited. It is on the bank of the Ponnear and Jonnapar Rivers. Is the principal entrepôt of trade of this district.

Denkencottah.—In a thickly wooded country, 17 miles from Ossoor, to which place is a good road; the trade of the town is chiefly in timber.

Ossoor.—On the high road from Madras to Bangalore, from the latter of which places it is distant 26 miles. The adjacent country is a continued succession of hills and valleys.

6. The principal agricultural produce of this district, of the above places, and of the talooks about them, is paddy, raggy, jowaree, bajera, toovur, pessaloo, oloonthoo, buller, horse gram, oil seed, till, tobacco, saffron, jaggery, Palmyra jaggery, tamarind, ghee, seekai, coffee, gingly oil, lamp oil, cocoa-nuts, betel-nuts, red dye bark, sandalwood, honey, and iron ore.

7. The main articles of local manufacture are pig iron, iron bars, saltpetre, indigo, steel bars, cloth, gunny bags, cumbles, vessels of brass and copper, bullock carts, dubbers, split bamboo matting, and skins of kinds.

8. The chief articles of export and import to and from this district are shown below.

EXPORTS.

To Madras.—Cloth, ghee, gingely and lamp oil, honey, saltpetre, skins, indigo, seekai, saffron, tamarind, coffee, steel bars, and pig iron.

To Pondicherry.—Pessaloo, jaggery, lamp oil, and oil nut, till, horse gram, saffron, coarse brown sugar, saltpetre, tamarind, ghee, cloths, and timber.

To Bangalore.—Cloth, timber, brass vessels, raggy, and rice.

To Chittoor.—Gingely oil, lamp oil, ghee, tamarind, jaggery, indigo, till, cloth, and timber.

To Calicut.—Cloths, Selumpoie cloths, cumbles, and iron.

To Mangalore.—Cloth.

To Bombay.—Cloth.

To Madura, Cumbaconum, Trichinopoly, and Tinnevelly.—Cloth, coarse brown sugar, jaggery, saffron, steel bars, and iron.

To Coimbatore.—Jaggery, sugar, saffron, cloths, iron, and steel.

IMPORTS.

9. *From Madras.*—Salt, miscellaneous articles, cloths of European manufacture, brandy and other spirits, copper, lead, tootinagum, hardware.

From Pondicherry and Portonovo.—Lead, copper plates, tootinagum, black lead, sundry articles, coloured thread, drugs, and salt.

From Calicut.—Betel, pepper, assafœtida, seekai, cloves, cardamoms, and articles of wood manufacture.

From Columbo.—Silk.

From Combaconum.—Vessels of brass and other metals, and cloth.

From Madura.—Red-coloured cloths, and salt.

From Mysore.—Pepper, betel, dry cocoa nut, sugar, silk, and wheat.

From Arnee, in the Chittoor District.—Cloths.

From Bellary.—Thread, and brass vessels.

From Guntoor.—Coloured cloth (in Hindoostani "Soosy"), and coloured handkerchiefs.

From Masulipatam.—Coloured chintz.

From Nellore.—Fine white cloths.

10. The agricultural produce of this district above described is believed to be mainly consumed within its own limits.

11. Consequent on the abolition of the sayer, the collector of a district does not now possess officially any information on which to found an opinion of what may be the extent of the traffic, or amount of trade carried on within the limits of his charge, and the approximate value which might be ascertained in some districts from reference to the veesabuddy tax is not available here, where the veesabuddy import is not levied; I am, however, impressed with the belief that the trade of the entire collectorate may be taken at 50 lacs of rupees annually.

12. The markets for the above-mentioned articles of local production are given in paragraph 8. The ordinary means of conveyance are carts with pairs of bullocks, and pack bullocks. In regard to the nature of the traffic between this district and Madras, I would refer to paragraphs 8 and 9. Its amount is roughly estimated at 15 lacs of rupees; but, as above explained, we have at present no official data whereby to frame any safe calculation of its real value. The same observation applies to the trade between Portonovo and Pondicherry, which is stated to me to be in value about 50,000 rupees.

13. The trade between the collectorate and the coast is confined to the above-mentioned three places.

14. There are but two principal roads used in the transport of articles brought into the district from the coast. One is by Ahtoor, passing through Ahtoor and Thullavassul into the Cuddalore collectorate, and so by Palaveram to the Presidency; the other is by Darampoory, Tripatoor, and Vaniambaddy, to Vellore.

15. The road to Pondicherry is by Ahtoor, Thullavassul, and Cuddalore. Occasionally merchandize is conveyed to Portonovo by Moganoor and Pollepolliam, across the Cauvery at the latter place. There is a good smooth road (the intervening ghaut being much less abrupt than that of Topoor) from Salem to Vaniambaddy, through the Munjawaddy Pass; but it is not liked, or generally resorted to, owing to the supposed unhealthiness of some parts of the line, and the small number of villages on it.

16. The distance between Salem and Madras being 220 miles, carts can always be had for 11 rupees, at half a rupee per 10 miles; but when there is no pressing demand for them, they can be procured even for nine rupees. Pack bullocks are procurable for the trip at 5½ rupees, or one-quarter rupee per 10 miles; but these too can be had at times for 4¼ rupees. Return carts and cattle from either place may be engaged at half the first rates of hire.

17. The inhabitants of this district have so long been accustomed to the very excellent roads by which it is intersected through its most important parts, that I do not anticipate any very immediate or general abandonment of the mode usually adopted by them for the transport of their produce and merchandize to the ordinary markets, unless the railway rates are in a marked degree lower than the present cost of the ancient and more primitive system of carriage.

18. If, however, what is now conveyed to Madras on bandies and bullocks can be carried from Arcot to its destination for something less than the hire of the present day, I believe that there is a very good disposition on the part of the Salem mercantile community to take advantage of the opening.

19. There will nevertheless be the greater difficulty in effecting the relinquishment of the system to which they have so long been accustomed, that the advantages of the new one will not be clear to the inhabitants of the district until the railroad is at their own doors; I therefore think it by all means desirable that the line proposed to Arcot should without delay be extended through Salem to Vulliaputty, a central village eight miles beyond Namcul.

20. The whole of the commerce carried on by means of carts, bullocks, and coolies between the Trichinopoly district and Madras, passes through Vulliaputty, where it enters on the great high road to Arcot by Salem and Vanembaddy. The traffic in a similar direction of the Madura and Dindigul districts, which now reaches Caloor and thence goes by Salem to Madras, would, it is fair to infer, be drawn towards Vulliaputty when the railroad is there available, instead of being taken on by the present more direct road, and now that the bridge across the river between Bawany and Comarapolliem has approached completion, and that the difficulties connected with crossing the Cavary at that spot will be surmounted, I consider that a large portion of the trade of Combatoore would also be attracted toward a railroad through Salem, in preference to being conveyed to the western coast. These are the principal advantages of opening the road in question which occur to me. Any remarks on the minor benefits resulting to the native community and to the government of the country by such a system of communications would be trite and superfluous.

21. Opinions as to the line to be selected for laying down the railroad from Arcot through the northern part of the Salem district to Salem, will probably be divided between the roads down the Topoor and Munjawaddy Ghauts. The latter undoubtedly is the more easy line, and the rate of communication on a railroad will necessarily remove all objections on the score of its being a less healthy part of the country than the road through Tripatoor and Darampoory. The engineering difficulties by the Topoor would be great, but that line, to my idea, would be the preferable one, on reference to the relative prosperity and condition of the talooks through which it would pass.

I have, &c.
(signed) *H. D. Phillips*, Collector

Appendix, (H.)

NOTE to Paragraph 35.

It is intended here to exhibit merely an approximate general statement of the cost of working the proposed line. To do full justice to the present project, it is necessary to consider how greatly the cost of carriage by railways (which have been always hitherto worked with a view to the payment, not only of the current expenses, but also of a fair interest on the capital), how greatly this depends upon the original cost of the line, the actual tractive power being obtained by a very small cost. In calculating from data drawn from experience in Europe, we have to bear in mind, on the one hand, the higher price here of fuel, and of all European agency, and on the other, the advantages arising out of a light traffic and moderate speed contemplated in the present instance, contrasted with the high pressure (so to speak) under which many of the English lines work.

The following Table, submitted to the Gauge Commission in 1846, shows the several items which, in six different railways, constituted the entire charge upon each train per mile.

COMPARATIVE WORKING EXPENSES OF THE GREAT WESTERN, BIRMINGHAM, SOUTH WESTERN, BRIGHTON, LEEDS, AND PARIS AND ROUEN.

	1844.		1844.		1844.		1844.		July to Dec 1844.	1843 & 1844, 1 Year.		
	Great Western.		Birmingham.		South Western.		Brighton.		Leeds.	Paris and Rouen		
	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.	s.	d.
Locomotive - - -	-	11·927	-	12 728	-	13·238	-	15·949	-	8 460	-	16·995
Repairs of carriages - -	-	-	-	1 883	-	3·302	-	2 702	1	3 346	-	2 629
Repairs of waggons - -	-	1·476	-	0·598	-	1·224	-	0 432	-	0·751	-	-
Passengers and goods; guards and porters - -	-	6 514	-	3·075	-	4·477	-	3·831	-	2·875	-	5·819
Police - - - - -	-	-	-	2·163	-	1·475	-	2·175	-	0·315	-	3 111
Direction and management	-	4 441	-	2·827	-	3·244	-	4 780	-	3 005	-	4·469
General charges - - -	-	3·191	-	3 372	-	4·944	-	6·696	-	1 920	-	4·716
Depreciation - - - -	-	3·201	-	5·588	-	-	-	-	-	2 079	-	-
	2	6 750	2	8·234	2	7·904	3	0·565	1	8 751	3	1·739
Passenger duty - - -	-	4 624	-	5·137	-	4·635	-	5·669	-	2 043	-	3 609
Rates and taxes - - -	-	3·790	-	3·346	-	4·456	-	5 934	-	3 019	-	0 284
Rent, toll, interest, &c. -	3	3 138	1	3 741	-	11·129	4	6·418	1	10 591	1	3 303
Maintenance - - - -	-	7 332	-	8 388	-	10·712	-	7·469	-	2 679	-	In locomotive.
	7	1·634	5	4 846	5	2 836	9	2 055	4	3 083	4	8·935

Part III.
Official Reports,
&c.

* Including main-
tenance.

It will be seen that the charge for locomotive power ranges on the English lines from 31 to 36 per cent. of the total expenses, exclusive of taxes, duty, &c. On some railways this charge was much lower, falling in one case (the Hartlepool Dock) as low as 5 $\frac{1}{2}$ *d.* That* for the French line appears as high as 45 per cent.; when these expenses come to be divided among the units of work, the cost per unit becomes singularly small, as shown upon the same authority below.

STATEMENT of LOCOMOTIVE EXPENSES per Ton per Mile (Goods Trains) on various English Railways, from Reports submitted to the Gauge Commission in 1846.

NAME OF RAILWAYS.	Cost per Ton per Mile.	Average Gross Load.	REMARKS.
	<i>Pence.</i>		
Manchester and Leeds - - - -	0·04	177	—
London and South Western - - -	0·10	121	—
Birmingham and Gloucester - - -	0 09	152	—
Great Western - - - - -	0·06	265	—
Grand Junction - - - - -	0·13	152	—
London and Birmingham - - - -	0·12	162	—

Had I taken the highest of these as the locomotive charge per ton per mile, and trebled it for the total working expenses, the entire cost of working the proposed line to Wallajah-nuggur, with the present estimated traffic, would have been 32,00,000 × (for gross load) 64,00,000 × 0·13 × 3 = 24,96,000 pence, or *Rs.* 1,04,000, instead of *Rs.* 1,41,110* allowed by my calculations in para. 35.

The total expense ("special charges") involved in the conveyance of one ton for one mile on the Belgian railways, is, according to Belpaire (0·1 *d.*), one-tenth of a penny.

The circumstances under which this railway would be worked, contrasted with those of the railways at home, render it certain that our expenses would be, per train, less than theirs; per unit of work, more.

(signed) *T. T. Pears.*

Appendix (I.)

From Major *T. T. Pears*, Engineers, to the Chairman of the Chamber of Commerce, Madras.

Sir,

Rajah's Choultry, 4 November 1850.

Para. 1. GOVERNMENT has been pleased to appoint me to survey and report upon the lines of railway proposed in this Presidency, and I am at present engaged in the examination of a line proposed between Madras and Arcot, and the consideration of the probable results to be anticipated from the construction of that line. May I request the Chamber of Commerce will favour me with their assistance, and furnish me with such information as it may be in their power to offer upon the following points:—

1st. Looking at the effects likely to be produced on the exports and imports of Madras by sea, what are the districts in the Madras Presidency which stand most in need of improved means of communication with Madras, and from the opening up of which the greatest benefits are likely to accrue.

2d. What are the principal articles of trade likely to be affected by the establishment of railway communication to or towards such districts, and to what extent might we reasonably expect them to be affected thereby.

3d. What is the present average annual importation by land into Madras of the chief articles of commerce, as cotton, sugar, indigo, betel, grain, oil, timber, and from what districts brought; what proportion the land carriage bears to the local market price; for what market chiefly destined; and what the proportion per cent. of the land carriage in this country to the ultimate selling price.

4th. Of the above articles what quantity is believed to pass along the present road from Wallajahnuggur, and from what district that amount is originally brought.

2. The line of railway proposed between Madras and Arcot is to be considered not merely with reference to the country through which it passes, and the towns constituting its proposed termini, but also with a view to the districts beyond likely to be immediately affected by it, and the direction in which it would ultimately be extended.

3. We

3. We have to consider, therefore, mainly the province of Mysore, the districts of Bellary, Cuddapah, North Arcot, Salem, and Coimbatore, their relative claims in a commercial point of view, and the prospect which they severally hold out of benefiting by the establishment of railway communication with Madras.

4. The information which I have now solicited is that which occurs to me at present as embracing points of primary importance; but I need scarcely observe that I shall be thankful for any further information it may be in your power to afford me, or that I shall be glad to be favoured with the opinion of the Chamber of Commerce generally upon the subject which I have under consideration.

(signed)

T. T. Pears.

Railway Commissioner.

Appendix (K.)

(No. 200.)

From J. D. Bourdillon, Esq., Collector of North Arcot, to Major T. T. Pears, C.B.,
Engineers, Madras.

Sir,

Para. 1.—I HAVE the honour to acknowledge your letter of the 19th November, asking for some further information on the subject of the production and price of sugar and salt, with reference to the proposal of a railway from Madras to Palmanair.

2. In my letter of the 12th November, I stated the quantity of sugar taken from this district for export by sea in Fusly 1259; I now give you in the margin a statement of the quantity similarly exported in each of the five years since Fusly 1255 inclusive; the trade appears to have commenced a few years previously, but the particulars of the first two or three years are missing.

				Maund.
Fusly	1255	-	-	431,641
„	1256	-	-	364,944
„	1257	-	-	115,462
„	1258	-	-	189,978
„	1259	-	-	359,712

I enclose a statement of the whole extent of sugar-cane cultivation for all purposes, consumption as well as export, for the 15 years, Fusly 1245 to Fusly 1259, with the exception of Fusly 1255, the accounts of which are not forthcoming.

No 1.

3. You will perceive that the production of sugar for export by sea is of very recent origin in this district. The Act under which the export takes place passed in 1839 (Act XV.); and I believe certificates were first given in this district in 1841 or 1842. In Fusly 1255 (1845-46) the trade was at its maximum; it had, perhaps, been pushed too far for the capital engaged in it, and the commercial crisis in England in 1846, the consequent fall in the price of sugar, and the simultaneous rise in freight (caused by the unusual demand for shipping to convey corn) gave it a shock which it has not recovered. You will see in the statement (No. 1) of cultivation that the extent of Government land occupied with cane has nearly doubled during the last fifteen years, the increase being probably due in a great part to the demand for export to Europe. I have no returns for the zemindary and enam lands, except for the last Fusly, 1259; but it seems likely that the increase there has been concurrent with that in the Government lands. I am aware of no obstacle to the continued extension of the cultivation of cane much further; and I have no hesitation in stating my conviction that the export of sugar is a branch of trade capable of very large extension in various parts of this district, the requisite condition being that the price in England shall be steadily such, with reference to the cost at the place of export, as to enable the merchant to give a liberal price to the grower.

4. One item in that cost is the carriage to the coast, but it is not a very important one. The mere carriage here for a ton of sugar from Palmanair to Madras is about 15 rupees, or three quarters of a rupee a cwt. Taking the average price in the English market of the quantities brought from Palmanair at 35 s., this would be about 2 per cent. of the ultimate price. Assuming that this cost might be reduced to one-fourth by a railway, the saving would amount to 1 ¼ per cent. on the final price. This does not appear much, but the proportion of the saving to the net profit of the exporter would be much more considerable, and I cannot but think that the diminution of charge, small as it appears in comparison with the whole price of the commodity, would not be without considerable effect as an encouragement of the trade.

5. Nor would the mere pecuniary saving be all; much perhaps more than that would be gained in speed and safety to the commodity. As to speed, the ordinary time by a bandy in fine weather is about 10 days from Palmanair to Madras; and I was told lately by a gentleman extensively engaged in the trade, that a number of bandies with sugar belonging to him had been out 30 days, and still had not reached the Poonnay River, being delayed by bad roads and swollen streams. As to the safe carriage of the sugar, it is no very uncommon sight to see sugar bandies upset or broken down, and the load scattered about the road or piled up till the bandy can be repaired, and in bad weather the contents of a bandy, independently of accidents, must always be somewhat exposed. On the whole, therefore, I cannot but think that a railway would be of material assistance to this branch of trade.

Part III.
Official Reports,
&c.

No 2.

McCulloch's Com-
mercial Dictionary,
and the Penny
Cyclopædia

Porter's Progress of
the Nation The
statistics of the
intermediate years
are not given

6. With respect to salt, I enclose a statement of the average retail price at each talook cusbah of the district, for the five Fusly years 1255 to 1259. These prices are taken from the usual monthly returns received from the talooks. I will not vouch for their truth, but with the exception of Sholinghur and Penmurry, they seem to vary pretty nearly with the distance from the coast, and that is an argument in their favour. The wholesale prices are given for the two towns of Vellore and Arnee, from which only they are received. I am unable to explain the variations in price from year to year, and there are some inconsistencies between the several talooks, which I am unable to reconcile on the assumption of their being all correct. I regret that I have no materials whatever for estimating the actual consumption of salt in this district. If the rowanah system were strictly enforced, the rowanahs of salt taken for consumption within it would afford some criterion; but under the present lax system, an appeal to them would only mislead.

7. Some idea may be formed, however, as to the cost of a wholesome quantity of salt. In England the annual consumption is variously reckoned at from 16 lbs. for each adult to 22 lbs. a head, and the common food of this country being almost exclusively vegetable, a larger quantity is required, but I will suppose 20 lbs. to each person. I find that the retail price of salt in the Chittoor bazars amounts, after the separation of the dirt, to nearly 3 lbs for one anna, 20 lbs. would therefore cost about seven annas. In out-villages it would be more, and in parts nearer the coast it would be less. This does not seem an amount of much moment in the course of the year, but it must be remembered that the wages of common agricultural labour do not exceed at the outside 20 rupees* a year, and the salt of an average family at the allowance above given, costing probably two rupees a year, would obviously bear an excessively large proportion to the earning of the family. I cannot but think, therefore, that the present price must greatly operate to limit consumption

8. But fortunately some insight into the truth may be gained by looking at the actual results of a large reduction in the price in our own country. In England, from 1805 to 1823 there was an Excise duty of 15 s. a bushel on salt used for domestic purposes; in 1823 this was reduced to 2 s., and in 1825 it was abolished. During the existence of the high duty, the retail price of salt was 4 $\frac{1}{2}$ d. a pound; it is now something under $\frac{1}{2}$ d., and the following was the result:—In the eight years from 1810 to 1817 the average consumption of salt, according to the Excise accounts, was 1,918,598; from 1827 to 1834 inclusive, the average was 10,358,002, or above five-fold increase; and deducting one-fifth of the whole for the increase of population in the interval between 1814 and 1831, the consumption per head in the latter period may be taken at four times what it was in the earlier.

9. Nominally the present price at Chittoor is equal to the present price in England, but compared with the price of labour it is higher than the price was there under the high duty. For, taking the ordinary wages of common field labour in this country at 20 rupees a year, I find that the price of 16 lbs. of salt equals 1-64th of a labourer's annual wages; and taking 28 l. as the earnings of an ordinary agricultural labourer in England (and this is no more than fair, including the harvest month), the price of 16 pounds of salt in England is equal to 1-840th part of such annual earnings, so that the price in India is in effect about 13 times as high as it now is in England. The price therefore must be regarded as very high, and bearing in mind that prior to the reduction of the duty the price in England was in effect already lower than it now is here, I think I am fully justified in anticipating a large increase of consumption in India also, from any material reduction in price.

10. The foregoing remarks have reference primarily to a district like that of North Arcot, which is near the sea, and most parts of which are accessible by roads, bad as they are, but they have much more force when applied to some other tracts. In the western parts of the Mysore country, as I have been recently informed by a gentleman who has very good opportunities of knowing, sea salt is an article almost unknown, earth salt being substituted, or the use of the condiment being more or less dispensed with. In Bellary also, the use of sea salt is extremely limited, earth salt being made and used in large quantities; and probably Salem and Combatoore are similarly circumstanced. Yet sea salt is universally allowed to be a far superior article, and there appears no doubt that if offered at a moderate price, it would quite supersede earth salt.

11. It may be objected, perhaps, that any inferences drawn from the increased consumption in England, that it has resulted in great part from the increased use of salt in manufactures and agriculture, to which it is not likely to be applied in India. But, in the first place, it is obvious that there is a great vacuum in the ordinary domestic consumption of the country, which has yet to be filled; and, secondly, such reasoning is rash, no man can say beforehand what benefits will not result from such a reduction of duty, or to what new uses an article so much reduced in price will not be put. How often have even the advocates of improvements been themselves surprised to see the beneficial effects of enlightened fiscal legislation displaying themselves, not only in a degree much greater than even they had anticipated, but in totally new and different directions. Among other uses
to

* My inquiries lead me to suppose that the earnings of an agricultural labourer do not exceed 15 or 16 rupees a year, including everything; but I put it down at 20 rupees.

to which salt might probably be put, if cheap, I think it very likely that it will be largely given to cattle.

12. There is yet another aspect in which this subject may be regarded, viz, in connexion with the influence of smuggling on the revenue. I will not venture a conjecture as to the proportion borne by the smuggled salt to that which pays revenue, but I am satisfied from observation that it is large; and it would contradict all experience to suppose that it was otherwise, even in so bulky a commodity, when the Government tax amounts to from 600 to 1,200 per cent. on the cost of production,* a material reduction in price would bring the whole or a greater part of this smuggled salt to pay revenue.

13. In the foregoing remarks I have had in mind a material reduction in the tax on salt, and perhaps the abolition of the monopoly, and the imposition of an Excise duty. I will now come to the subject more immediately in hand. The question is, what part of the supposed good effects of a reduction in the price of salt would be secured by a railway from Madras to Palmanair. I give in the margin the retail prices of a garce of salt at Palmanair (Cuddapanuttum talook) in the last 10 years. The average is 187 ½ rupees, of which 120 rupees must be taken as the cost price on the coast. A garce of salt weighs 9,600 pounds;† and I am told that the ordinary load for a bandy is 40 maicals, or 960 pounds, so that a garce would require 10 bandies. Taking the full hire of a bandy from the coast to Palmanair at six rupees, the transport of a garce would cost 60 rupees, leaving on the average only 7 ½ rupees for profit to the dealers, which is obviously too little. I cannot but think, however, that the cost of the conveyance of salt to Palmanair depends much on the prosperity of the sugar trade; and I cannot but ascribe the material fall in price there in Fushies 1258 and 1259 (larger as it was than in other parts of the district) in great part to the greater number of return sugar bandies, which will often bring a load for half hire. If this is the case, the cost of the carriage of salt must not be calculated at the full bandy rate. I will assume the actual cost of the transport of a garce to Palmanair at only 40 rupees on an average; and supposing that a railway would reduce it to 15 rupees (being the fourth of full bandy hire), the reduction in the price of a garce of salt would be 25 rupees, or from 187 ½ to 162 ½ rupees, being 13 ½ per cent. I think it cannot be doubted that a permanent reduction of price to even this amount would cause increased consumption, but I do not think it would be reasonable to expect any very marked increase, or the application of salt to other than its present uses. In this case also, as in that of sugar, the increased speed and security of a railway would be a benefit, independently of the direct saving of expense.

Fushies	Rs	a	p
1250	-	184	8 -
1251	-	178	1 5
1252	-	184	8 -
1253	-	182	13 1
1254	-	196	14 9
1255	-	185	- 11
1256	-	220	3 8
1257	-	196	11 11
1258	-	175	13 11
1259	-	169	12 3
<hr/>			
Total	-	1,971	11 11

North Arcot Collector's Cutcherry,
Chittoor, 20 December 1850.

I have, &c.
(signed) *J. D. Bourdillon*,
Collector.

MINUTE by the Honourable Mr. *Elliott*, dated 17th April 1851.

I HAVE kept this important Report in order to make an analysis of it, with a view to offering some remarks which I shall prepare as soon as possible. I now forward the Report in circulation to save time. I have only to say at present that I think Major Pears should be urged to send in the estimate promised in para. 33 of his Report, with a complete survey of the line to Wallajah-nuggur, without delay; but that the survey and estimate for the extended line had better be deferred.

(signed) *D E.*

MINUTE by the Honourable Mr. *Elliott*, dated 22d April 1851.

MADRAS AND WALLAJAHNUGGUR RAILWAY.

Major *Pears*' Report.

It appears that Major Pears considered it his duty, in the first instance, to apply himself to the determination of the best line for a railway between Madras and Wallajah-nuggur, as the points contemplated by the Madras Railway committee, and having, as he states, neither plan nor estimates before him, the original‡ papers connected with the Madras and Wallajah-nuggur Railway having been sent to England, he set himself to prepare complete surveys and estimates, with the assistance of surveyors placed at his disposal by the Board of Revenue, D. P. W.

Major Pears submits this Report in anticipation of his surveys and estimates, which are not yet ready, in order to lay before Government, as early as possible, the information he has

* Viz, according to the price paid for it to the ryot at the different pans.

† Viz, 120 Indian maunds of 80 pounds each

‡ These must be the surveys, plans, and estimates prepared for the committee by Captain Collyer. The original survey of this line by Captain Worster, and the estimate framed by him, are no doubt among the records of the Board of Revenue

Part III.
Official Reports,
&c.

has obtained, and the conclusion he has arrived at in regard to the expediency of adopting the line proposed by the railway committee, or rather, as it would seem, of confining it within the limits contemplated by the committee.

After observing that, as the basis for a general system of railroads, a line running out due west from Madras to a point about 60 or 70 miles distant, clear of Wallajahnuggur, would be the most eligible, he remarks that the line to Wallajahnuggur, though not the best, will, however, form a very convenient basis.

10

12.

13-14

He thinks that the importance of Wallajahnuggur as an entrepôt has been overrated, but he observes that it is from hence that the trade from the westward is disseminated through the Carnatic, especially the cotton of the Ceded Districts and the betel-nut of North Canara, both of which are, according to a practice of long standing, consigned to agents at Wallajahnuggur, while the traffic passing along the Western road to Madras comes, for the most part, through this town. On the other hand, the trade passing over the road from Madras to Wallajahnuggur is insignificant.

16 to 30.

Present traffic by Western road, between Wallajahnuggur and Madras.

2.

In the papers submitted to Mr. Simms the traffic in goods seems to have been estimated at 30,000 tons.

The traffic in goods now carried over the Western road between Wallajahnuggur and Madras, Major Pears, from all sources of information, estimates at 50,000 tons. This estimate is deduced from various computations of the traffic, the lowest being 34,136 and the highest 54,000 tons. It is, perhaps, a fair approximate estimate, but it may be safer to take something nearer the mean, say 45,000 tons.

Present cost of carriage and possible charge by railway per ton per mile.

31.

The present cost of carriage Major Pears estimates (taking a bandy to carry half a ton, and the charge for a bandy from Wallajahnuggur to Madras to be 4 rupees, and of a return bandy *Rs.* 2. 12.) at 1 *a.* 6 *p.* per ton per mile on the average; and he concludes that the maximum charge by the railroad cannot be raised above 1 anna per ton.

Cost of construction.

33

Framed by Captain Collyer

34

Major Pears, not having completed his own estimate for the line, which appears to him the most direct and cheapest, he adopts in the meantime the estimate of the Madras-committee for a single line, which, he observes, is framed upon liberal principles, and is likely to prove amply sufficient; viz.

	<i>Rs.</i>
Construction of railway - - - - -	18,32,615
Engines, waggons, buildings, &c. - - - - -	3,30,000
	21,62,615

Expenses of the Railway

35.

Major Pears mentions the interest on the capital expended in the construction of the railway per year, which, at 5 per cent., will be 91,636 rupees as a permanent annual charge, distinct from the cost of maintaining and working the railway; the latter he estimates at 1,57,610 rupees per annum; viz.

	<i>Rs.</i>
Interest - - - - -	16,500
Maintenance of way, 64 miles, at 700 rupees - - - - -	44,800
Locomotive expense, at 8 annas per train per mile, four hours daily, for 313 days - - - - -	40,060
Repairs to waggons, at 10 per cent. - - - - -	10,500
Ditto to buildings at 5 per cent. - - - - -	5,750
	1,57,610

Financial results.

36.

In estimating the financial results, Major Pears assumes that the whole of the traffic in goods which, according to his reckoning, now passes by the trunk road between Wallajahnuggur and Madras, will pass by the railroad; thus, traffic, 50,000 tons, at 1 anna per ton per mile—

	<i>Rs.</i>
<i>as.</i> <i>ms.</i>	
$(50,000 \times 64 = \frac{32,00,000}{10} =$ - - - - -	2,00,000
Expense of maintenance and working, as above - - - - -	1,57,610
Surplus gain - - - - -	42,390
Against the permanent charge for interest on cost of railway - - - - -	91,630
Deficit - - - - -	49,240

In this manner he calculates that by the return carriage of goods alone there will be an income of 2 lacs, which will leave a surplus, after paying the costs of maintenance and working, available towards payment of interest on the capital laid out in the construction of the roads, but insufficient by 49,240 rupees.

It seems to be a better arrangement to throw the two sums of interest on capital expended together, as an unvarying charge, distinct from the charges of maintenance and working, which must necessarily vary, but may be estimated, on an average, thus:

Income from traffic on goods - - - - -	Rs. 2,00,000	1,57,610 - 10,500 = 1,41,110.
Expense of maintenance and working - - - - -	1,41,110	
	Surplus - - - - -	
Interest on capital - - - - -	58,890	
	1,08,130	
	Deficit of interest - - - - -	
	49,240	

The above shows a surplus of 58,890 rupees after paying all costs but that of interest on capital, which it will cover to the extent of about 2 1/2 per cent.

To meet the deficit, there remain the returns to be expected from the conveyance of the mails and the transport of troops, which Major Pears estimates at 24,458 rupees, leaving only 24,782 rupees to be made up by ordinary passengers, parcels, &c.

Deficit from goods - - -	49,240
Mails and troops - - -	24,458
Passengers and parcels - - -	24,782
	Paras, 38 to 40.

In reference to Major Pears' estimate of the present traffic on the trunk road between Wallajahnugger and Madras, I have suggested an abatement, reducing it from 50,000 to 45,000 tons, and a further abatement would seem to be advisable in reckoning the amount likely to be carried by the railway, at least at the outset. I think it will hardly be safe to count upon more than 40,000 tons in the first year from the ordinary traffic. But it will be in the power of Government at once to throw additional traffic upon the railway by means of the article of salt alone, to an extent which will go a great way to make up the difference. I have no doubt that as soon as the railway is ready to work, the long-contemplated project of establishing a salt depôt at the Western terminus will be carried into effect.

Board's Proceedings, 5th Dec 1836, enclosing a Minute by Mr D Elliott, 3d Nov., dated 9 Nov 1836

Major Pears assumes that the quantity of salt carried by the Western road is about 3,000 garces, or 12,400 tons. Referring to the statement (O.) quoted by Major Pears, I observe that of the whole quantity of salt supplied from the north-east coast to inland districts likely to be more or less affected by the railway, 4,551 garces were supplied from Madras and the district of Chingleput. If a depôt were established at Wallajahnuggur, it would probably be deemed expedient to make the supply equal at least to the present export from Madras and Chingleput together, drawing the quantity of salt required beyond what the Madras Customs will afford from the Chingleput pans, which now send salt inland. To furnish the depôt to this extent the railway would be required to carry 18,772 tons instead of 12,400, or 6,372 tons beyond Major Pears' estimate, for which it would receive a payment of 75,088 rupees; and if the price at the depôt should be reduced, as I originally proposed, by an abatement of 15 or 25 rupees from the rate per garce charged on the coast, to meet the expense of carriage further inland, there might be expected an increase in the sale to the extent, at least, of the difference between the above quantity and that which could be brought for the same money at the reduced price. Thus, the price of 4,550 garces at the present charge is 5,46,000 rupees, which, at 105 rupees, would purchase 5,200 garces, and at 95 rupees, 5,748 garces. Supposing the demand to increase so as to warrant the supply being extended to 5,750 garces, or 23,000 tons, the payment to the railway would amount to 90,816 rupees, and would fully compensate for any deficiencies in other articles below Major Pears' estimate.

Min of Cons 20th Dec 1826, No 1703. 8,090 garces.

4,551 garces.
4 1/2
Tns 18,772, at 1 ann.

$$\frac{18,772}{16} \times 64 = 75,088 \text{ rupees.}$$

4,550 garces	
120 rupees.	
5,46,000 rupees	
105	= 5,200 garces.
5,46,000	
95	= 5,748 garces.

Now, assuming, according to Major Pears' estimate, that the income required to pay the costs of maintenance and working, and to afford interest at 5 per cent. on the capital expended, is 2,49,240 rupees, we have, from one article under the control of Government, an income accruing to it of 90,816 rupees, leaving only 1,58,424 rupees to be supplied from the general trade in goods, from passengers and parcels, from the mails and troops. Setting down the returns from the mails and troops, as Major Pears does, at 24,458 rupees, the sum further required is 1,33,982 rupees.

Should Major Pears' estimate of the goods traffic, exclusive of salt (50,000 - 12,400 = 37,600 tons), be realised, as it probably will eventually, the return therefrom would be 1,60,000 rupees, and the total, including salt, 2,50,816 rupees.

as.
4 1/2 per garce.
64 miles.
264 16rs. 8a.
16

In the above calculations I have not noticed the additional charge which must be made upon the salt sold at the depôt for the cost of carriage by the railway, advanced by the Government; it will be Rs. 16. 8. per 1 garce = 4 1/2 tons, at 1 anna per ten garce. The charge per bandy, at the average estimated by Major Pears, Rs. 3. 6., allowing half ton per bandy, would be 27 rupees.

Rs 3 6
8 bandies.
27 -

The trader buying at the depôt at 120 rupees per garce, with Rs. 16. 8. added for carriage, would thus save Rs. 10. 8 per garce. To this is to be added a little saving by sending on by the railway the goods brought to it on the bandies now to be employed on carrying the salt inland. This saving in money, not to mention the saving in time, might be sufficient to induce the trader bringing cotton or sugar from the Ceded Districts or Mysore, with the intention of taking back a cargo of salt, to transfer his cotton or sugar to the railway, and to resort to the depôt for his salt, without the additional inducement of a more profitable speculation by a reduction in the price of the salt. The object of

120	120
16 8	27
136 8	147
	136 8
	10 8

Part III.
Official Reports,
&c.

diminishing the price would be to extend the sale, and bring this important article of consumption *pro tanto* more within the reach of the people of the interior, the increased sale making up to the revenue for the diminution of the price.* The trader would probably lay out not only the amount gained by him by the reduction of price, as before supposed, but also his saving in carriage, in the purchase of as much more salt as the amount would procure. The Rs. 10. 8. saved on the carriage of salt, added to a reduction of 15 rupees in the price, would be a gain on the whole of Rs. 25. 8. per garce; added to 25 rupees, it would be a gain of Rs. 35. 8., besides the saving on the carriage of the goods forwarded by the railway.

Sugar.

Besides this increase in salt, which it will be in the power of Government to command, as above shown, it is likely that the establishment of the railway would give a stimulus to the trade in sugar from the Western talooks of North Arcot, and the adjoining parts of the Cuddapah district, and from Mysore. This traffic would fall on the railway at Wallajah-nugger. Major Pears states, that the present cost of carriage from Palmanair to the coast is about 2 annas per ton per mile, and that the saving by the railway from Wallajah-nugger to Madras would be Rs. 3 12. per ton.

Para. 51.

Cotton.

Major Pears observes, that a railway carried into the Ceded Districts would tend greatly to the encouragement of the cotton (the import of which into Madras from those districts has declined of late), not more by cheapening its transport, than by facilitating communication, and promoting among our European community a more intimate acquaintance with the country and its capabilities, but that the line now projected, running 64 miles towards Bellary, cannot be expected to produce any marked effect upon a field so remote. The advantage of forwarding the cotton by the railway this comparatively short distance is not, however, to be regarded by itself, but as combined with the advantage of a cheaper return cargo carried a shorter distance, in which view the benefit of the Bellary trader is more considerable, the whole distance saved out and home will be 128 miles, and the time probably 10 days. Major Pears justly observes, that few articles are likely to be so much affected by a railway as cotton, from its bulk, and its liability to injury from accident or exposure.

52.

Major Pears thinks a railway may be expected to exercise a marked influence on the less valuable products. And with regard to grain, timber, hay, straw, firewood, &c., he observes, that could they, by a judicious arrangement of the tariff, be brought on to the rail, a fall of nearly 50 per cent. on the cost of transport would greatly increase the demand, while it would extend the influence of our market in the direction of the railroad to districts now beyond its reach.

I am led to conclude, on the whole, that with the aid that Government will be able to afford to the railway in establishing a salt depôt at its inland terminus, by which, at the same time, a considerable benefit will be afforded to the people of North Arcot, Mysore, and the Ceded Districts, the traffic will speedily rise to the amount which, on Major Pears' estimate, is requisite to make the line pay, that is, to yield an interest of 5 per cent., after defraying all costs.

Whether the estimate Major Pears has adopted of the original cost of making the road and laying down the rails, and providing the working apparatus, and the annual cost of maintenance and working the line, is adequate, is a question on which it is more difficult to form an opinion. The estimate we have seen allows for the construction of the railway and providing the working apparatus, 21,62,615 rupees, or say, in a round sum, 22 lacs, or 34,500 rupees per mile.

$$\frac{22,00,000}{64} = \text{Rs. } 34,500 = \text{£ } 3,450.$$

This is much less than the cost contemplated in the project reported on by Mr. Simms, which embraced a single line of railway about 70 miles in length, not exceeding 5,000 l. per mile. Mr. Simms was of opinion, from what he had seen of works in Bengal, and knowing the cost of rails, engines, and machinery, which he presumed must be nearly all brought out from England, that 5,000 l. per mile would be insufficient for the construction of the line and the purchase of the plant necessary for working it, but he thought it probable that the whole of the proposed capital, 500,000 l., would cover the outlay; an additional 100,000 l., however, he considered advisable.

$$\frac{\text{£ } 500,000}{\text{Miles } 70} = \text{£ } 7,157 \text{ per mile.}$$

$$\frac{600,000}{70} = \text{£ } 8,571 \text{ ,,}$$

I do not think much stress need be laid upon Mr. Simms' experience of works in Bengal, but his knowledge of the cost of rails, engines, and machinery ought to be pretty correct.

However, I imagine that there has been a material reduction in the cost at which rails, &c. can be procured since the date at which Mr. Simms wrote, and I take it that he was determined to be on the safe side, by keeping a very large margin. The experience of the Bombay Company, which has already entered into contracts for the supply of rails, &c. to a great extent, will be a most valuable guide in checking the estimate which Major Pears has to submit. I think an early application should be made to the Bombay Government to procure for us all the information on this head which is obtainable.

I now

* Perhaps the best way of diminishing the price will be to take off the cost of carriage, and to sell at the depot at the same rate as at the pans and cotours on the coast. This at any rate ought to be the minimum of reduction.

I now proceed to the question discussed by Major Pears as to the sufficiency of the proposed line as an experimental one, and the propriety of selecting Wallajahnugger as its terminus.

Para 55 et seq

Major Pears observes that 64 miles is a respectable length for a railway in England, but considered as the commencement of a line destined to extend from 500 to 1,000 miles,* it is but a mere fragment, and its results must be partial and unsatisfactory. Remarking that a railway is incomplete so long as it fails to reach the source or sources of its traffic, he refers to a statement showing the principal products constituting the traffic to Madras by Wallajahnugger, the distance from Wallajahnugger, of the sources thereof, and the saving which would be effected by the railway from that place, and answers negatively to the question, whether this would be sufficient to induce traders to establish agencies at Wallajahnugger, and incur the risk and loss of the shipment at that place, the greater and worse part of the journey having been accomplished, the rivers crossed, and only three† days' march on a good road remaining.

Appendix (M)

Major Pears expresses strongly his conviction that the line to Wallajahnugger is too short to furnish a satisfactory experiment, or to produce any marked improvement. He notices, as an unfavourable circumstance, that the proposed terminus falls short of two rivers, the Ponay and the Palar, both unbridged.

He thinks that the railway should be extended to Vaniambaddy, as the line upon which there is the greatest amount of traffic, and one which, from the favourable circumstances under which it might be constructed and worked, is most likely to exhibit favourable results.

Vaniambaddy, he observes, has a population of from 6,000 to 8,000, including the suburbs ‡. It is situated at a point where the traffic from Madras branches into two channels; towards Salem, Coimbatore and Malabar by the one, the Mysore territories and Canara by the other. The advantages of this line, according to his view, are a greater amount of traffic in proportion to its extent than any other that could be selected, and greater cheapness of construction, as involving fewer works of magnitude, the bridges across the Ponay and Palar being the only works of magnitude, and those attended with no difficulty, and no expense that would not be amply counterbalanced by the cheapness of the line and the importance which the railway would derive from the passage of those two rivers.

He asserts that the traffic over each mile of this extended line is even now not much below § that on the shorter one, but the longer line would exercise a far greater influence on its amount, and the profits arising from it would probably be greater, while its usefulness would be much more extended; already, he observes, there is a considerable traffic by the trunk road from the districts of Trichinopoly, Madura, and Dindigul, which would be increased by a railway terminating at Vaniambaddy. Major Pears reckons that at present by far the greater part of the traffic which passes from Wallajahnugger to Madras comes from Vaniambaddy, || while there is between the latter place and Vellore an additional amount, not far, if at all short of that which joins the present at Wallajahnugger from other channels. The railway being extended to Vaniambaddy, Major Pears assumes troops and military stores for the southern division of the army would be sent by this route. As regards passengers and the conveyance of troops and stores, he remarks that a line starting at Madras, that would place them 130 miles on their road to Bangalore, Salem, Coimbatore, Malabar, the Neilgherry and Sheewaroy Hills, would afford greater accommodation than any other line of equal length. Finally, he observes that this would derive additional importance from the town of Vellore, with a population of 120,000 (83 miles from Madras), far surpassing Arcot in political and military importance.

Para 61

§ This I cannot but think questionable

|| Doubtful, I think

I am rather inclined to think that it might be advantageous to extend the line to some distance westward, but how far, and whether directly westward, or with a deviation to the north or to the south, are questions which demand the most careful consideration. Bangalore is slightly to the north of a line running due west from Wallajahnugger, while Vaniambaddy is 17 or 18 miles to the south of it. Goriattum and the old Naikanari Pass are pretty nearly due west. The road by Vaniambaddy to Bangalore is disapproved, both on account of the additional distance caused by the line trending so far to the south, and also on account of the difficulties from the natural features of the country between Vaniambaddy and Ossoor, which render it the least eligible way of access to the Mysore territories. It is therefore in contemplation to change the line of the high road from Madras to Bangalore, and to carry it to the north of west by Chittoor and the Mooglee Pass. When the road to Chittoor is made, and the Mooglee Pass improved as proposed, there can be no doubt that the most part of that main portion of the traffic by Vaniambaddy, which Major Pears speaks of as branching off at that point to the Mysore territories and Canara, will

* This is an exaggeration in speaking of this Presidency, in which the extreme length of any line from Madras, or from any part in the interior of our territory to a convenient sea-port, must be within 500 miles, the distance to the opposite coast being about 428, to Bangalore little more than 200, to Bellary about 340, to Hyderabad within 400, to Pallamcottah about 400.

† This is understated: the distance by the road is about 70 miles, $\frac{70}{3} = 23\frac{1}{3}$, which is an extremely long march for a bandy; it is more likely that the time occupied is 5 days, $\frac{70}{6} = 11\frac{2}{3}$

‡ The population of Wallajahnugger and the towns of Raneepet and Arcot, within two miles of it, amounts to 44,000.

Part III.
Official Reports,
&c.

will cease to pass that way. For this reason, I think that while Vaniambaddy would probably be a good terminus for traffic to and from Salem, Coimbatore, Malabar, &c., it would not answer at all for Mysore, &c.

Major Pears himself shows that the extension of the railway to Vanaimbaddy would not benefit the Ceded Districts, nor the western talooks of North Arcot above the Ghauts. Bellary, he observes, might be benefited by its being across the Pouey river, six or seven miles west of Wallajahnugger, but not farther.

N. P.

The point which he last indicates (a place called Trivellum) is that at which the new road by Chittoor and the Mooglee Pass on the Mysore, and towards the districts of Cuddapah and Bellary is to commence, by which, no doubt, a large part of the exportable produce of Mysore, Bellary, and Cuddapah, and the Balaghaut talooks of North Arcot, in which sugar is now growing into importance, will in future pass coastward.

Trivellum is a small place, with a population numbering only 1,357, but it is the chief station of a talook, and would therefore not be ineligible for a railway station, if there were not a better further on. I think a better place for a station, if not a terminus, on this line, would be the point of junction between the railway and the road from Vellore to Chittoor, with which the road from Trivellum is to be united at a distance of nine or ten miles from Vellore; and it may be observed, that if the railway were carried to this point,

Population, 120,000 The point of junction appears to be about four miles from Vellore See Road Book, No. 2

the new road might be spared. This extension would carry on the railway 15 miles, to the vicinity of Vellore, the importance of which is not overrated by Major Pears; but it ought to be carried on farther, for the sake of the traffic by Vaniambaddy, in the direction of Salem, if, at the same time, it could be made serviceable to that of Mysore and the Ceded Districts, &c.; and the place which strikes me as most eligible for a terminus is Goriattum, if, as Major Pears thinks, not only possible, but very likely, a pass can be formed instead of that of Naikanairy, leading directly above the Ghaut,

About 104 miles from Madras, and 34 or 35 from Wallajahnugger.

and issuing between the head of the old pass and Palmanair; or otherwise, if a road could be made easily from Goriattum to fall into the road from Chittoor at the foot of the Mooglee Pass, the distance being, apparently, much the same as from Vellore to Chittoor, say 20 miles. Goriattum is a fit point of divergence and conveyance for the traffic by Vaniambaddy; it is a more considerable place than Vaniambaddy, the population numbering 10,788, and it is not far from Ambore, which has a population of 10,000. It is, as before observed, nearly due west from Wallajahnugger, and if, failing a better pass by which eventually the railway might be carried directly above the Ghaut, and forward to Bangalore, or towards Bellary, a road could be made to Mooglee of not greater distance than the proposed one from Trivellum, or that from Vellore to Chittoor, it seems to me that every desideratum would be obtained in fixing the terminus here,* it would command alike traffic to Mysore and the upper talooks of North Arcot, Bellary, and Cuddapah, which would otherwise go by Trivellum; and it would command the traffic from Vaniambaddy, while the line so far would be an excellent commencement for an extended railway to Bangalore, or, by Salem, towards Malabar.

Para. 58.
On No. 78 of Arrow-smith's Atlas there is the trace of such a road.

I think it would be advisable to take the opinions of Major Cotton and Captain Best, who are both just now at Madras, upon the question, where, supposing it to be determined to carry the railway farther to the westward, but short of the Ghauts, the terminus ought to be fixed, with a particular reference to the above suggestions touching Goriattum. A similar reference might be made, also, to Mr. Bourdillon, who, as Collector of the district, must be pretty well acquainted with the line of country and the particular localities

Possibly Major Pears may intend to carry his railroad by Goriattum, or near to it; he has nowhere described the line he has in view; but the sketch serves to show that he means to keep on the left bank of the Palar, till he reaches Vaniambaddy.

This is not, indeed, quite consistent with what he says of Vellore, his words seeming to imply that Vellore is actually embraced in the extended line, but he may mean only that it will be nearly affected by the railway.

I shall very briefly notice some of the other points considered in the sequel of Major Pears' Report.

Paras. 76 to 79.

I quite agree with Major Pears, that a single line will be sufficient for the present. This, I observe, was the opinion of Mr. Simms also; but his recommendation that the bridges, &c., should be constructed of such dimensions as to be suitable for a double line, should be attended to.

80.

I agree with Major Pears that we ought not to aim at the adoption of the highest rates of speed attained in England. On this point, I think we should aim at uniformity with Bengal and Bombay.

67.

The maximum charge for goods certainly should not exceed one anna per mile.

The

* I am somewhat sceptical as to the accounts given by Major Pears of the traffic between Vaniambaddy and Wallajahnugger as being equal, or nearly equal, to that between Wallajahnugger and Madras; but whatever may be its extent, I think most part would fall upon the railway at Goriattum, if the terminus were fixed there.

The rates proposed for passengers are, perhaps, as low as they can be made. I am not sure, however, that the rate for the first class is not too low. I suppose the carriages of this class will be used chiefly by gentlemen and others who would be able and willing to pay more. The extent to which the carriages of the present transit companies have come into use along the line on which they run, to the almost entire supersession of palankeens, proves that there will be a ready demand for conveyance by the railway by persons who now paying from six to eight annas per mile for the accommodation of the transit carriages, will cheerfully pay four annas for greater comfort, and for three or fourfold greater speed.

74.
2 annas per mile.

As to native passengers, I think their resort to the railway will be slow, but I have no doubt that it will increase year by year, and that in process of time, and when trunk lines are carried through the heart of the country, it will be considerable. I think it is likely to be used particularly on the occasions of great festivals, at which multitudes of people are assembled from distant parts, when it is usual for whole families to join with their neighbours in companies to travel together. Their progress is slow, and there is, of course, a great loss of time, and in proportion to the length of their absence from home is the danger of accidents, and, above all, of sickness, to which such travellers are peculiarly liable. I conceive that on the occurrence of the great festival at Canjeveram,* for instance, the multitudes which flock to them from Madras, Wallajahnegger, and the neighbouring large towns of Arcot and Raneeput, from Vellore, &c., would be apt to use the railway, the charge might be reduced, as I believe it is in England, to meet such special occasions.

Para. 71.

I concur in the opinion expressed by Major Pears, that it is advisable that this work should be undertaken by the Government; it should be undertaken on the principle that it is called for as a means of improvement to the country, which it is the duty of Government to care for, on the same principle that led to the devotion of four lacs of rupees per annum to the construction and maintenance of trunk roads of the ordinary description, from which Government looks for no direct profit.

Para 63.

It should be undertaken as an experiment, having this object, among others more obvious, to test whether it will not be more economical in the end, particularly on a line such as that under consideration, with so many concurring circumstances in its favour, to construct and maintain the best possible road, instead of the very inferior and very costly one now kept up, the general utility of the improved road being, probably, fourfold that of the other. I think that on this line a railway would yield at an early period a return sufficient to save Government from all cost, while a better road having been provided, there would be no necessity for keeping up the present trunk road, the heavy expense of which would in future be saved. But were it otherwise, were it clear that the returns would not pay its costs, so long as the deficit did not exceed the expense of the trunk road, there could be no doubt of the expediency of substituting the railway for it, so far, there could be but one opinion; but here arises the question, ought the Government of a country circumstanced as this is to substitute railways for trunk roads of the ordinary description; to introduce a means of communication so greatly more perfect, and so peculiarly adapted to remove the existing impediments to the improvements of the country; to provide an instrument fourfold more powerful and efficacious than that which is now available, notwithstanding that it will be much more costly. To this question I would answer, that it must depend upon the degree in which it is more costly, upon the degree in which the difference between the returns and the costs of the railway (making a reasonable allowance for a prospective increase in the returns as the influence of the railway comes into full action) exceed the expense of maintaining a perfectly efficient trunk road. Were it to cost 50 per cent. more to maintain the railway, it would, in my opinion, be cheap compared with the advantage to be gained, and I should say it would be the duty of Government to concede that advantage to the country.

22 April 1851.

(signed) *D. Elliott.*

MINUTE by the Honourable Mr. *Thomas*; dated 3 May 1851.

I AM not aware that there is much to be added to what Major Pears has adduced in his valuable papers, as to the importance and perfect feasibility of constructing a railroad from Madras westward, at a comparatively low cost, and the beneficial results, direct and indirect, which must follow the introduction of railroads into this Presidency.

See para. 68, also, and especially, para. 60.

2. The indirect results referred to, are, to my mind, of the utmost value. I agree entirely with that officer, that railroads will give an immediate impulse to the native mind, second, I believe, only to education, which can be but a slow process; further, that they will impart a stimulus to enterprise, and lead to the influx of capital, and thus to the earlier development of the resources of the country, repaying tenfold the additional outlay in excess of that of the ordinary road; and that these advantages will be realized at a comparatively early date.

See Paras. 80-82.

3. For

* Since I wrote this I have learnt that, on the occasion of the late festival at Canjeveram, some of the transit carriages were engaged to carry parties thither from Madras - *D. P.*, 24th May.

Part III.
Official Reports,
&c
—

3. For I do not think it will be found that the native is so unwilling to deviate from the beaten track, and so unapt to take advantage of new and untried courses, that we must not expect him to use the rail at once. I cannot entertain this view as regards that class at least of the natives who are engaged in extensive commerce, or in turning a penny by a petty trade. Such men are, as I am well aware, not disposed to risk their capital or gains in untried courses; but show them practically that they can gain a few annas, or even pice, by changing their mode of transit by using the rail in lieu of the ordinary native bandy, and there is probably less chance of their foregoing the more gainful mode than the same class in Europe. I cannot question, therefore, the immediate utility and success of the railroad.

5. I will now offer an opinion upon what appear to me the most prominent points noticed by Major Pears.

See paras 10-14,
and paras. 57, 58,
and especially
para. 59.

First, as regards the direction of the line; I agree with him that it is most desirable, if not necessary, in order that the experimental railroad may have a full and fair trial, that the terminus should be westward, and beyond Arcot or Wallajahnuggur; I would place it at Vellore.

See para 66.

6. It would thus traverse the Paular River with its wide and sandy bed, and do away with one great and serious obstacle to the traffic from the Western districts and Mysore; the terminus, too, would be at a large and important town, united by a good road with Chittoor and the Moogly Ghaut, and leading thence to Bellary and Cuddapah. Vellore would also be a good terminus as connected with the direct lines into the Mysore, whether through the Sâtyhur or other more eligible pass, as well as with the line through Vaniambaddy to Bangalore.

Para. 55, 56.

7. But my chief reason for preferring it is, that it is the point, rather than Arcot, at which the large traffic of the Western districts and the Mysore would naturally rest. For Jattach, the greatest weight to the opinion expressed by Major Pears, that a railway terminating at Arcot will be subject to the special disadvantage pointed out by him; that goods arriving there *en route* to the coast, having nothing but an easy three days' journey to Madras, with no impediment, would not be transhipped to the railroad; and a rail ending at Arcot or Wallajahnuggur, might afford a great advantage to traffic.

8. But if it terminated at Vellore, it will, I think, be different. It will not only be at a greater distance from Madras, but the carts would avoid the heavy and trying drag across the bed of the Paular, at all times severe upon the bullocks, and the river itself is occasionally impassable. I should conclude, therefore, that if the terminus were fixed at Vellore, the cart traffic would stop at that point.

9. I think it would also be found that the traffic from Madras westward would seek the railway to Vellore more readily than to Arcot, for the same reason, that whilst the road from Madras to Arcot offers no impediment to carts, and they would therefore probably continue to work and compete with the rail, they could not readily compete with it to Vellore, so long as the Paular is unbridged; and it would be scarcely worth while to bridge this river unless the thought of a railroad is altogether relinquished.

10. I will further add, that it appears to me that the line should run direct through Wallajahnuggur and Arcot, and not leave a large and commercial town out of its immediate line, and take a less thickly inhabited and less wealthy line of country, as that to Sholingur would be. I do not think it probable that the warehouses at Wallajahnuggur, or its trade, would be transferred to another locality, to meet the rail. The capital and resources of the trading community are too limited to admit of their readily relinquishing dwellings and property at Wallajahnuggur to fix themselves at a new spot, and it is not probable that it would be for their interest to do so. The only result, therefore, of thus passing by Arcot would be, I fear, to continue the cart traffic indefinitely.

See para 59.

11. I shall not advocate, in the first instance, an extension of the line beyond Vellore to Vanjambaddy, as proposed by Major Pears. The Government is not in position now to say which is the best line into Mysore; or whether an extension from Vellore or Arcot to Bellary and Cuddapah is not more important than south-westward to Vaniambaddy, Salem, &c. Major Pears appears to me himself to assign sufficient reasons for not now determining this point. I should think it therefore inexpedient for the Government to commit itself to such an extension, as the placing the terminus at Vaniambaddy would do.

See paras. 59-64.
See paras. 57-58.

12. Financial results.

Paras. 16-29.

I look upon Major Pears' statement on this head, so far as regards the present and probable amount of tonnage and of traffic on the rail, as deserving of much confidence. They are well and carefully deduced from trustworthy data, and reliance may, I think, be fairly placed upon them.

Paras. 42-49.

13. His proposition for an inland depôt for salt I should of course entirely approve, and have no doubt of its policy, if accompanied by a reduction in the monopoly price. And it can scarcely be doubted also, that it would prove a source of increased revenue, provided the monopoly price is, as it most certainly should be, fixed so low as to bring marine salt within the means of the bulk of the people. But upon this point I would refer to my Minute, recorded on the 17th August 1850, para. 20.

See Letters to Hon.
Court, 11 Oct. 1850

14. I do not attach so much importance to the other items of estimated traffic. It is questionable whether the inland districts will be able to compete with the coast provinces in the production of sugar when the Godavery and Kistna annicuts are completed. And indigo, named also by Major Pears, is of so high a comparative value to its bulk, that it is not affected by the cost of transit. The merchant exporter is by usage allowed the turn of the scale, and this covers the full cost of the transit to the coasts. But the great point is not, in my view, whether this or that particular article will be benefited by the rail. It is certain that for a long time to come the great export from India will be the raw, and, therefore, ordinarily bulky products of her soil. And as the rail will offer a cheap and speedy mode of transit, it cannot fail to benefit the producers, *i. e.*, the mass of the people largely.

15. I should entirely agree with Major Pears that the rates of carriage should be as low as he has estimated; and I would look to the extension of commerce, and to the general improvement of the country, for the profitable return upon railway outlay, rather than to the immediate income from the carriage of goods.

Paras 32, and
72-74

16. Major Pears appears to me to overlook, in part, the importance of the rail, and its influence, for passenger traffic. It may be difficult to compute it, but the importance of the rail in this respect is incalculable. Take for instance the demands for troops for Ceylon in 1848:—The 34th regiment, N. I., though it accomplished its march from Vellore to Madras, and was ready for embarkation within a remarkably short period, was yet some days, whereas if a rail had been available, it would have made little or no difference whether the troops were at Vellore or at the Presidency itself. With the large sea-board of this Presidency, and the form of the peninsula, bringing nearly all our provinces within a short distance of the sea, the facility a railroad running to Vellore and Bangalore would offer for the transport of troops to Madras, and thence to any point where they might be reached, appears to me to offer strong grounds for the proposed railway. The expenditure will be found, I cannot but think, alike politically and financially wise and expedient, if the Government is to look beyond the present hour.

Para 30

Despatch to the
Hon. Court, dated
11 August 1848

17. Although the data given by Major Pears of the probable receipts from the traffic which will seek the railway may be considered sound, and deserving of confidence, I can see nothing at all satisfactory as to the given cost of the railroad. I cannot discover that Major Pears has tested and carefully sifted, as it appears to me he should have done, the estimate of 22 lakhs as the cost of the rail to Arcot.

Para 90

18. I am unable of course to judge of the value of this professional estimate, and I can only reiterate here an opinion already given to the railway committee, that, as a preliminary measure, a full and minute survey of the first three or five miles of the proposed line, in its course to Poonamallee, should be carried out by the officer appointed by Government. That a full statement should be then prepared of the probable cost of every yard, the price of land, the earthwork, the tunnels for water, channels, boundary banks, or hedges, laying down the rails, &c &c, estimating for every item of local expenditure, with a rateable charge for supervision per mile. The country is so similar throughout, that any five miles may be taken as an average of the whole, except the bridge over the Palaur, and perhaps the ground near the few very large tanks. This would give a clear view of the charges for work to be done, and materials to be supplied in the country, and without something of this nature I do not feel any confidence in the estimates formed.

19. The probable charge for rails, the plant, &c. and agency for working the line, can be thoroughly known, it appears to me, only by reference to England, and must vary largely from year to year, with the price of iron, improvements in engines, &c. The calculation an engineer officer can make upon those points here, are, I suppose, of very little value, and hardly to be relied upon as an approximation to the actual charge.

20. I should also have desired to see in Major Pears' paper a more full statement of the cost of the present Great Western Road, and the outlay required to keep it in fair working order for a term of years, as greatly influencing the questions of the rail running on the same line. This appears to me an element in the calculation of some importance, as it will never be necessary to keep up this road at anything like its present cost, when the greater part of the traffic is transferred to the rail.

21. I concur with Major Pears in his view that the rail should be a Government undertaking; I would, however, advocate that contracts for constructing parts, or the whole line, should be entered into, if contractors of capital are forthcoming, the Government officers retaining the general supervision, and inspecting every portion of the work in its progress, so as to insure durable and permanent work, as well as the best line the railway remaining the property of the Government. The expediency of a single line, with the means of laying down a double line, as stated (paras. 76 to 79), seems to me the wise course in the first instance, and should be adopted. I also concur in the opinion given of the rate of speed desirable to obtain. As Major Pears remarks, these two points are of great moment, as affecting the cost of the railroad, and may upon that ground be approved. But I cannot but observe, in conclusion, that I should deem it of comparatively little consequence whether a few thousand pounds, more or less, are required for the railway, the advantages it would confer appear to me so great.

Para. 83

Orig.

Para. 60.

Let any one acquainted with the features of this Presidency, its peculiar *adoption* to railways, so favourable are the natural features of the country, that the steepest slope throughout the whole line would not exceed 16 feet in the mile, and it may safely be affirmed that there is not a single engineering difficulty of any kind; its peculiar want of such means of transport, for there is not, correctly speaking, a navigable river in it, and it has but few and very imperfect roads; and its produce is now carried to Madras, and to the eastern coast, from the inland districts, upon the time-consuming, wretched bullock-carts, or the pack bullock, often at a heavy cost, and to the injury of the produce itself.

Looking to these facts, I know no object in my judgment of equal importance, in every point of view, political as well as fiscal, upon which the State could lay out its funds, and no work that would eventually so repay the expenditure in the general improvement and progress of the country, and therefore, of necessity, of its revenues. We need only advert to America, where the rail is the earliest road constructed, to feel assured that a large but a judicious government expenditure on this head would not fail to yield the most ample returns, and conduce beyond all other means, by its influence on all the interests of the country, to the rapid development of its resources. I should not, therefore, hesitate to urge the undertaking of this great work at the earliest moment practicable.

3 May 1851.

(signed) *J. F. Thomas.*

MINUTE by the Right Honourable the President.

I HAVE read the Minutes recorded regarding the railway by my Honourable colleagues, Messrs. Elliott and Thomas, with great interest, and I may add, satisfaction, as they both take the same favourable view of the project which the perusal of Major Pears' reports had impressed on me.

I observe that there is some slight difference of opinion between them as to the best station for the Western terminus, and this is a point of which, from my entire ignorance of the localities, I cannot venture to speak with any confidence. The opinion I expressed in my former Minute was solely grounded on the reliance I placed in Major Pears' recommendation that Vaniambaddy should be chosen as the terminus; but whether it, or Goriattum (proposed by the Honourable Mr. Elliott), or Vellore (suggested by the Honourable Mr. Thomas), is a matter deserving of the fullest inquiry and consideration, and I quite concur in Mr. Elliott's proposition that it should be referred for the sentiments of the civil and military (engineer) officers whom he has named, and any others who are likely to throw light on it. All parties seem decided on one point, that of the railway at once extending beyond Wallajahnuggur, and the terminus should be fixed with reference to the best position for its future extension above the Ghauts.

10 May 1851.

(signed) *Henry Pottinger.*

(No. 465.)

1. THE Right Honourable the Governor in Council has perused with deep interest Major Pears' valuable Report, in which the importance and feasibility of constructing a railroad from Madras westward, and he considers, have been clearly shown, as also the beneficial results, direct and indirect, which must follow the introduction of railroads into this Presidency.

2. It appears that Major Pears, in the first instance, applied himself to the determination of the best line for a railway between Madras and Wallajahnuggur as the points contemplated by the Madras Railway committee, and submits the above Report in anticipation of his surveys and estimates, which are not yet ready, in order to lay before Government as early as possible the information he has obtained and the conclusions he has arrived at in regard to the expediency of adopting the line proposed by the railway committee, or rather, of confining it within the limits contemplated by the committee.

Para. 83

Paras. 76 to 79.

3. The Governor in Council fully concurs in the views expressed by Major Pears, that the proposed railway should be a Government undertaking; that a single line, with the means of laying down a double line, will be sufficient for the present, and that it is not necessary to adopt the highest rates of speed attained in England.

4. With regard to the direction of the line, there can be no doubt that it should be westward, but to what point is a question of considerable importance.

5. Major Pears expresses strongly his conviction that the line to Wallajahnuggur is too short to furnish a satisfactory experiment, or to produce any marked improvement; he notices, as an unfavourable circumstance, that the proposed terminus falls short of two rivers, the Ponay and the Palar, both unbridged.

Vaniambady as a terminus.

6. He thinks that the railway should be extended to Vaniambady, as the line upon which there is the greatest amount of traffic, and one which, from the favourable circumstances under which it might be constructed and worked, is most likely to exhibit favourable results. Vaniambady, he observes, has a population of from 6,000 to 8,000, including the suburbs.

suburbs.* It is situated at a point where traffic from Madras branches into two channels, towards Salem, Coimbatore, and Malabar by the one, the Mysore territories and Canara by the other. The advantages of this line, according to his view, are a greater amount of traffic, in proportion to its extent, than any other that could be selected, and greater cheapness of construction, as involving fewer works of magnitude, the bridges across the Ponay and Palar being the only works of magnitude, and those attended with no difficulty and no expense that would not be amply counterbalanced by the cheapness of the line and the importance which the railway would derive from the passage of those two rivers

Part III
Official Reports,
&c
—

7. He asserts that the traffic over each mile of this extended line is, even now, not much below that on the shorter one, but the longer line would exercise a far greater influence on its amount, and the profits arising from it would, probably, be greater, while its usefulness would be much more extended. Already, he observes, there is a considerable traffic by the trunk road from the districts of Trichinopoly, Madura, and Dindigul, which would be increased by a railway terminating at Vaniambady. Major Pears reckons that, at present, by far the greater part of the traffic which passes from Wallajahnuggur to Madras comes from Vaniambady, while there is between the latter place and Vellore an additional amount not far, if at all, short of that which joins the present at Wallajahnuggur from other channels. The railway being extended to Vaniambady, Major Pears assumes troops and military stores for the southern division of the army would be sent by this route, as regards passengers and the conveyance of troops and stores, he remarks that a line starting at Madras that would place them 130 miles on their road to Bangalore, Salem, Coimbatore, Malabar, the Neilgherry and Sheewaroy Hills, would afford greater accommodation than any other line of equal length. Finally, he observes, that this would derive additional importance from the town of Vellore, with a population of 120,000 (83 miles from Madras), far surpassing Arcot in political and military importance

Para 61

8. Major Pears proposes Vaniambady, but perhaps Goriattum or Vellore would be a more advantageous position for the terminus

9. Bangalore is slightly to the north of a line running due west of Wallajahnuggur, while Vaniambady is 17 or 18 miles to the south of it. Goriattum and the old Nackanary Pass are pretty nearly due west. The road by Vaniambady to Bangalore is disapproved, both on account of the additional distance caused by the line trending so far to the south, and also on account of the difficulties from the natural features of the country between Vaniambady and Osson, which render it the least eligible way of access to the Mysore territories, it is therefore in contemplation to change the line of the high road from Madras to Bangalore, and to convey it by Chittoor and the Moogly Pass, when the road to Chittoor is made, and the Moogly Pass improved, as proposed, there can be no doubt that the most part of that main portion of the traffic by Vaniambady, which Major Pears speaks of as branching off at that point to the Mysore territories and Canara, will cease to pass that way.

Goriattum is
terminus

10. For this reason, while Vaniambady would probably be a good terminus for traffic to and from Salem, Coimbatore, Malabar, &c., it would not answer so well for Mysore, &c. Major Pears himself shows that the extension of the railway to Vaniambady would not benefit the Ceded Districts nor the Western talooks of North Arcot above the Ghauts. Bellary, he observes, might be benefited by its being carried across the Ponay River, six or seven miles west of Wallajahnuggur, but not further.

11. The point which he last indicates (a place called Trivellum) is that at which the new road by Chittoor and the Moogly Pass into Mysore and towards the districts of Cuddapah and Bellary is to commence, by which, no doubt, a large part of the exportable produce of Mysore, Bellary, Cuddapah, and the Balaghat talooks of North Arcot, in which sugar is now growing into importance, will in future pass coastward. Trivellum is a small place, with a population numbering only 1,357, but it is the chief station of a talook, and would therefore not be ineligible for a railway station, if there were not a better further on. Perhaps a better place for a station, if not a terminus, in this line would be the point of junction between the railway and the road from Vellore to Chittoor, with which the road from Trivellum is to be united † This extension would carry on the railway 15 miles, to the vicinity of Vellore, the importance of which is not overrated by Major Pears, but it might be carried on further for the sake of the traffic by Vaniambady, in the direction of Salem, if, at the same time, it could be made serviceable to that of Mysore and the Ceded Districts, &c.

Population,
120,000, four miles
distant

Para 53

12. Under this view, Goriattum ‡ would appear to be an eligible place for the terminus, if, as Major Pears thinks, not only possible, but very likely a pass can be formed instead of that of Nackanary, leading directly above the Ghauts, and issuing between the head of the old pass and Palmanair, or otherwise if a road could be made easily from Goriattum to fall into the road from Chittoor at the foot of the Moogly Pass, the distance being apparently

On No 78 of Arrow-
smith's Atlas there
is the trace of such
a road.

* The population of Wallajahnuggur, and the town of Raneept and Arcot, within two miles of it, amounts to 44,000.

† About four miles from Vellore, but on the opposite bank of the river.

‡ About 104 miles from Madras, and 34 or 35 from Wallajahnuggur.

Part III.
Official Reports,
&c.
—

apparently much the same as from Vellore to Chittoor, say 20 miles. Goriattum is a fit point of divergence and convergence for the traffic by Vaniambady; it is a more considerable place than Vaniambady, the population numbering 10,788, and it is not far from Amboor, which has a population of 11,000; it is, as before observed, nearly due west from Wallajahnuggur, and if, failing a better pass by which eventually the railway might be carried directly above the Ghauts and forward to Bangalore, or towards Bellary, a road could be made to Moogly of not greater distance than the proposed one from Trivellum or that from Vellore to Chittoor, every desideratum would apparently be obtained in fixing the terminus at Goriattum; it would command all the traffic from Mysore and the upper talooks of North Arcot, Bellary, and Cuddapah, which would otherwise go by Trivellum; and it would command the traffic from Vaniambady, while the line so far would be an excellent commencement for an extended railway to Bangalore, or by Salem towards Malabar.

Vellore as a terminus.

13. On the other hand, by fixing the terminus at Vellore, the rail would traverse the Palar River, with its wide and sandy bed, and do away with one great and serious obstacle to the traffic from the Western districts and Mysore; the terminus, too, would be at a large and important town, united by a good road with Chittoor and the Moogly Ghaut, and leading thence to Bellary and Cuddapah; Vellore would also be a good terminus as connected with the direct lines into the Mysore, whether through the Satghur or other more eligible pass, as well as with the line through Vaniambady to Bangalore.

14 But a chief reason for naming Vellore is, that it is the point, rather than Arcot, at which the large traffic of the Western districts and the Mysore would naturally rest.

15 It would not only be a greater distance from Madras, but the carts would avoid the heavy and trying drag across the bed of the Palar, at all times severe upon the bullocks, and the river itself is occasionally impassable; it may, therefore, be reasonably supposed that if the terminus were fixed at Vellore, the cart traffic would stop at that point.

16. It may also be found that the traffic from Madras westward would seek the railroad to Vellore more readily than to Arcot, for the same reason that, whilst the road from Madras to Arcot offers no impediment to carts, and they would, therefore, probably continue to work and compete with the rail, they could not readily compete with it to Vellore, so long as the Palar is unbridged.

Resolution

17. But as the fixing on a place for the western terminus is a point deserving the fullest inquiry, the Governor in Council deems it advisable to call for the opinions of Major Cotton, now at Madras, and of Captain Best, superintendent of roads, upon the question where, supposing it to be determined to carry the railway further to the westward, but short of the Ghauts, the terminus ought to be fixed, with particular reference to the above suggestions touching Goriattum and Vellore; a similar reference will be made to Mr. Bourdillon, who, as Collector of North Arcot, must be well acquainted with the line of country and the particular localities.

18 Major Pears will furnish as early as possible the estimate promised in his Report, with a complete survey of the line to Wallajahnuggur, deferring till further instructions the survey and estimate for his proposed extended line. He will afterwards submit a full and minute survey of the first five miles of the line to Wallajahnuggur into its course to Poonamallee, accompanied by a full statement of the probable cost of every yard, the price of land, the earthwork, the tunnels for water, channels, boundary banks, or hedges, laying down the rails, &c. &c., estimating for every item of local expenditure, with a rateable charge for supervision, per mile.

19. With the view of this Government availing itself of the experience of the Bombay Company, which has already entered into contracts for the supply of rails, &c. to a great extent, it is resolved that application be made to the Bombay Government to procure all the information obtainable on this head.

20. The papers above recorded will be brought to the notice of the Honourable the Court of Directors by the next mails, with an assurance that the estimates, when received, will be forwarded with the least practicable delay.

No. 1.

MEMORANDUM of the Extent of SUGAR CANE CULTIVATION in the North Arcot District, from Fusly 1245 to 1259 inclusive.

Part III
Official Reports,
&c.

FUSLIES.	POONJAH.	NUNJAH.	TOTACAL.	TOTAL.	REMARKS.
	<i>Cawnies. as</i>	<i>Cawnies. as.</i>	<i>Cawnies. as.</i>	<i>Cawnies. as</i>	
1245 - - -	18 3 ½	860 14 7/8	2 7 ¾	881 9 7/8	
1246 - - -	31 2	865 1 ¾	3 2	899 5 ¾	
1247 - - -	21 4	930 12 ¾	3 15 ¼	956 -	
1248 - - -	47 3 ¾	1,013 7 1/8	4 10 ½	1,065 5 3/8	
1249 - - -	23 7	975 4 ¼	2 13 ½	1,001 8 3/8	
1250 - - -	35 14 ¾	920 1 7/8	6 3 ¾	962 4 3/8	
1251 - - -	20 4 ¾	1,100 15 7/8	3 8	1,124 12 3/8	
1252 - - -	63 1 ½	1,511 - 1/8	2 15 ¼	1,577 1 ¼	
1253 - - -	69 8 ¼	1,606 8 7/8	6 9 ½	1,682 10 5/8	
1254 - - -	190 14	2,135 7 ¼	7 11 ¾	2,334 1 ½	
1255 - - -	- - -	- - -	- - -	- - -	The accounts for Fusly 1255 are not forthcoming
1256 - - -	114 4 ½	2,186 15	7 6 ¾	2,308 10 ¼	
1257 - - -	123 12	1,965 13 3/8	4 2 ¾	2,093 12 ¼	
1258 - - -	118 3 ¼	1,350 3	6 5 3/8	1,474 11 ¼	
1259 - - -	91 2	1,462 11 ½	5 6 ¾	1,559 3 7/8	

Note —The above refers to Government lands only. There is no record of the cultivation in zeminary, pallium, enam, &c. lands, except for Fusly 1259, in which year it was 1,198 cawnies. It is probable that this also has been much increased during the last 15 years, as is the case in the Government lands.

North Arcot,
Collector's Cutcherry, Chittoor, }
20 December 1850.

(signed) J. D. Bourdillon,
Collector

Appendix (L.)

STATEMENT showing the Average RETAIL PRICE of SALT at the undermentioned Places in the District of North Arcot, from Fusly 1255 to Fusly 1259 inclusive, and the probable Cost of Carriage from Madras in each Case.

NAMES OF PLACES	Average Retail Price per Garce	Deduct Depôt Price and Profit.	Distance from Madras.	Rate per Ton per Mile
	<i>Rs a. p.</i>	<i>Rs a. p.</i>	<i>Miles. fur.</i>	<i>Rs a. p.</i>
Chittoor - - - - -	171 13 8	35 - -	98 0	- 1 3
Tirputty - - - - -	169 10 9	33 - -	84 2	- 1 5
Caverypack - - - - -	155 14 2	30 - -	68 0	- 1 7
Sholinghur - - - - -	174 9 3	37 - -	65 4	- 2 1
Tirvalum - - - - -	163 7 6	27 - -	75 0	- 1 3
Satghur - - - - -	160 5 -	24 - -	107 5	- - 9
Cuddapanuttum - - - - -	189 9 4	51 - -	124 2	- 1 5
Arcot - - - - -	153 11 9	18 - -	70 0	- - 11
Vellore - - - - -	163 3 2	27 - -	84 0	- 1 2
Tirvatoor - - - - -	157 - 9	22 - -	75 0	- 1 1
Polloor - - - - -	162 15 7	26 - -	102 0	- - 11
Vanduvash - - - - -	153 10 2	18 - -	70 0	- - 11
Sutwaid - - - - -	128 - -	- - -	50 0	- - -
Penmerry - - - - -	200 11 10	60 - -	113 0	- 1 11
Vencatagherry Cottah - - - - -	203 5 -	63 - -	154 0	- 2 1
Arnee Jaghire - - - - -	162 13 5	26 - -	81 5	- 1 2
Average Cost of Carriage - - - Rs				- 1 3

Appendix (M.)

STATEMENT showing the Extent to which the COST of CARRIAGE, as well as the Market Value of some of the Chief Articles of Commerce, would be affected by the Railway to Wallajah-nugger.

Name of Articles	From whence Derived.	Total Saving per Ton by Railway.	Per Cent. on present Cost of Carriage.	Per Cent. on present Market Value at Madras.	Remarks.
		<i>Rs. a.</i>			
Cotton -	Cuddapah -	3 5	16 per cent. -	1 2 p'cent.	
	Bellary -		8 " -		
	North Arcot		32 " -		
	Coimbatore -		9 " -		
	Salem -		15 " -		
Indigo -	Cuddapah -	3 5	16 " -	- 1 "	-- One ton, valued at 3,200 rs.
	North Arcot		32 " -		
	Salem -		15 " -		
Grain -	Bellary -	3 5	8 " -	11 - "	Ditto at 30 rs.
	Cuddapah -		16 " -		
	North Arcot		32 " -		
Rice -	Bellary -	3 5	8 " -	7 8 "	Ditto at 45 rs.
	Cuddapah -		16 " -		
	North Arcot		32 " -		
Ghee -	Cuddapah -	3 5	16 " -	1 - "	Ditto at 330 rs.
	Salem -		15 " -		
Oils -	Salem -	3 5	15 " -	1 6 "	Ditto at 200 rs.
Redwood -	Salem -	3 5	15 " -	14 - "	Ditto at 25 rs.
Tamarind -	Cuddapah -	3 5	16 " -	9 - "	Ditto at 35 rs.
	Salem -		15 " -		
	North Arcot		32 " -		
Sugar -	Palmanar -	3 5	22 " -	1 6 "	Ditto at 200 rs.
	Cuddapah -		16 " -		
	Salem -		15 " -		
Saltpetre -	Coimbatore	3 5	9 " -	1 8 "	Ditto at 180 rs.
	Salem -		15 " -		

Appendix (N.)

(No. 349.)

From *J. D. Bourdillon*, Esq., Collector of North Arcot, to Major *T. T. Pears*, c.B., Engineers.

Sir,

1. I HAVE the honour to acknowledge your letter of the 22d October, requesting information on certain points connected with the statistics of this district, with reference to the proposed railway from Madras towards Bangalore. I enclose a statement (No. 1) giving the information required respecting the names, situations, and population of the chief towns, and their distance from Madras, and some other particulars.

2. The district is chiefly agricultural, and its agriculture is, for the most part, confined to articles of county consumption, by which I mean grain chiefly, paddy, tamarinds, chillies, &c. There are a number of large towns in it, which go far to consume this produce, but a considerable quantity goes from the eastern parts to Madras, and some from the south-eastern, even to Pondicherry. Indigo has long been grown and made in this district to a limited extent, and the manufacture shows no tendency to material increase. For the most part this is manufactured according to the European system, and the greater part of the produce is taken to Madras. Of late years the growth of the sugar-cane has very much increased, with a view to exportation; the talooks where this product is most general are, Cuddapanuttum, Vencatagherry, Cottah, and Congoondy (the talooks above the Ghauts), Chittoor, and Arcot. The quantity of sugar carried to Madras for export in the Fusly year 1259 (1849-50), was 359,712 maunds; and the quantity of rum passed out of the district in the same period, was 9,686 gallons, chiefly to Madras. Large quantities of firewood are also taken to Madras from the Sutwaid talook, and parts of the Calastry and Canvetinugger zemindaries. Part of this enters Madras by the northern road, part by country roads, and part by the Cochrane Canal.

3. Of the towns of the district some of the most populous, as Arcot, Ranipett, Vellore, Tripetty, cultivate no special branch of industry, and owe their growth, not to trade or manufactures, but to their being, from various causes, favourite places of residence to certain classes having income to spend. Such places are not without the common manufactures necessary to the convenience of their own population, but they consume more than they produce, and have few or no exportable commodities, other towns are principally places of business, and of these the chief are Wallajappett and Amboor. The former has long been a large emporium for the trade between the coast and the interior, and also possesses an extensive manufacture of chintz, much of which is, I believe, exported to the eastward; a good deal of cloth is also woven there. Amboor is a place of very active trade, it is inhabited by a number of wealthy and enterprising merchants of the Subbay class, who collect the country produce, sugar, ghee, chillies, &c., and transport it to Madras. It also contains manufactures of indigo. Trivatoor and Arnee may also be mentioned as manufacturing cloths extensively.

4 With respect to the situation of the various towns, and their communications with Madras, Wallajappett, Ranipett, Arcot, Vellore, Goriattum, Trivullum, and Amboor, are all either on the high western road or within a few miles of it, and that is of course then line of road to the coast. I need say nothing of its condition, which must be well known to you, though much abused, and certainly extremely bad, compared with any high road in Europe, it is infinitely better than the common country roads. Arnee, Poloor, Trivatoor and Wandiwash also communicate with Madras by the high western, the two former coming into it at Arcot, the two latter near Conjevaiam. As to the central and western parts of the district, Chittoor, Pemnurry, Cuddapanuttum, and Vencatagherry Cottah, the traffic from these parts also falls into the High Western Road at Ranipett or Wallajahpett; the route by Sholinghur would be shorter, but being in a very bad state, it is little used. The northern and north-eastern talooks, Tripetty, Calastry, Cavetnugger, and Sutwaid, communicate with the Presidency, principally by the Cuddapah road, and partly by the northern road. I will only add here, that the roads by which the high western road is reached are universally extremely bad, so as to offer a very serious impediment to traffic; the same is true of the Cuddapah road.

5. With respect to the amount of traffic on the various roads, I have some tables which were taken last year for the Damulchervoo, Nuggery, and Naicknany Passes, these I enclose. I will not offer an opinion as to the amount of credit to which they are entitled, though it was my endeavour to have them accurately taken. I will cause similar returns to be prepared for the Moogly Pass, and the Arcot road at Poonnay. There are no other passes either possessing much traffic or offering facilities for it, the Naicknany Pass, indeed, is now in such a state as to be almost impassable for wheel conveyances, and its natural defects as a road are so great, that it has been thought inexpedient to repair it. Even the sugar from Vencatgherry, Cottah, and from Congoondy is sent to Madras by Palmanair, Chittoor and Wallajappett, over very bad roads, to avoid that pass.

6. As to the increase in the population of Wallajappett and Arcot (by which latter you probably intend Ranipett) I regret that I can afford you no precise information, as my records contain no authentic or trustworthy accounts of the population at former periods. There is no doubt, however, that both Ranipett and Vellore have been very much extended during the last 20 years, and I have no doubt that the population of Wallajappett also has increased within the same period.

7. I entertain no doubt that a railway passing through this district from Madras would be a great benefit to it, by cheapening transport, and so increasing the value of its products.

But to give full effect to this improvement, it would be absolutely necessary at the same time to improve the branch roads by which commodities would reach the railway, at present some of the chief arterres of the district are so bad as to be barely passable for wheel conveyances. I may mention especially the roads from Chittoor to Arcot and to Vellore, and from Tripetty to Chittoor. If these branch lines continue in their present condition, the advantages of a railway would be very much restricted.

I have, &c.

North Arcot, Collector's Cutchery, Chittoor,
12 November 1850.

(signed) *J. D. Bourdillon,*
Collector.

STATEMENT showing the NAMES, SITUATION, and POPULATION, &c., of the Chief Towns in the District of North Arcot.

TALOOK.	TOWNS.	Situation of the Towns.	Population of the Towns	Distance of the Towns from Madras.	Remarks as to the Nature of the Roads to Madras.	Chief Produce of the Towns.	Principal Market to which taken.	Remarks.
1.	2.	3.	4.	5.	6.	7.	8.	9.
Chittoor - -	Chittoor - -	- - Twenty-two miles north of Vellore.	9,383	m. f. 98 -	- - The road from Chittoor to Raneepeet is extremely bad; thence on the High Western Road.	- - Grain, tamarind, jaggery, sugar, chillies, tobacco, and cloths.	- Vellore, Arcot, Wallajahnugger, and Madras.	
Triputty - -	Triputty - -	- - Forty-four miles north of Madras, and about 10 miles from the high road between Madras and Cuddapah.	8,996	84 2	In a very bad state -	- - Grain, tamarind, and cloths.	- None.	
Caverypauk -	Wallajapett -	- - West of Madras, and on the Great Western Road.	20,000	68 -	In good order -	- Grain, indigo, chintz, and different sorts of cloths.	Madras.	
Ditto - -	Raneepeet -	Ditto - ditto -	18,000	70 -	Ditto - - -	None - - -	- None	
Sholinghur -	Sholinghur -	- West of Madras, and 10 miles north of the Great Western Road	4,000	65 4	- The road to Madras is in very bad order.	- - Grain, indigo, and cloths.	- - Wallajahnugger, Arcot, and Madras	
Tirvulum - -	Tirvulum - -	- - West of Madras, and four miles north of the Palar River, and of the Great Western Road	1,357	75 -	- - The road from Tirvulum to Arcot is pretty good, the remainder is the Great Western Road	- - Grain, indigo, chillies, tamarind, and cloths.	- - Vellore, Arcot, Wallajahnugger, and Madras.	
Satghur - -	Gornatum - -	Ditto - ditto -	10,788	107 5	- - The road from Gornatum to Pullicondah is bad, the remainder is the Great Western Road.	- Grain, indigo, cloths, tamarind, chillies, tobacco, jaggery, and sugar.	- - Vellore, Arcot, Wallajahnugger, and Madras.	
Cuddapanuthum -	Palmanair -	- - Twenty-six miles west of Chittoor, and at the top of the Moogly Ghant	2,201	124 2	- - From Palmanair to Chittoor is in tolerable order.	- - Grain, tamarind, jaggery, sugar, rum, and cumblies.	- - Chittoor, Raneepeet, Vellore, and Madras.	
Arcot - -	Arcot - -	- - West of Madras, and south of the Palar River and the Great Western Road.	16,000	70 -	- The Great Western Road.	- Grain, sugar, indigo, chintz, and cloths.	- - Wallajahnugger, Raneepeet, and Madras.	
Vellore - -	Vellore - -	- - West of Madras, on the Great Western Road.	120,000	84 -	Ditto - - -	- - Grain, cloth, tamarind, and indigo.	- The towns of Vellore, Arcot, Wallajahnugger, and Madras.	
Ditto - -	Amboor - -	Ditto - - -	11,000	120 -	Ditto - - -	Grain - - -	- Vellore, Arcot, Wallajahnugger, and Madras	
Trivattoor - -	Trivattoor -	- - South-west of Madras, and 20 miles south of the Great Western Road.	About 6,000	75 -	- - The road as far as Royajee Choultry is bad; the rest is the Great Western Road.	- - Grain, indigo, and cloths.	- Conjevaram and Madras	
Poloor - -	Poloor - -	Ditto - - -	About 4,000	102 -	Ditto - - -	Grain and cloths -	- Conjevaram, Vellore, Arnee, and Madras.	
Arnee Jaghire -	Arnee - -	Ditto - - -	About 16,000	81 5	Ditto - - -	- - Grain, indigo, and cloths.	- Conjevaram, Wallajahbad, and Madras.	
Wandiwash -	Wandiwash -	Ditto - - -	About 3,000	70 -	Ditto - - -	Grain and cloths -	- Conjevaram and Madras.	
Sutwaid - -	Nagalapoorum -	- - North-west of Madras.	About 1,880	50 -	- - A common country road.	Grain and cloths -	- - Razanagarum and Trevalloor.	
Permerry - -	Penmerry - -	- - Fifteen miles north of Chittoor.	1,428	113 -	- - The road to Chittoor very bad, thence as above.	- - Grain, chillies, tamarind, jaggery, and sugar.	- - Arcot, Chittoor, Wallajapett, and Madras.	
Vencatagherry Cottah	- Vencatagherry Cottah.	- - West of Madras, and above the Ghauts	500	154 -	- - To Palmanair (26 miles) very bad, thence as above	- - Grain, tamarind, jaggery, and sugar.	- Chittoor, Arcot, Wallajapett, and Madras	
					Note - The direct road by the Naicknary Pass is 136 miles, but that pass is too bad to be used.			
Convateenugger Zemindary	Narnavanum -	West of Madras -	About 6,000	70 -	- - The high road between Madras and Cuddapah in bad order	Grain and cloths -	- None.	
Ditto - -	Tirtany - -	Ditto - - -	About 6,000	60 -	- - A country road, in bad order	Grain - - -	- None	
Calastry Zemindary.	Calastry - -	North-west of Madras	About 7,000	90 -	- - A country road, in bad order.	Grain and cloths -	- None	

Note - The population as given in this Statement must only be taken as an approximation to the fact.

North Arcot,
Collector's Cutcherry, Chittoor,
12 November 1850.

(signed) J. D. Bourdillon,
Collector.

Appendix (O.)

Part III
Official Reports,
&c

STATEMENT of the Quantity of SALT supplied to the undermentioned Districts in Fusly 1259.

	North Arcot.	Salem.	Coimbatore	Cuddapah	Bellary.	Bangalore	Mysore
Madras - - -	209	31	3	14	1	276	1,667
North Arcot - - -	-	-	-	96	12	-	20
Tinnevelly - - -	-	-	37	-	-	-	-
Madura - - -	-	45	510	-	-	-	-
Tanjore - - -	-	195	274	-	-	-	-
South Arcot - - -	6	719	327	-	-	-	236
Chingleput - - -	144	325	88	162	25	-	1,506
Nellore - - -	211	-	-	505	446	-	-
Guntoor - - -	-	-	-	-	-	-	-
	570	1,315	1,239	777	484	276	3,429
Malabar - - -	-	-	374	-	-	-	436
Canara - - -	-	-	-	-	-	-	1,383
	-	-	374	-	-	-	1,819
	-	-	1,613	-	-	-	5,248

N. B.—The supplies from the Northern Circars are not given for this year, but of these, Guntoor alone, judging from former years, appears to supply any of the above districts, and that to a very small extent.

(signed) T. T. Pears, Railway Commissioner.

Appendix (P.)

NOTE to Paragraph 39.

THIS calculation is not strictly correct; the profits alone arising from the conveyance of mails and troops should have been taken into account in this place. We cannot calculate, however, with any approach to accuracy, the expense attending their conveyance, as this depends so very greatly on the number of other passengers. With sufficient passenger traffic to load a train each way every day, the conveyance of mails would cost almost nothing, with no passengers, or only a few, the mails could only be conveyed daily at a very high charge. Under any circumstances, a special grant would probably be made by Government on their account.

(signed) T. T. Pears.

From W. Robinson, Esq., Head Assistant Collector, to H. V. Conolly, Esq., Collector of Malabar.

No 298/1850.

Sir,

Palghaut, 10 November 1850.

WITH reference to the papers noted marginally, I have the honour to give cover to a return I have taken of the traffic on the principal roads leading through the Palghaut Gap, viz., on the trunk road No. 5, to and from Salem, Coimbatore, the northern talooks of the districts of Coimbatore, and the Neilghery Hills. 2dly. By the lower road to and from Tinnevelly, Madura, Dindigul, and the southern talooks of the district of Coimbatore, via Palny, Udumala, Kutta, Palachy, Colinjampana, and Yellapully, and joining the trunk road in the neighbourhood of Palghaut.

From the Collector of Malabar, dated 31st October 1850, No. 1,876, and Enclosure.

2. These are the only roads on which anything of a brisk bandy traffic is maintained, and the only two lines as yet used by merchants and others from a distance.

3. The returns are taken on both for a few weeks last year only, but they afford data from which a guess may be made at the probable traffic, and they are, as far as they go, very perfect for both roads.

4. Its natural peculiarity indicates the Palghaut Gap as the proper passage for any great line of traffic joining the east and west coasts of the Peninsula, whether it be by a line of rail or good continuous road; and as such, this natural passage is now, and is becoming every year, more important and more thronged. The bulk of the traffic from this district

itself and from the seaward (as Bombay, &c.), with the interior of this side of India, now passes up the Palghaut Gap, and probably most of the exports from the interior districts east of the Ghauts towards Bombay and the west coast finds its way to Palghaut, and thence for embarkation to the coast at Calicut, Ponany, or Cochin. Many Bombay and coast merchants have agents at Palghaut, purchasing and transmitting produce from the interior. The business done here in piece goods alone from Tinnevely and Madura, is estimated at upwards of two lacs of rupees a year, while the whole of the cotton wool grown in Coimbatore, &c. comes this way for shipment

5. It is, however, in its being an outlet from the interior of this side of India towards the west coast, and *vice versa*, chiefly, that the importance of the Palghaut Gap does now, and is likely still to consist.

6. The advantage, if any, of joining Madras and such districts as those of Arcot, Salem, &c, directly with this district or with the west coast, must be of a very general nature; and for any great outlay on such a project, I think the returns, present or prospective, doubtful. At present there is little or no direct communication between Malabar and Madras,* or between Malabar and the western coast generally (Bombay, &c.) and those towns and districts lying beyond the Cavery and Salem. The trade of those districts seeks the east coast, and the countries on the Cavary make use probably of that river.

7. My impression is, that for the commerce of this district and the west coast, whether rails or roads, lines taking an easterly or east-south-east direction from the Palghaut Gap into the interior are those required, and likely to pay throughout, and not a line pursuing a north-east direction, as would any joining this district with Madras or Arcot direct. The portion beyond Salem to the north-east might possibly pay, but it is difficult to see how the portion on this side could do so. I have never heard what the traffic on the trunk line, which does take this north-east direction, amounts to annually east of Coimbatore; but the communication of those districts with Malabar, as the return† of traffic along the trunk road near Palghaut shows, is not great; and I do not think that the traffic with the west coast were likely to increase when the facilities of transport from those districts to the east coast becomes added to, as they must be by such a line.

8. The north-east line has been chosen for the great trunk line, and as a political, military, and postal line, it is an important one, but as a trade line, and one to meet the wants of the country, and open the producing districts towards the sea, the returns of traffic show, beyond a doubt, that the south-east line, *via* Pulachy, Udamala, Kutta, and Dindigul (or I would say generally a line in that direction), were far more valuable, and likely to pay even now, despite the wretched and disgraceful state of this road. A commercial traffic, in point of value and bulk much greater than there is on the fine trunk road, passes over this south-east line.

	Bandies.	Bullocks.
East to West - -	18	106
West to East - -	26	131
TOTAL - - -	44	237

	Bandies.	Bullocks.
East to West - -	43	153
West to East - -	37	123
TOTAL - - -	80	276

9. A comparison of the returns for the last year, as far as they go, will show this. The return of traffic on the trunk road, reduced, as shown in the marginal note, will give a daily transit of carts during the brick season, bearing commercial goods and passengers, as in the margin ‡, and does not perhaps greatly exceed 40 to 45 bandies, and 240 bullocks daily, carrying perhaps 100 to 120 candies of goods; on the south line the traffic amounts to 80 bandies and 280 bullocks per diem, carrying perhaps 150 to 200 candies of goods.

10. At Palghat this traffic falls into the trunk line, and west of Palghaut the trunk line is of great value, and is the only bandy road leading direct to the coast.

11. The travellers from Bombay to the hills, and native travellers towards Coimbatore and Trichinopoly, quadruple the passenger traffic on the trunk line over that on the other, but I have little doubt that most of this too leaves the trunk line at Coimbatore, and I fear there is a break of 100 to 150 miles between that and Salem, where a line of rail would do little or nothing in return for the outlay.

12. A general system of rail were of course most desirable, but if they are to pay, I think the requirements of the west coast must be considered irrespective of Madras, or any line direct from Arcot towards Palghaut, and that, as was most judiciously done in the case of the

* There is still some trade in coarse piece goods from Salem, for local and domestic consumption of Malabar.

† These include also the bandies *en route* to Trichinopoly, *via* Coimbatore, and to Coimbatore itself.

‡ This return of bandies was taken of those passing the newly-built bridge at Nargumpully, five miles east of Palghaut, and was made with a view to ascertain the local as well as the general commercial value of that work. From the position of the bridge, the return taken there comes to include, besides the general commercial traffic also, all the bandies of firewood for local consumption. The country for miles round Palghaut is supplied with firewood from the Walyar jungle, and it must all cross the bridge. In estimating the general traffic along the trunk road from such return, the whole of the bandies entered in the west to east line under the head of "timber, wrought-wood, and firewood," in this return, must be deducted, as they are all of that description (firewood bandies). There is no trade from the east towards Malabar in wood. The tobacco monopoly also throws the whole of this trade unnaturally on this line.

the trunk road in 1845, such lines must be begun at the coast (the portions nearest the coast will pay the best), and carried inward through the Palghaut Gap, and thence extended to the exterior. The nature of the country will confine such a line to the valley of the Ponany River for 35 to 40 miles from the coast, but from thence the paying line would leave perhaps both Palyghaut (a few miles only) and Coimbatore to the north, and go down the centre of the Palyghaut valley, and due east by Dampuron, &c., or by Pulachy. Were the Madras line of rail eventually carried out to Trichinopoly, the indirect junction with the west coast might be formed there with fairer prospects of paying than any other and more direct line would afford. Now that the subject of rails is occupying public attention, I would beg to urge the absolute necessity of adopting measures for obtaining accurate statistics of the traffic on each road leading east and west through the Palghaut Gap. and I therefore place in the margin an estimate for taking this throughout the ensuing year, 1851, whereby at the small outlay of 500 rupees, invaluable data would be secured from the three principal roads of this district.

	Pay of Three Men, at Rs 5 each per Month	Per Year
On the Trunk Road at Wallyar or at Nargumputty	Rs 15	Rs 180
On the South Road, <i>via</i> Pulachy - - - -	15	180
At Talamanyam on the Wellyat Road - - -	15	180
	Rs. - - - -	540

I have, &c.
(signed) *W. Robinson,*
Head Assistant Collector.

(No. 2,143/1850.)

From *H. V. Conolly, Esq.,* Collector of Malabar, to Major *T. T. Pears, c. B.,* Engineers, Madras.

Sir,

Calcut, 21 December 1850

I THOUGHT it well on receiving your letter of the 26th October last, to forward it to my head assistant, whose attention has for some years past been particularly attracted to the traffic in the road leading through the Palghaut Gap. His answer is appended, and I concur generally in his remarks.

Dated
26 November 1850.

2. By the enclosed abstract statement it will be seen that the traffic of this district with Madras, and other ports on the Coromandel coast by sea, is not very considerable. The value of exports averages 4,94,909 rupees, and of the imports 3,03,070 rupees per annum.

I am unable to furnish a similar table as regards our commercial intercourse with Madras by land, there being now no official data upon which the same could be framed.

I have, &c.
(signed) *H. V. Conolly,* Collector.

(No. 178)

From *E. B. Thomas, Esq.,* Acting Principal Collector of Coimbatore, to Major *T. T. Pears, c. B.,* Engineers.

Coimbatore, Principal Collector's Office,
12 November 1850.

Sir,

IN reply to your letter of the 26th ultimo, requesting my sentiments with regard to the benefits that might be expected to result from the construction of a line of railway between Madras and the western coast through the district of Coimbatore, I beg to observe that I think this end of a railway line (if one should ever be carried out in Coimbatore) would be almost the only portion of value here. So much of the line as reached from Coimbatore to the nearest point of the western coast (our natural sea-road and outlet) would be the channel through which the exports and produce of this district would flow; none would, of course, take the much longer distance to Madras. The Madras end of the line would in like manner be available and valuable for Aicot, Salem, and all commerce naturally flowing that way; but I cannot suppose that much traffic of any kind would use the whole line, or traverse from Madras to the west coast across the continent or *vice versa*. Such unbroken continuous line would only, I should conceive, be of use politically, for movement of treasure or troops with the tappal, not commercially. The trade between this and Madras is small cotton piece goods, &c., go to the western coast, the nearer point, usually Ponnaney, about 90 miles.

I have, &c.
(signed) *E. B. Thomas,*
Ag. Principal Collector.

Part III.
Official Reports,
&c.

From Major *T. T. Pears*, c. B., Engineers, to the Chief Secretary to Government,
Fort St. George; dated 11 March 1851.

Sir,

I HAVE the honour to forward a copy of a letter from the Collector of Bellary, having reference to the subject of my Report of the 5th instant. Anxious that no more time should be lost, I was compelled, most unwillingly, to prepare that Report upon information (as far as Bellary and Cuddapah are concerned) that I have gathered from various sources, and without having the benefit of that most to be relied upon, from the Collectors themselves.

The Collector of Cuddapah has not yet replied to my letters, but the opinion which I have given regarding the probable effect of a railway to Arcot upon the district of Bellary, derives confirmation from the several facts stated, and the sentiments expressed in the accompanying letter from the collector of that district.

I have, &c.
(signed) *T. T. Pears*, Major,
Engineers.

Madras, 11 March 1851.

To Major *T. T. Pears*, c. B., Engineers.

Sir,

I HAVE the honour to acknowledge receipt of your letters of the 26th October, 27th November, and 24th December 1850, and with reference to the first of these letters I have the honour to subjoin the information on the four points alluded to in paragraph 3d.

First Point.—In this district there are 17 chief towns, as follows: the population, and the classes into which that population is divided is specified. The relative situation of these towns is shown (Enclosure No. 1) in the annexed Sketch.

MEMORANDUM of the PRINCIPAL TOWNS in the BELLARY DISTRICT.

No	Talooks	Chief Towns.	Tradesmen.		Cultivators.		Labourers.		Independent.		TOTAL.	
			Houses.	Persons	Houses.	Persons.	Houses.	Persons.	Houses.	Persons.	Houses.	Persons.
1	Bellary - -	Bellary - - -	799	3,528	601	2,816	3,830	17,075	2,631	13,707	7,861	37,128
2	Kumply - -	Kumply - - -	312	1,528	34	156	665	3,282	420	1,941	1,431	6,007
3	Hurponhully -	Hurponhully - -	289	1,165	17	64	737	2,850	429	1,918	1,472	5,007
4	Koodlighee -	Haspett - - -	285	1,359	36	168	1,136	5,316	303	1,478	1,760	8,321
5	Havenhadagally	Hampasagurum -	188	1,008	1	5	383	1,708	79	378	651	3,015
6	Adomic - -	Adomic - - -	487	2,132	56	239	1,283	6,650	1,799	10,450	3,625	10,471
7	Punchapollem -	Putticondah and Mim- repet.	189	767	108	515	725	3,467	245	1,107	1,267	5,850
8	" - -	Paypally - - -	112	493	55	267	621	2,910	182	804	970	4,474
9	Gooty - -	Gooty - - -	82	312	87	384	511	2,351	303	1,438	983	4,485
10	Judakee - -	Pandy - - -	71	285	68	379	832	4,419	59	364	1,030	5,447
11	Raidroog - -	Raidroog - - -	143	681	88	426	565	2,742	280	1,349	1,070	5,108
12	Tandputry - -	Tandputry - - -	124	540	108	768	621	3,248	250	1,098	1,103	5,654
13	Anantapoor -	Anantapoor - -	92	384	41	198	415	2,004	315	1,590	803	4,176
14	Pencondah - -	Pencondah - - -	44	197	137	600	389	1,932	250	1,407	820	4,196
15	Kadocondah -	Hendoopoor - -	165	843	81	424	408	1,966	152	678	804	3,911
16	Madagaserah -	Madagaserah - -	104	534	135	576	522	2,399	151	910	912	4,419
17	Dhurmaverum -	Dhurmaverum - -	116	478	130	509	770	3,638	308	1,400	1,324	6,085
		TOTAL - -	3,602	16,234	1,783	8,554	14,411	67,955	8,156	42,075	27,952	134,818

Second Point.—The principal produce, whether manufacture or agricultural, in this district, which will also be applicable to each of the towns, is as follows:

MANUFACTURES.

- | | |
|----------------------------------|--|
| 1. Piece goods, cotton and silk. | 1. Muddy-chucka, a bark used for dyeing. |
| 1. Carpets, cotton. | 1. Puppaly-chucka, another kind, ditto. |
| 1. Ditto woollen. | 1. Indigo. |
| 1. Blankets or cumblies. | 1. Ghee. |
| 1. Iron. | 1. Oil of different kinds. |
| 1. Earth salt. | |

AGRICULTURAL PRODUCE.

- | | |
|---------------|--|
| 1. Cotton. | 1. Fruits. |
| 1. Jaggery. | 1. Curry stuff, such as cummin seed,
coriander, &c. |
| 1. Sugar. | 1. Tobacco. |
| 1. Cocoa-nut. | 1. Roots, eatable, of a few kinds. |
| 1. Betel-nut. | |
| 1. Turmaric. | |

Third Point.—The nature of the exports and imports at the above towns may be ascertained from the following list, but I am unable to state the amount of each pettah. The aggregate amount of imports into the district may, however, be stated at about 15,00,000 rupees, and exports at 10,00,000. The places with which the traffic is carried on is stated. The traffic is chiefly carried on bullocks, some also on carts.

The chief imports are—

NAMES OF ARTICLES.	FROM WHENCE IMPORTED
1. Silk thread - - - - - }	Chiefly from Bombay, and partly from the Nizam's country
1. European piece goods - - - - - }	
1. Cherinjee, a fine bark for dyeing purposes - - - - - }	
1. Coosombah flower, for dyeing - - - - - }	Nizam's divisions.
1. Cotton - - - - - }	
1. Cotton thread - - - - - }	
1. Grains of kinds - - - - - }	
1. Cumbles or blankets - - - - - }	
1. Ghee - - - - - }	
1. Oil - - - - - }	
1. Saltpetre - - - - - }	Nellore and Chingleput
1. Marine salt - - - - - }	
1. Betel-nut - - - - - }	Naghur, in Mysore country, and Cmaria district.
1. Dried cocoa-nut - - - - - }	
1. Pepper - - - - - }	
1. Dates - - - - - }	
1. Cardamums - - - - - }	
1. Indigo - - - - - }	Poodootoor, in the Cuddapah district
1. Turmeric - - - - - }	Poodootoor, in Cuddapah district
1. Piece goods - - - - - }	
1. Sugar - - - - - }	Bangalore, in Mysore country.
1. Raw sugar or molasses, or jaggeiy - - - - - }	
1. Silk thread - - - - - }	
1. Iron tyers - - - - - }	From Madras.
1. Copper and other metal - - - - - }	

CHIEF EXPORTS.

NAMES OF ARTICLES.	WHERE EXPORTED TO.
Cotton - - - - - }	To Madras, Wallajahpett, in Chittore, zillah Careta, in Canara, and to Bangalore.
Cotton thread - - - - - }	
Piece goods - - - - - }	To Bangalore, in Mysore country.
Cumbles - - - - - }	
Tobacco - - - - - }	
Grain - - - - - }	To Kurnool and Nizam's country.
Iron - - - - - }	To Nizam's country.
Betel-nut - - - - - }	To Cuddapah, Madras, and Wallajahpett.
Black cumbles - - - - - }	To Madras.

Fourth Point.—The nature of the trade between this district and Madras is chiefly cotton and cotton thread, oil seeds, betel-nut, and cumbles, which are sent to the coasts; and salt, iron bars, and military stores, and European articles, which are imported. The amount I am unable to state with any accuracy. The roads are by Cuddapah and Nundiroog, which are not good. The hire of a bullock is about 10, and a bandy 22 to 25 rupees, to Madras from Bellary. A bandy load of cotton is about 40 to 48 maunds. Marine salt is imported from four places on the eastern coasts to Bellary district; namely,

- From the depôts of Esacapully, in Nellore.
- Ditto - - of Gogalapully.
- Ditto - - of Madraspatam.
- Ditto - - of Chingleput.

The salt is conveyed on cattle; the owners are Bringaries, Vuddawar, and Carchawar, and they traverse through the Cuddapah district into Bellary and other markets of the district, and thence they carry the salt into Nizam's country for sale.

The quantity consumed in this district is estimated at 100 garce per year. The original authorised cost of this salt, per garce, is 120 rupees. The hire of Bringary, &c cattle (which are of a very small size), each carrying six meracals, or 72 pukka seers, requiring

Part III.
Official Reports,
&c.

about 67 bullocks per garce for 240 miles, would be two annas each per 10 miles, and would amount to 201 rupees per garce.

At the foregoing rate, the whole 100 garce would cost 32,100 Company's rupees; original price 12,100 rupees, and hire 20,100 rupees. But it is evident that these Bringaries, who generally take goods to the coast, do not calculate the hire back of salt at even this low rate, as the wholesale price of marine salt in this district is only from 220 to 240 rupees, the first cost being 120 rupees. In your fourth paragraph, you state your object is to ascertain "to what amount the traffic already tending towards Madras might be expected to increase with the establishment of the superior means of communication offered by a railway, and also how far we might look for a diversion of the trade, now taking other channels, into the line thus thrown open." I do not think that, under the present state of the district, any very great increase of traffic towards Madras would take place in consequence of the proposed railroad as far as Arcot. Cotton is the great staple article of this district. The market value of the article at Madras, compared with the market price given for it at Bombay and the western coast parts, would generally regulate the line of traffic; and it is very doubtful whether the cost of carriage would be lessened by the railroad. A railroad the whole distance, into the heart of the district, would probably command the whole traffic in cotton, but not unless the rail would convey it at a price equally low as at present. The cost of conveyance of a candy of cotton now to Madras may be stated at about from 11 to 12½ rupees. The quantity of cotton exported from this district, which could be increased according to demand, is not known; it may perhaps amount to about 8,000 candies, the whole cost of which in carriage to Madras would be 70,000 rupees. The railroad would probably effect a change in the sea-salt expenditure in this district; earth salt manufactured in the district is universally used. Many attempts have been made to introduce the marine salt, but the great distance from the coast, and the expense of hire, has hitherto quite rendered the attempt abortive. But a railroad could probably bring sea-salt in such abundance, at such a cheap rate, as to enable the people to purchase it at a price not exorbitantly above the price of earth salt, and, could that be effected, there would be in the course of time a consumption of sea-salt from five to ten times the amount now consumed.

I beg to subjoin, as near as possible, the information on salt asked for in your letter of the 27th November, in the following Statement:

FUSLY YEAR.	I M P O R T S										Whole- sale Price at Bellary, per Garce.	Retail Price in the District, per Garce.
	FROM NELLORE			FROM CHINGLEPUT.			Total		Whole- sale Price at the Depôts.			
	Quantity.		Cost of Carriage to Bellary, reckoned at 2 Annas per 10 Miles, per Bullock Load.	Quantity.		Convey- ing Hire per Garce to Bellary.	Quantity.					
	Garce	Marcal.		Garce.	Marcal.		Garce.	Marcal.				
1256 - -	11	360	201	3	310	226 2	15	270	120	200 ¼	215	
1257 - -	19	93	201	1	170	226 2	20	203	120	233	245	
1258 - -	43	324	201	1	110	226 2	45	34	120	248	262 ¼	
1259 - -	9	122	201	-	-	-	9	122	120	220	230	
1260 - -	8	190	201	-	-	-	8	190	120	224 ¼	240	
	92	289	1,005	6	190	678 6	99	79	600	1,131 12	1,192 ¼	
Average - -	18	217	201	2	63	226 2	19	89	120	226 4	238 8	

On the whole, I am not sanguine that any very beneficial results will accrue to Bellary by the formation of a railroad to Arcot; if extended to Bellary, some manifest benefit, in the course of time, would certainly follow, to what extent, I would not venture to predict.

I have, &c.

Bellary, Collector's Office, }
28 February 1851. }

(signed) C. Pelly, Collector.

MINUTE by the Right Honourable the President, dated 8 April 1851.

Major Pears' Report on the line of proposed Railway to Wallajahnuggur and Vainambady, dated the 5th of March 1851 (No. 212).

I REGRET that I have been obliged to keep the above Report and its accompaniments so many days, but I did not like to pass them on without offering my sentiments on them, and my time has been fully occupied with other matter that has flowed in faster than I could dispose of it.

I consider

I consider Major Pears' Report to be a very able and valuable paper on the most important question, by far, that has come before Government since I have been in this Presidency. That officer has, I conceive, proved that a better selection could not have been made by Government for the task entrusted to him; divesting himself of any shade of bias, he has brought the mass of information which he had collected to bear on his investigation in a shape that it is impossible to misunderstand, and whilst he has stated his own views on each point of discussion, and the grounds of them, he has most distinctly and candidly set forth the arguments which have occurred to him on both sides of the question.

My opinions as to the vast benefits that would result to the Madras Presidency (and I may say to all India) by the establishment of railways have been so publicly and unequivocally expressed on all occasions, that it seems almost superfluous to repeat them, but I cannot allow the opportunity to slip, without saying, that, had those opinions required any strengthening, they would have obtained it from the Report before me.

I am free to admit, with Major Pears, that those who expect the railway to spring at once into a highly profitable speculation may (I do not say will) be disappointed, but that it will in due time do so, I have myself no doubt. I look on it, that, in the single article of salt, it will repay the whole outlay, should the Government bear it, but these are, it may be remarked, positively secondary considerations (I mean the profits), when placed in competition with the incalculable benefits which it will be the certain and gradual means of bestowing on the whole country.

My recommendation is, that Major Pears be requested to prepare the proper estimates as quickly as possible for continuing the railway to Vainambady, including the bridging of the two rivers, Palaar and Poonee. I am, so far as my little acquaintance with the localities will permit me, to pronounce decidedly in favour of the Vainambady line, notwithstanding its twofold expense. If once done, it will form, as it were, the basis of a future series of railways throughout the Madras territories, and is obviously at the outset much more likely to demonstrate to our native subjects the advantages which are being prepared for them, than the shorter line to Wallajahnuggur. I also think that the alteration of the line to Vainambaddy is sure, from the large (already) and increasing intercourse with the Neilgherry Hills, Bangalore, the Cheveroy and Pulney Hills, &c, &c, to ensure tenfold the amount for passengers to that which Major Pears reckons on.

When the estimates for both lines come in, I shall be prepared to pass my opinion on them, if it is required. In the meantime, I would suggest a copy of this Report, with accompaniments, being transmitted to the Honourable Court by an early opportunity, with an assurance that the estimates will follow as quickly as practicable.

8/4/51.

(signed) *Henry Pottinger.*

P. S.—Should it be considered advisable to record these hasty remarks as a minute, I have not the smallest objection.

(signed) *H. P.*

MADRAS RAILWAY COMPANY.

COPIES of the CORRESPONDENCE between the PROMOTERS of the MADRAS RAILWAY COMPANY and the COURT of DIRECTORS of the EAST INDIA COMPANY; and of the CORRESPONDENCE between the BOARD of CONTROL and the COURT of DIRECTORS; and of any OFFICIAL REPORTS with reference to the same Subject.

(Mr. Bright.)

*Ordered, by The House of Commons, to be Printed,
31 May 1853.*

[*Price 11d.*]

545.

Under 12 oz.

RETURN

(To an Order of the HOUSE OF LORDS, dated 11th July 1853.)

FOR

COPIES of any CORRESPONDENCE between the GOVERNMENT of INDIA and the COURT of DIRECTORS, and of any DOCUMENTS received from INDIA, relative to the LINES to be selected for the SYSTEM of RAILWAY COMMUNICATIONS in that Country.

East India House, }
21st July 1853. }

JAMES C MELVILL.

Ordered to be printed 21st July 1853

CONTENTS.

	PAGE.
No 1. Copy Despatch from the Court of Directors of the East India Company to the Governor-General of India in Council, in the Financial Department, No. 51, dated 22nd September 1852	5
No. 2. Copy Memorandum by Major Kennedy, dated 14th September 1852	ib.
No. 3. Copy Despatch from the Court of Directors to the Governor-General, in the Financial Department, No. 67, dated 21st December 1852	20
No. 4. Copy Despatch from the Court of Directors to the Governor-General, in the Financial (Railway) Department, No. 1, dated 19th January 1853	21
Enclosures. Copy Correspondence between the Court of Directors and the Promoters of the Baroda and Central India Railway Company	ib
No 5 Copy Despatch from the Court of Directors to the Governor-General, in the Financial (Railway) Department, No. 3, dated 16th February 1853	27
No. 6. Copy Despatch from the Court of Directors to the Governor-General, in the Financial (Railway) Department, No. 4, dated 2nd March 1853	ib.
No. 7. Copy Despatch from the Court of Directors to the Governor in Council at Fort St. George, in the Financial Department, No. 13, dated 18th August 1852	28
No. 8. Copy Letter from the Governor-General to the Court of Directors, in the Financial (Railway) Department, No. 4, dated 4th May 1853, and accompanying Documents	29

MINUTE by the HONOURABLE SIR F. CURRIE, BT., dated May 2, 1853.

THESE very voluminous papers came to me on Friday. I have studied with great attention the Governor-General's Minute, and I have given the best consideration which I am able, under the pressure of preparation for departure from India in a few days, to the immeasurably important subjects discussed therein, many of which have necessarily been for some time familiar to me, and have been, more or less, subjects of thought and deliberation. I entirely concur with the Most Noble the Governor-General in his opinions regarding the vast importance of railways in India in every point of view, and regarding the lines which should be first attempted in the several presidencies, and the means by which these comprehensive operations should be carried on.

(Signed) F. CURRIE.

May 2, 1853.

MINUTE by the HONOURABLE J. LOWIS, dated May 2, 1853.

I FULLY concur in the views of the Most Noble the Governor-General on this most important subject, and in the earnest hope expressed by his Lordship that a system for the introduction of railways over the whole Indian empire may be at once organized.

The more specific recommendations contained in his Lordship's Minute appear to me to be highly practical and judicious, and calculated to secure the great end in view economically, and within a reasonable time.

In my opinion there is nothing which will give so immediate an impulse to the moral, social, and commercial improvement of this country as these railways.

(Signed) J. Lowis.

May 2, 1853.

CORRESPONDENCE, &c.

No. 1.

Financial Department, September 22 (No. 51), 1852.

Indian Railways
—

Our Governor-General of India in Council,

WE forward, for your consideration, copy of a memoir by your late consulting engineer, Major J. P. Kennedy, upon the subject of railways in India, and we request your attention to his remarks upon the future direction of the Bombay line, as this is a question upon which we are expecting to receive your decision, in view to the extension of that railway.

We are, &c.

(Signed) J. W. HOGG.
R. ELLICE.
&c. &c.

No. 2.

MEMORANDUM UPON INDIAN RAILWAYS, by Major J. P. Kennedy.

Major
J P Kennedy
—

CONTENTS

	Paragraph
Saving which railways would produce in the Military Establishment of India 2,332,482 <i>l.</i> per annum - - - - -	1 to 22
Saving would produce a capital of 77,749,400 <i>l.</i> which would construct 15,549 miles of railway at a cost of 5,000 <i>l.</i> per mile - - - - -	23 „ 28
Erroneous project now in progress in the Presidency of Bombay - - - - -	29 „ 35
General rules proposed for construction, &c, of railways to prevent error - - - - -	36 „ 38
Indian Government occupies the position of General Land Proprietor as well as Government, and is therefore the only source from which the development of the country's resources can emanate - - - - -	39 „ 50
Peculiarities in the physical structure of India affecting railway projects - - - - -	51 „ 54
General project for construction of railways in India - - - - -	55 „ 58

APPENDIX

Torrington Square, 14th September, 1852.

1. It is not sufficient to be convinced, as I am, that the establishment of railways in India is an essential preliminary to the attainment of the highest degree of efficiency of which our military and civil administrations are capable—to the prevention of local famine, and to the uniform dispersion of food—to any vigour and activity in manufacture or commerce—to the increased consumption of English goods—to the power of competing with America in furnishing to England raw cotton and other important articles—in short, to the growth of every thing connected with the extension of British interests in India, as well as with the industry, the wealth, and the comfort of its vast population.

2. It is still requisite, in addition to this conviction, to be able to see how the risk of the government guarantee, which the money market requires for capital invested in Indian railways, shall be borne, under the worst aspect that that risk can assume.

3. I believe that upon the Great North Western Line of Bengal, which I know better than any other, the risk would be absolutely nothing; but, at the same time, when Government, or when an individual gives a guarantee, it is a correct precaution to assume the possibility of being called upon to pay the whole amount of such guarantee, and to examine how that amount, if required, shall be forthcoming.

4. The question then is, where there be any direct and immediate equivalent which the Government of India can calculate upon from the establishment of

Indian Railways.

Major
J. P. Kennedy.

railways, which would enable them, if so called upon, to disburse the amount of the guarantee required without any additional charge upon the revenues.

5. I feel certain that such an equivalent would be the result, at least as far as regards the one great line of railway from Calcutta to the north-west, by the enormously increased efficiency that it would produce upon the operations of the Bengal army in facilitating the concentration of troops on any required point, and by the consequent numerical reduction of that army which it would justify. If I can show this, I am persuaded that nothing more will be required to induce the Government to adopt that immediate and vigorous activity in pressing forward the construction of railroads, which they are so well aware that every interest of India demands.

6. On referring to the last revenue accounts furnished to Parliament by the East India Company, we find the military expenditure incurred for the last year of the return, 1848-49, to be as follows:—

Bengal, Company's Rupees	-	4,99,35,384
Madras	”	2,62,06,214
Bombay	”	1,71,57,759
Total	”	<u>9,32,99,356</u>

7. We may assume, that of this expenditure a certain proportion, say one-fourth, would be of a nature that would not, under any circumstances, bear reduction, such as staff pensions, officers' pay, &c.; but that increased efficiency would enable a reduction with safety to be applied to a portion of the remaining three-fourths of that expenditure.

8. To judge as to the effect which the contemplated line of railway from Calcutta to the north-west would have upon the efficiency of the Bengal army, it must be kept in mind that a regiment marching from Calcutta to Peshawar (about 1,446 miles) would occupy a period of six months, or the whole temperate or active season of one entire year, on the way, whilst by railway it could be carried the same distance in from 70 to 100 hours, and shorter distances in corresponding comparative periods respectively.

9. When the Sikhs crossed the Sutlej on the 15th of December 1815, it was six days before the nearest troops could be congregated to meet them, and that could only be effected by leaving the adjacent stations of Ludiana, Umballa, and Meerut comparatively unprotected, whilst the small force at Ferozepore were for several days exposed to the risk of an attack from the whole Sikh army.

10. The British Commander-in-Chief, Lord Gough, aided by the whole power and military experience of Lord Hardinge as Governor-General, having marched from Umballa on the 11th of December, by the utmost exertions and forced marches, met the enemy on the 18th—the greatest amount of concentration that could be effected during those seven days by denuding the nearest stations, being under 13,000 men; and with this comparative handful of troops he was obliged to fight, at Moodkee, a most hazardous battle with a well equipped army of 30,000 men having a reserve of 30,000.

Three days later, on the 21st of December, when the British force had been increased by only 5,000 men more, making in all about 17,000, they were forced to fight at Ferozeshah for two consecutive days. Thus, after ten days of concentration, only 17,000 men could be brought together from the nearest stations, leaving those stations exposed, and this out of the large and magnificent force forming the Bengal army, or I should say rather out of the united armies of British India.

11. This gallant little band was obliged to take the risk of three battles opposed to a well organized and well equipped army of 60,000 men, with the enormous disadvantage of an inadequate supply of ammunition; a combination of circumstances which placed in extreme peril the British empire in India.

12. Had the proposed railway from Calcutta to the north-west been in existence, twenty-four hours would have enabled the Commander-in-Chief to concentrate on the point attacked 60,000 men, amply furnished with artillery and stores of every kind, drafted proportionally from all the main stations, and without leaving any point or cantonment in the rear unprotected.

13. To be convinced of this it is only requisite to refer to the plan, showing that the line of railway would pass centrally through the great line of important military stations between Calcutta and the Sutlej; and, if we conceive a well combined extension of the principle of trunk railways completed throughout the three presidencies, the draft for any large field force required might, with proportional facility and rapidity, be concentrated from the main stations of the three armies, thereby producing a proportionably slight withdrawal of the force from any particular locality.

14. We have at this moment conflicts going on at the north-western and north-eastern extremities of our Indian frontier points about 2,000 miles apart; either or both of which conflicts may grow into serious wars requiring immediate and extensive reinforcements of troops and stores. The very nature of our empire in India must, at all times, expose us to similar conflicts without much warning; and our stability, or even existence there, must depend on our being able to meet such conflicts with energy and rapidity, without dangerously diminishing the garrisons of other important districts, particularly of those that are nearest to the seat of war, and therefore most exposed.

15. No one will deny that the efficiency of an army is in some inverse ratio to the time required to concentrate such a preponderating force of well-trained troops on any given point of its lines of defence as shall secure victory over the largest hostile force that can be expected to attack it.

16. When the movements are slow, as must be the case when the troops have to concentrate by marching, each limited district must be copiously armed for its own defence and protection, but when the power of concentration is rapid, as is the case when troops can be brought together to any given point by railway from very distant stations—then a comparatively small force will suffice for each particular district.

17. What the exact ratio of increased efficiency may be as compared with the increased power and rapidity of concentrating troops and conveying artillery and commissariat supplies to the first place of assembly for a campaign, as well as in the subsequent supply of reinforcements and provisions, it is difficult to express in precise numbers. But it would probably not be straining the argument to assume, that two-thirds of any given army for the protection of British India, would be much more efficient where a field force of 50,000 or 60,000 men, with ample artillery, stores, and provisions, could be congregated on any point of its vast lines of defence in twenty, forty, or sixty hours, than the whole of such an army would be under the present system, requiring a mean period of three or four months to bring such a force together.

18. It is not for a moment implied that in the subsequent manœuvres of a campaign the general can be aided by the existence of railways. Their advantage in a military point are only assumed to apply to the first concentration of a force and to its after reinforcement with troops, provisions, and stores. But all those acquainted with the Indian climate and practices will understand how much greater those advantages would be as applied to India, than if our consideration had reference to Europe. In India, marching or campaigning in summer is out of the question, unless at a fearful expense of life and health to our troops, whilst from the vast extent of territory we occupy there, the ordinary dispersion of our forces may be nearly in the ratio of 1,000 miles as compared to 100 miles at home.

19. Under the foregoing views I shall deal with the present military expenditure of Bengal as follows:—

That amount being, Company's Rupees	-	-	4,99,35,384
From this sum I take $\frac{1}{3}$ of $\frac{3}{4}$, or $\frac{1}{4}$ of the whole, as a reduction of expenditure, due to the increased efficiency of the army, to be produced by railways			1,24,83,846
Subsequent military charge for Bengal	-	-	3,74,51,538

20. The reduction of expenditure in the military establishment of Bengal, which I maintain the construction of the railway from Calcutta to the north-west would justify, and still leave the army a much more powerful engine than it is at present, would be Company's Rupees 1,24,83,846 per annum; or taking the rupee at 2s., it would be in British money 1,248,384*l.*, which at 5 per cent. would enable the East India Company to raise a capital of 24,967,690*l.*, or at 4 per cent. 31,209,600*l.*, or at 3 per cent. 41,812,800*l.*, with which to construct railways in Bengal on government account; or, if it be considered preferable,

Indian Railways,
 Major
 J. P. Kennedy.

to work the railways through private companies, the Indian Government can venture to guarantee to such an amount of capital without increasing the public charges of Bengal, even supposing the whole amount of the guaranteed interest to be annually paid by government to the companies.

21. But if, as I firmly believe, an economically and judiciously constructed line to the north-west of India, would be ample remuneration from its own resources, then the whole reduction* of 1,248,384*l.* annually, on the Bengal military establishment, would be a clear saving upon the present expenditure; and, in addition to this large saving must be considered the saving that would occur on the transport of troops in the annual reliefs, the saving upon transport of treasure and treasure parties, and, above all, the abolition of that most oppressive practice which the movement of troops now entails by the necessity of pressing the carts and animals of the country people, and carrying them hundreds of miles from their homes, in order to furnish the requisite means of military conveyance. Yet the advantages, in a military point of view, would form only one of the numerous classes of benefits which such an undertaking would confer upon the country; nor is it easy to estimate the annually increasing prejudice to Indian produce which the delay of applying this principle is producing; or how it is to recover the start which energy, wisdom, and activity in this respect are giving to American produce, even in our own markets!

22. Adopting the foregoing principles as generally applicable to the three presidencies, I shall now offer a table showing the annual saving on the military establishments of India generally, which a well arranged system of railways would produce; showing also the capital which that saving would enable the Government to command, either as a guarantee fund in the event of private companies doing the work, or as a fund for actual construction, by the Government itself. And further showing the number of miles of railway that can be made out of such capital at different rates of cost per mile, omitting fractional parts.

TABLE ABOVE REFERRED TO

PRESIDENCY.	Present Cost of Military Establishment as given in Parliamentary Return for 1848-9	Annual saving upon Military Establishment which would accrue from the introduction of Railway Intercourse	Capital which may be raised for Construction of Railways upon annual saving in Col 2, at			Number of Miles of Railway which may be constructed by Capital in Col. 4, at per Mile						Number of Miles which may be constructed by Capital in Col. 5, at £5,000 per Mile.
			5 per Cent. per Annum	4 per Cent. per Annum.	3 per Cent. per Annum.	£ 5,000.	£ 6,000.	£ 7,000.	£ 8,000.	£ 9,000	£ 10,000.	
	1	2	3	4	5	6	7	8	9	10	11	12
	£	£	£	£	£	Miles.	Miles.	Miles.	Miles	Miles.	Miles	Miles.
Bengal - - - - -	4,933,538	1,248,384	24,967,680	31,209,600	41,612,800	6,241	5,210	4,438	3,901	3,467	3,120	8,322
Madras - - - - -	2,620,621	655,155	13,103,100	16,378,875	21,838,500	3,275	2,729	2,339	2,047	1,819	1,637	4,367
Bombay - - - - -	1,715,775	428,943	9,578,860	10,723,575	14,298,100	2,144	1,787	1,531	1,340	1,191	1,072	2,859
Total - - - - -	9,329,953	2,332,482	47,649,640	58,312,050	77,749,400	11,660	9,716	8,328	7,288	6,377	5,829	15,549

(326.)

B

(9)

Indian Railways
Major
J. P. Kennedy.

Indian Railways.

Major
J. P. Kennedy

23. In a report which I addressed to the Government of India on the 29th of January 1851, I dwelt at some length on the principles which appeared to me indispensable to ensure success and profit in this class of undertakings, and to avoid those errors, that waste, and that ruin to shareholders, which have characterized similar works in England.

24. Those principles were at once approved and adopted by the Government, and one important result which may be anticipated from them, is that of forcing those charged with the construction of the works in India to adopt the most essential of all rules in engineering, which has unfortunately been generally disregarded in English railway practice, that of the engineer feeling his character responsible not only for the eligible nature of his project and the efficiency of his works, but likewise for the funds invested bringing back a remunerative return to his employers—unless he shall have clearly expressed his written opinion that such a return is not to be expected, *even under the most economical system of construction that can possibly be applied.*—This assuredly should have been the first consideration with engineers employed by companies whose sole object was to obtain a profitable return for their investment. (And had they been guided by such a consideration they would never have allowed their works to cost 188,000*l.* per mile, nor 178,000*l.*; nor 70,000*l.*, nor 60,000*l.*, nor 50,000*l.*, nor 40,000*l.*, nor even 30,000*l.* per mile. Nor would they have constructed their lines with such defective gradients as must necessarily limit the loads of their powerful engines to a degree that must consume the profits otherwise attainable in the permanent working of the lines.)

25. Had engineers kept the interests of their employers in view, they would have individually and collectively remonstrated against the extravagance and fraud attending the preliminary investigation of the merits of projects prior to their sanction and adoption, the frauds in valuation of property, law costs, &c.; and had they done so Parliament would have listened to their remonstrance, and would have granted reasonable protection to the most useful class of speculators who have ever shown themselves in the British empire, and who, as matters now stand, have been pillaged by the inexcusable negligence of those in whom they confided to the extent of so many millions of pounds sterling. Happily for India its Government have not overlooked the justice and wisdom of protecting this class of investment from the futile processes and scandalous frauds which attended the preliminary investigation, the legal chicanery, and the acquirement of the land in England.

26. But it is still imperative to adopt the most arduous and incessant scrutiny of all projects, as well as supervision in the subsequent execution, to eradicate the grave errors in the former, and the extravagance in the latter, which will otherwise assuredly emanate from those trained in the practice of England.

27. For greater security, I have given in the above table to paragraph 22 a scale, showing the number of miles which might be made at different rates of cost, to the amount of the capital which I assume the annual saving on the military establishment would produce in each of the presidencies. But although for facility of calculation and precaution's sake, I have extended this scale from an average of 5,000*l.* per mile to that of 10,000*l.*, I am nevertheless convinced that the lower average of 5,000*l.* per mile ought amply to suffice for single tracks, if the engineers in charge can be forced to keep constantly in mind that the one thing needful is a remunerative return for the capital confided to them. My own experience, the results obtained on the continents of Europe and America, some few cases even in our own country, as well as the comparative low price of labour in India, all tend to confirm this conviction. It will be safe, however, even holding this opinion, to limit in the first instance the authority for construction to one half of the mileage,—which would be, at that rate, a quantity quite sufficient to open the main lines of trunk road throughout the several presidencies. It would give—

For Bengal	- - - - -	3,120 miles
„ Madras	- - - - -	1,637 „
„ Bombay	- - - - -	1,072 „
Total	- - - - -	5,829 miles.

28. I have no doubt that the saving upon the military establishments may be fairly calculated to cover the risk of railway guarantee in the presidencies of

Madras and Bombay, as well as in Bengal. The natural formation and fall of the land, the commercial requirements as regard lines of railway, and the military points of occupation in those presidencies, sustain this view. In Bengal it must be allowed that all these matters have a singularly concurrent coincidence, whilst some peculiarities of the Bombay presidency call for the most cautious and judicious consideration, in order to secure to it the full measure of advantage of which it is susceptible.

Indian Railways.

Major
J P Kennedy

29. In this view I apprehend that the project now in progress at Bombay calls for some very important modification of the original design. It is to be hoped, however, that this modification may be effected without the necessity of abandoning, for one object or another, any of the work done. It was an error to contemplate carrying the great northern traffic, including that of Candeish and Berar over the Syhadru Ghauts. At the same time the portion of road made from Bombay as far as Tannah will probably be found suitable as the commencement of the great northern trunk road; whilst from Tannah on by Calhan, &c., the work done may come into use as a branch towards Sholapore, &c., from the trunk line.

30. It would appear that the proprietors of the works now in progress at Bombay proposed to cross the Syhadru range by the Malsej Ghât, 2060 feet high. They propose to surmount the precipitous portion of the Ghât, 1,770 feet high by a fixed engine incline of about six miles, with a gradient of about one in eighteen, or by an alternative incline thirteen miles long with a somewhat reduced gradient. They would then proceed through the table-land due east, for twenty miles and a half to Alleh, the maximum incline being so great as one in 113. At Alleh they would send off a branch to the south eastward, in the direction of Sholapore; but the principal object appears to be the northern line from Alleh through Candeish, and crossing the Taptee and Nerbudda rivers, they would take the direction of Agra, after passing by Mhow, Indore, &c. They would also throw off a branch from the Nerbudda, bearing on Allahabad. Here, then, we have gravely proposed a most erroneous project of a grand trunk road by which the whole northern, north-western, and north-eastern traffic is to approach Bombay, the important mercantile capital of western India. Between Bombay and Agra, it appears to be the intention that this great trunk line, (second only to that of the Ganges, if even second to it,) should pass over no fewer than four *unnecessary* and fierce ranges of mountain, of which I imagine the aggregate amount of rise and fall would not be less than from 8,000 to 9,000 feet, whilst on the natural route by Surat and the valleys of the Mhye and Chumbul there is but one summit to pass, at Neemuch, between Bombay and Agra. The height of this summit is 1,356 feet, which, added to the fall from Neemuch to Agra, say 850 feet, would make the total rise and fall by this line only 2,206 feet, whilst the distance would be about 120 miles less than that by the hilly route through the Ghâts.

See Appendix
Nos 2 and 3

See Appendix
No 2.

31. The same reasoning which overthrows this project as a general trunk line between Bombay and Agra holds equally against that portion of it intended to open an intercourse between Bombay and the districts of Candeish and Berar. On this portion of it the aggregate amount of rise and fall would probably exceed considerably 4,000 feet, whilst by the coast we go level to Surat, and branch off by the Taptee Valley at the slight gradient of the river, without passing any range whatever; nor would the distance by this route exceed that over the Ghâts.

32. The best route harmonizes with every general and local interest of India, in their widest extent,—whether as regarding the north, by the route I propose, with the power of throwing off branches,—or as regarding the east, by the valleys of Taptee, Nerbudda, Soane, Godavery, Lower Kistna, &c.,—or as regarding the west, by Guzerat, Kurrachee, the Indus, &c.

Nothing can exceed the eligibility of this mode of opening the communication of all those districts with Bombay. Nothing could be more preposterous than to think of carrying the traffic of any of them over the Ghâts.

33. There is no doubt that the interests of the table-land east and south-east from Bombay call for every exertion to open a passage through the Syhadru range. But it is with this view, and this view only, that the work done to the eastward of Tannah can be made available.

34. I shall not *here* enter into the smaller question of whether the Malsej or the Bhore Ghât might have been the preferable one through which to reach that-table land.

See Appendix
No 3.

Indian Railways.

Major
J. P. Kennedy.

35. But what I most earnestly appeal against is, the project which has for its object to approach the district of Candeish or Berar, or any other part of India to the north, the eastward, or the westward of those districts, by any line whatever passing over the Ghâts. I trust that the East India Directors and the Board of Control will resist every suggestion made to them with this object, until they shall have heard from the Governor-General of India upon the subject. And I feel firmly convinced, that his Lordship's experience will sustain the view which I take of this most important subject. The nature of the error is precisely similar to, though of much greater magnitude than that which I brought under his consideration in the project of the East Indian Railway Company in Bengal. He did not hesitate in adopting the remedy I recommended in the Bengal case; (nor will he now for a moment hesitate in protecting those vast districts which the Bombay project would affect,) from the unnecessary tax on their transport of goods, that would be the inevitable effect of carrying them over several fierce ranges of hills, when a much shorter line can be had, avoiding those hills, and combining the broadest interests of Indian traffic generally.

36. The project above referred to proves at least the pressing necessity of laying down without delay some general and well defined principles of action on the subject, as a protection against similar errors in future, and with a view to direct, concentrate, and combine with useful effect the efforts of well intentioned active minds. With this object I would propose the following broad rules in respect to railways, for the adoption of the Government of India. They may somewhat startle European Engineers as aiming at a degree of perfection, of which our section of the world might scarcely admit; but the more they examine the physical formation and circumstances of India, the more they will be convinced that what I propose is in strict harmony with those natural advantages which Providence has placed within our reach there, if we can but appreciate them and exert the requisite degree of judgment in their application.

37. I propose—

1st. That all railways constructed in India shall belong to one of two classes—the first or the second class.

2d. That the regulating gradient of the first class or trunk railway shall not exceed one in 2,000;—by “regulating gradient” is meant the gradient which shall regulate the load of the engine.

3d. That no regulating gradient of any second class or branch railway shall exceed 1 in 330.

4th. That short, alternate, impulsive planes may be introduced to assist the ascent, not to exceed a length of half a furlong each, and not to be nearer to each other than one furlong and a half.

5th. That no line shall be undertaken where the estimated cost shall exceed the average rate of 5,000*l.* per mile of single tract. But that this rate of cost is not expected to include the bridging of large rivers as the Soane, Jumna, &c. exceeding half a mile wide at flood level. Such rivers are to be considered as breaks or temporary termini, where goods and passengers are to be carried across on rafts.

6th. That no line shall be sanctioned except for a single track of rails, with masonry, cuttings, and embankments to correspond. The ground, however required for a double tract, to be in all cases secured.

7th. That no locomotive engine shall be introduced to India for ten years, except such as the ratio between the length of stroke of piston and the diameter of the driver wheels shall sanction with reference to the maximum load. Notwithstanding any sacrifice of velocity on the journey, Rule No. 11, contains an exemption from this restriction.

8th. That when piling for foundations may be requisite, the foundations are to be laid to suit a double track, although the superstructure is only carried up for a single tract.

9th. That no portion of any line shall be permitted to open for the transport of goods or passengers until the capital account for the construction of such portion shall have been closed.

10th. That no more than one train daily shall run in each direction upon any line until the traffic shall furnish more goods and passengers than one engine can carry, after which a second may start daily each way. And that when the traffic calls for three trains fully loaded per day, then arrangements shall be made for laying down a second track of rails.

See Appendix
No. 4

11th. That notwithstanding the tenor of Rule No. 6., if on any line it shall appear that the profits exceed a dividend of six per cent. per annum, it shall then be permitted if thought advisable by the directors of the company interested, to introduce engines of higher powers of velocity with the view of running passenger trains separate from goods trains.

Indian Railways.

Major
J. P. Kennedy

12th. That the height above the sea of all obligatory points throughout India, having reference to the construction of works, draining, irrigation, &c., such as the highest points or necks of valleys, the low passes in mountain ranges, be obtained and recorded with all convenient despatch on the maps now in progress of construction by the Surveyor-General's department; and that, in addition to this, the heights of numerous points of inundation level be taken upon the rivers of India, and recorded upon the maps at intervals of two or three miles, so as to admit of the protraction of proximate sections of the slope of such rivers; and that any striking peculiarity in the lines of rivers, or of the ground between adjacent rivers be reported upon to the Surveyor-General by his subordinate officers, such reports to be methodically arranged in his office as records.

38. Although the object of the foregoing rules is sufficiently obvious, still a few observations upon them may not be considered superfluous. They seek to unite all considerations in the grand object of securing a remunerative return for the capital employed, without which it is clear that the progressive expansion of the principle involved cannot possibly be carried to the extent required by the interests of the Indian people. They keep in view the first principle of advantage possessed by Railway traction over all other kinds, that of (enabling the smallest power to produce the greatest result,) and they tend to secure that that result so absorbing the power shall be as much as possible applied to the movement of effective load, and that the power shall not be absorbed either in the mere luxury of a superfluous velocity, or in contending with gravity or unnecessarily steep inclines. They seek to secure the principle of economy both in the permanent working of the lines and in their original construction. With regard to this last consideration, there is no question that if engineers are forced to work with economy they can do so. I am about to inspect a line of single track road that has been lately constructed at home at an outlay of 5,000*l.* per mile. If I find the result of any importance I shall not fail to report it for the benefit of the Indian Government; and if a work can be produced here at that cost, there can be no question as to its sufficiency in India, where labour can be had at one-seventh of our rate.

39. It is necessary now to refer once more to the general finance account already alluded to. In it we find that the land revenue or government rents of the land in India for the year 1848-9 amounted to about 14,274,272*l.*, whilst the charge for buildings, roads, and other public works, exclusive of repair, was in the same year, 1848-9:—

	£.
In Bengal Presidency	53,568
„ N.W. Provinces	192,780
„ Madras Presidency	23,801
„ Bombay	24,811
Total	£ 294,962

40. From this statement it would appear, that nearly two-thirds of the total expenditure on public works in India for the year 1848-9 was incurred in the North West Provinces, and probably the greater part of it for that magnificent undertaking, the Ganges Irrigation Canal, a work highly creditable to the British administration, and one which when completed must prove largely remunerative in a financial point of view. The balance expended on public works, exclusive of repairs in all other portions of India, appears to have been 102,182*l.* for that year!

41. In considering this part of the subject, it must be kept in mind that the Government of India occupy not only the position of the Government, but likewise that of the most influential class of subjects in England—the land proprietors, a class second only in importance to the Government itself. And therefore as the Indian Government derive the revenues of these two classes, they will naturally feel disposed to meet the charges borne by the corresponding

Indian Railways.

Major
J. P. Kennedy.

classes in England, without which the improvement of the country cannot proceed, nor can India compete with other countries in the general markets of the world.

42. That is to say, the Government will feel the wisdom of executing the requisite public works which should emanate from an ordinary Government, as well as the territorial improvements pertaining to the class of landed proprietors.

43. What the right proportions of revenue may be that are due to these two heads, can only be estimated by the legitimate requirements of the country, laying down as a general maxim that all such legitimate requirements should bring back directly or indirectly a corresponding return for the investments.

44. The just claims of the Indian people upon their Government, as above described, will be better understood when it is considered that the monopoly of the proprietorship of land there reserved by the Government, must, to a great extent have prevented the gradual growth of the monied and speculating classes, which in England produce the vast variety of enterprising individuals, associations, and companies, who have effected such marvellous results in drawing forth the industrial resources of the country.

45. It is difficult to say what may be the ordinary or average charge for the improving operations of a well-managed English estate upon its annual rental, but, if we assume it to be twenty per cent., we shall not probably be guilty of exaggeration. This proportion of the Indian rental would amount to an annual outlay of 2,854,854*l.* by the Government in its position of general land-proprietor, irrespective of such further sum as it may be prudent to expend in its position of Government for public works.

46. The wisdom of the Indian Government in retaining in its own hands the rents of the land as a public revenue cannot be overrated, and it only remains to follow up this wise principle by a liberal fulfilment of its duties as general landed capitalist, in fostering the industrial resources of the country, in order to exhibit the most perfect financial administration of any Government in the world. It must rapidly lead to the abolition of every existing tax or duty, for rent is not a tax; and the rent or land revenue would soon be found amply sufficient to meet all the cost of Government.

47. The outlay of the Government on account of railways, or their guarantee to companies for such outlay, as well as the expenditure for construction of irrigation canals and all other works beneficial to the occupiers of the land, must be looked upon as so much money invested by Government in liquidation of the claim upon them as land proprietors of India. And the operation of these improving investments would rapidly stimulate every branch of industry, and promote the consequent accumulation of wealth in the hands of individuals. It would, in fact, call into existence the class of private capitalists so much wanting in India, that class which in Europe originated, in the first instance, in the principle of the Government having given away to private persons the proprietorship of land, which in India has been so wisely retained as state revenue.

48. No one, then, will deny the broad nature of the claims, in this respect, which the people of India have upon their Government. Nor can any one deny the broad interest which the Government must have in liquidating those claims, secured as has been shown they are, by the certainty of deriving an immediate and ample direct, as well as numerous indirect profits for all such judicious expenditure.

49. I take for granted, then, that as India has so far escaped from the errors that have attended the introduction of railways to England, the Indian Government will follow up their recent judicious commencement in Bengal by every possible precaution against the occurrence of the English errors. I likewise may assume, that as much time has already been lost in giving to India the advantages of railways, the utmost exertions will now be used for their judicious introduction, in order that her productions may be stimulated and enabled to compete with those of other countries, and particularly of America, in the general markets. My own experience whilst employed in this department in India has convinced me that the Government is fully impressed with the urgent necessity of these two principles, and that it is only necessary clearly to point out the precautions required and the mode by which immediate execution can be safely accomplished, in order to ensure the utmost activity in the

adoption of all those measures which shall lead to the fulfilment of what they know to be of such vital importance to their territories.

50. The first object must be, to lay down the great trunk lines with a view to the broadest future ramification, and on a principle that shall ensure the most profitable permanent working of the lines generally, bearing at once upon the internal intercourse of India itself, as well as upon the intercourse of India with Europe, &c.

51. Here we must keep in mind a few great leading features in the geographical formation of the peninsula of Hindostan, 1st. The great western range of hills parallel to the coast at a medium distance of about forty miles from it, and running south from the Taptee Valley south for 700 or 800 miles.

52. From the western range a formidable spur projects for about 400 miles to the eastward, reaching near to the centre of the peninsula from a point in the Ghât a little to the north-east of Bombay (a).

53. A feature of much general importance in our present consideration is the Great Central Omrawuttee table-land. It sheds its waters in every direction. 1st—To the north-east by the Soane Valley, which falls into the Ganges and passes Calcutta. 2nd—To the south-west by the Nerbudda and Taptee, which fall into the Gulf of Cambay on the Bombay coast; and 3d—To the south-eastward by the Gunga, Godavery, Mahanuddy, &c., which flow towards the Madras coast.

54. Keeping these great geographical features in mind, and they cannot be overlooked in any general project without fatal error, they force upon us the knowledge of what the great arteries of commerce must necessarily be, and with those arteries our trunk roads must correspond. We must remember the valleys of the Ganges and Jumna whose waters flow from the Himalaya to the south-eastward for about 1300 miles, passing by Calcutta and many of the richest districts in India. If we keep these leading features always in mind, and seek to accomplish the object in view without throwing away our great natural advantages, attempting to outrage scientific axioms, or fruitlessly striving to accomplish what is unadvisable merely to gratify erroneous local influences which are taken up in total ignorance or carelessness of first principles, there will be no doubt that singularly profitable trunk lines can be selected throughout India which shall admit of judicious ramifications to any extent that local interests can possibly demand hereafter.

55. In accordance with the principles contained in the foregoing paragraphs as well as with those advocated in my reports dated 29th January and 27th February 1851, I shall now proceed to consider the lines of railway in detail which would lead to the most perfect and comprehensive system of intercommunication that can at any future time be looked forward to for India as exhibited in the accompanying sketch map marked. On this map, the lines coloured red represent the main or trunk lines, and those marked yellow represent the secondary or branch lines. It will be observed that the direction given to all railways in this project is as much as possible in the course of the valleys, and that as rarely as may be is it proposed to cross any valleys or ranges of hills transversely. Attached to this map are two fly sketches, No. 1 and 2. No. 1 contains the most important portions of the lines which should be first constructed, supposing the capital only procurable under a guarantee of five per cent., as set forth in column 3 of the table attached to paragraph 22, and therefore limited to about half of forty-seven millions sterling, reserving the other half as a margin to meet contingent events until extensive experience shall have given practical and certain data. Fly No. 2 contains an extension of No. 1, supposing the capital procurable on a guarantee of three per cent., which I believe it would be, as calculated in column 5, and consequently extended to about half of seventy-seven millions.

56. I shall now close these memoranda, and whilst acknowledging with thanks the assistance which the secretary to the Court of Directors of the East India Company has afforded me by free access to the maps, &c. at the India House, it will be understood that I only seek to point out a general principle which shall be a protection against the incongruous errors of isolated action. I

Indian Railways.

Major
J. P. Kennedy

See Appendix
No. 6.

(a) Since writing the above a principle has occurred to me, as given in Appendix No. 4, by which the engine may be enabled to surmount considerable ascents with the load due to a level road

Indian Railways.
Major
J. P. Kennedy.

believe the sketches of projects which I offer in my plans and schedules will be found to have this effect, as the basis upon which they rest, and their relative bearing with each other are strictly mathematical; nor do I believe that the principle can be superseded by any other that shall not have an injurious effect.

57. I should have hesitated at this distance to put forward so large a subject necessarily connected with the minute physical structure and wants of the various particular localities of the vast continent of India, had not the evil consequences that must arise from the deficiency of some sound general plan of operations been illustrated strongly in my mind by the erroneous project now in progress at Bombay, as well as by the Bengal project, in the state in which I found it on taking charge of the railway department under the Government of India. These are the only cases where the introduction of railways has been practically attempted in India, and they were so crude and unfitting, that had they been persevered in under the original intention, they must have not only failed as individual cases, but their failure would have blighted the principle of such works. I earnestly hope that their correction may lead to a very different conclusion. The traffic of India has no broad margin like that of England to cover grave errors. The capabilities, however, of India are numerous, and her traffic, such as it is, will suffice, provided those capabilities are turned to the best possible account, but not otherwise.

58. I shall only venture further to suggest, with a view to prevent unnecessary delay, that the Governor-General should be furnished with a power if he does not already possess it, without reference home, to incur the requisite expenditure to investigate by reconnoissance or survey, or by reports from special officers the merits of such railway projects as his Lordship may think fit to order. If this be conceded, much indispensable preliminary knowledge may be obtained at a small cost during the ensuing cool season. I would earnestly press the advantage of having as many projects of this nature as possible now brought up, as there is no chance of any one hereafter being placed at the head of the local government of India, whose experience on the subject of railways could attach such value to their recommendations or decisions as that of the present Governor-General.

(Signed) J. P. KENNEDY, Major.

APPENDIX No 1

TABLE referring to Fly Sketch No 1, showing the number of MILES of RAILWAY in that Sketch passing through each PRESIDENCY, with the corresponding cost at 5000*l.* per mile.

Lines of Railway.	Bengal.		Madras.		Bombay.		Total.	
	Miles.	£	Miles.	£	Miles.	£	Miles.	£
1. Calcutta to Agra, by Ganges and Jumna Valleys	900	4,500,000	-	-	-	-	900	4,500,000
2. Bombay to Agra, by Surat Broach and Valleys of Mhye and Chumbul	409	2,045,000	-	-	309	1,545,000	718	3,590,000
3. Madras to Surat Junction, by Coast and Valleys of Godavery and Taptee	-	-	820	4,100,000	160	800,000	980	4,900,000
4. Madras to Malabar Coast at Poniany, by Chingleput, Tachinopoly, and Valleys of Cooleroon and Poniany	-	-	394	1,970,000	-	-	394	1,970,000
5. Madras to Bangalore, Arcot, and Tallar Valley	-	-	200	1,000,000	-	-	200	1,000,000
6. Bombay to Sholapore	-	-	-	-	350	1,750,000	350	1,750,000
7. Baroda to Kurachee through Guzerat	230	1,150,000	115	575,000	115	575,000	460	2,300,000
8. Madras Junction to Hyderabad (in Deccan), by Kistnah Valley	-	-	200	1,000,000	-	-	200	1,000,000
9. Agra to Lahore, by Delhi	385	1,925,000	-	-	-	-	385	1,925,000
10. Kurachee to Mittankote, Indus Valley	-	-	-	-	350	1,750,000	350	1,750,000
11. Raghmal to near Darjeeling	140	700,000	-	-	-	-	140	700,000
12. From near Simla to Junction with Ganges Line near Kirnaul, by Jumma and Ghiree Valleys	100	500,000	-	-	-	-	100	500,000
TABLE referring to Fly Sketch No 2.								
13. Burrampooter Valley	650	3,250,000	-	-	-	-	650	3,250,000
14. Bombay (Ghat Junction) to Nandair (Godavery Valley)	-	-	-	-	245	1,225,000	245	1,225,000
15. Poonah to Meuritch, by Satura	-	-	-	-	135	675,000	135	675,000
16. Assam to Chittagong and Arracan	540	2,700,000	-	-	-	-	540	2,700,000
17. Nerbudda Valley	450	2,250,000	-	-	-	-	450	2,250,000
18. Nagpore to Junction with Bombay, Surat, and Madras line	135	675,000	-	-	-	-	135	675,000
19. Mittankote to Lahore	300	1,500,000	-	-	-	-	300	1,500,000
20. Lahore to Attok	200	1,000,000	-	-	-	-	200	1,000,000
	4,439	22,195,000	1,729	8,645,000	1,664	8,320,000	7,832	39,160,000

Indian Railways,
Major
J P Kennedy,
Appendix 1

Indian Railways.

Major
J. P. Kennedy

Appendix 3.

APPENDIX No. 3.

ON OPENING a RAILWAY from Bombay into the Table Land, across the Syhadree Range.

In the foregoing Memorandum, (paragraphs 28 to '36,) I have stated the objections to any trunk line being carried over the Ghâts, having for its object the northern, north-eastern, or north-western intercourse of India with Bombay. I have also stated that the interests of the extensive districts of the Table land would call for the construction of one or more branch roads being made over this great range of precipitous mountains. And I now have to request the most earnest consideration as to the mode in which such an undertaking shall be effected. It is an enterprise of which the project and execution will test the resources of the railway engineers of India, and I trust that the government will not sanction any of the objectionable schemes hitherto brought before them.

The idea of a fixed engine incline of six miles at one in eighteen, or of thirteen miles at one in forty, as well as every other make-shift contrivance should be rejected; an admirable road for a locomotive, with an ample and profitable road can be obtained along the face of the range. In fact the ascent can be surmounted at any required gradient, as the power exists of lengthening the base to any required extent.

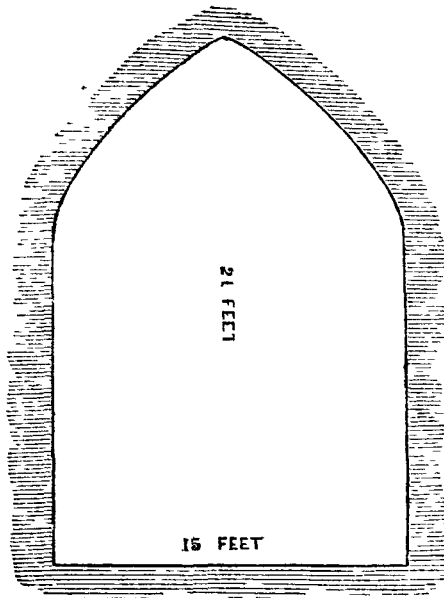
This is a work in which the character of the British engineering profession is not more interested than that of the British policy and interests in India. It will prove to the natives of that country, if properly done, that their rulers are capable of overcoming every difficulty opposed to Indian progress. Those who have already reported upon the structure of the district, state that it is most favourable for tunnelling. If this be so, it is only requisite to establish a judicious and economical principle for driving the tunnels, as well as for executing the side cutting and viaducts between adjacent tunnels; and the engineer may boldly select a first-class gradient for reaching the Table land without any apprehension of an exorbitant rate of cost.

When I commenced the first tunnel in the Himalaya mountains, on the Hindostan and Thibet road, I was influenced much more by anticipation of its effect upon the dawning subject of railway construction in India than even of its utility as an integral portion of that particular road. It was specially important to prove that that class of work could be executed at a small cost. With that view I obtained from Mr. Edwards, the superintendent of the hill states, the allocation to this work of a small party of convicts, who were a constant charge to the public, and had previously given very little in the way of a remunerative return for the cost of their maintenance. The party of convicts was divided into two sections, one for each opening of the tunnel; each section being divided again into sub-sections or squads, relieving each other every six hours. As the law did not authorize us to employ the convicts in the night reliefs, I was obliged to get hired labourers for that duty; so that one half of the work was executed by convict labour, and one half by hired labour. The overseeing of the work was done by privates of a sapper company, which was placed under my orders, and which furnished me with all the overseers I required along the whole line of road; nor were these sappers employed at any work except as overseers. There was a sapper overseer for each relief of the working parties at each tunnel opening, and they were particularly useful in the boring, loading, and firing of the mines. There was likewise a blacksmith's shop established for the repair of mining tools at the tunnel. Thus the work was carried on day and night. The overseers were not any additional cost to Government, as they were permanently paid military men; and one half of the labour, exclusive of the repair of tools, was likewise without cost, as the convicts must have been maintained at the same rate of outlay, whether they had been thus employed or not. The outlay by this measure, up to the time that I gave over charge of the work, was far within sixpence per cubic yard of excavation, exclusive of the cost of powder, which I obtained from the Government stores of captured ammunition, and was no cost to the Government, as had already been proved by large quantities of it having been blown up as useless or superfluous.

It will be observed here, that I could not bring down the rate to the minimum of cost at which it may be effected, because I could not employ the convicts in the night reliefs. This, however, can be easily obviated in future works of this class by a Government rule on the subject; and no one can object that the employment of convicts for six hours out of twenty-four at this labour is a hardship, whether by night or by day. In fact, the night work is the preferable of the two, particularly in summer, and tunnel work is preferable to any other in the Indian climate. The tunnel itself, too, forms the safest and coolest place of confinement and lodging for the prisoners employed.

The form and dimensions of a tunnel for a single track of rails may be taken as in the accompanying diagram, which would require the excavation of about thirty-five cubic yards of rock per yard forward. This, at the rate of sixpence per cubic yard, would enable us to excavate the tunnel for about 17s. 6d. per yard forward, exclusive of the cost of powder.

The precipitous face of the Syhadree range will probably be found to average about one perpendicular to three horizontal, with an elevation of 1,500 to 1,800 feet at some of the Ghâts above the more level country at its base—its crest, for the most part, offering a serrated line, with alternate salient and re-entering segments of curves of varying radii and chords, which we may assume to average somewhat less than semicircles of about half a mile radius—and occasionally diversified with spurs of considerable projection.



The principle upon which these data should be dealt with, in order to procure at the lowest cost a road fitted for locomotives, followed by a remunerative load, will be to conform as much as possible to the natural contour line of the hills, where the width can be obtained by simple side cutting; intersecting where necessary such portions of the projecting segments by cuttings or tunnels, and of the re-entering segments by embankments or viaducts, as shall bring the general line within the limits of well considered radii of curvature.

I shall assume that the large proportion of one half of every mile should consist of tunnels; this, at the rate above stated, of 17s. 6d. per yard forward, would make the cost of half a mile of tunnelling 682*l.* Let us assume that the other half of each mile consisting of cuttings, side cuttings, embankments, and viaducts would come to an equal amount of 770*l.* We should thus have the gross amount of our roadway ready to lay down the rails at a cost of 1,540*l.* per mile, which, I believe, would be found fully sufficient, as we must recollect that the tunnelling and side cuttings would give an ample supply of building stone and ballasting. But to render security doubly sure, we shall add nearly thirty per cent., and say that the preparation of the roadway for the rails, including tunnelling, cutting, side cutting, embankments, viaducts, and ballasting, may amount to 2000*l.* per mile. If we add to this, for cost and laying of sleepers, rails, &c., per mile 2,800*l.*, and road station houses, &c. 200*l.* per mile, we shall have our road finished along the Syhadree range, and roads for the engine and trains, at a total cost of 5,000*l.* per mile.

With regard to the rate of ascent which it may be desirable to adopt,—by inspecting the table of impulsive planes we can regulate the length that the road should have, and thence the point at which to meet the precipice, in order to reach the particular Ghât by which we may propose to enter upon the table land. Taking the Bhoire Ghât, which bears upon the Kistna Valleys, upon Poonah, and the Shoolapore districts as one point to approach, and the height of this above the sloping ground at the foot of the precipice to be about 1,500 feet, and choosing a rise of sixteen feet in the mile, which answers to a continuous slope of one in 330—we should require a base of about ninety-three miles to overcome the ascent. A rise of thirty feet per mile, answering to a continuous incline of one in 176, would require fifty miles to overcome the ascent.

Indian Railways.

Major
J. P. Kennedy.

See Appendix
No. 4.

If it be determined to adopt the old principle of a continuous slope, I should prefer the long base of 93 miles, so as not to bring the gradient above 1 in 330. But if the principle which I have suggested be adopted, that of using the alternate impulsive inclines, I should have no objection to the shorter base; because in that case we shall still be able to load the engine with the full weight that it can haul on a level.

To obtain a base of fifty miles terminating at the Bhore Ghât, would require us to commence the ascent of the precipice about fifteen miles to the south-westward of the Malsej Ghât, or about midway between the Bhore and the Thul Ghâts. And this would be a convenient point for a fork, of which one branch should bear southward by the Bhore, for the southern sources of the Kistna; and the other northern, by the Thul Ghât, for some source of the Godavery. A fifty miles' base for an ascent of 1,500 feet would admit the adoption of the alternate impulsive planes, enabling us to give the engine a load due to a perfectly level road.

(Signed)

J. P. KENNEDY, Major.

No. 3.

E I Company to
Governor General

DIRECTORS of the EAST INDIA COMPANY to the GOVERNOR GENERAL.

Financial Department (Railway),
21st December (No. 67) 1852.

Our Governor General of India in Council,

Construction of a
Railway in the
Upper Provinces

1. You are aware that in sanctioning the construction of an experimental line of railway in Bengal, it was made the subject of consideration whether the experiment should be made in the lower or the upper provinces, or simultaneously in both; and that we finally determined upon a section commencing at or near Calcutta, and to form part of a trunk line designed to connect Calcutta with Delhi. We have lately sanctioned a second section which will extend this line to Rajmahal.

2. We are of opinion that it is desirable immediately to commence a similar work in the upper provinces, so that India may, without unnecessary loss of time, possess the immense advantage of a regular and well-devised system of railway communication.

3. But before we take any specific steps for this purpose we are desirous of being in possession of your opinion, both as respects the project itself, and the points at which it would be most desirable that the section or sections undertaken should commence and terminate.

4. In connexion with the consideration of this subject, we wish to direct your attention to the following remarks by Major Kennedy, your late consulting engineer, in his report to your government, dated 29th January 1851.

"I had some misgiving at first as to the efficiency of the system which has been decided upon for the management and control of the East Indian Railway Company's works, but the more I see of its tendency, the more I am satisfied that it has been fixed upon a sounder basis than any other railway undertaking with which I am acquainted. The double check of the railway company's directors, and the close government supervision, should have a most salutary effect as regards expenditure." And again,

"I think that the railway management under a company strictly controlled by Government is much better than it would be under the single superintendence of either a company or Government separately."

5. We also direct your attention to the remark of the Governor General in his Lordship's minute, dated 11th April 1851.

"With respect to the policy and expediency, as well as the practicability of undertaking a general main line, I should hope that whatever may have been past difficulties, there will hereafter be nothing to prevent the extension of railways through upper India by the company on *easier terms* than those which govern their experimental lines."

6. We therefore request that you will bestow your careful and early consideration upon this most important subject, and that we may be furnished with your opinion upon the course most expedient to be adopted, with a view to

accelerate as much as possible the extension of that system of railway communication which appears to be so desirable for India, and particularly on the line between Calcutta and the north-western frontier, whether by carrying on simultaneously the construction of separate parts of it; and whether for that purpose it will be advisable to enter into several distinct contracts with different companies of British capitalists, or in any other manner.

Indian Railways
E. I. Company to
Governor General

We are, &c.,
(Signed) J. W. HOGG.
R. ELLICE.
&c., &c.

No. 4.

DIRECTORS of the EAST INDIA COMPANY to the GOVERNOR GENERAL.

E. I. Company to
Governor General

Financial (Railway) Department,
19th January (No. 1) 1853.

Our Governor General of India in Council,

1. We forward as No. in the packet, copy of a memorial addressed to us by the directors of a proposed company for the construction of a line of railway from Bombay viâ Baroda to Agra; and also copy of our reply to that communication.

2. We request your particular and early attention to the proposition thus made, and desire that you will furnish us with your views upon the subject, with the least practicable delay.

We are, &c.,
(Signed) J. W. HOGG.
R. ELLICE.
&c., &c.

The MEMORIAL of the DIRECTORS of the BARODA and CENTRAL INDIA
RAILWAY COMPANY,

Enclosure.

To the Honourable Court of the Directors of the East India Company,

Showeth,

1. That your memorialists are desirous of opening the cheapest and most effectual line of intercourse between Agra and Bombay, by the valleys of the Chumbul and Mhye rivers, Baroda and the western coast, with such lateral branches from this line as the interests of adjacent districts may require.

2. That they have selected this line of country in consequence of its large population, its valuable productions, including the most celebrated cotton of India, large quantities of opium, and an inexhaustible supply of salt,—its extreme deficiency in the ordinary roads requisite for commercial intercourse—the directness of its course, in connecting the nearest Anglo-Indian harbour (Bombay) with the ancient capital of Hindostan, and with those rich provinces which most largely consume British produce—its meeting at the most convenient point (Agra) the railway in progress from Calcutta to the north-west of India—its running in the most direct line for carrying British and Indian produce towards Thibet and China, as well as for reaching Simla, which has for several years been the principal residence of the head of the Anglo-Indian Government and of the army, and the climate of which, with the extension of railways, must ere long establish it as the permanent residence of the general Government of India and of the European troops attached to the Bengal army. This line likewise is the shortest from England, by Bombay, bearing upon the north-west frontier, the most disturbed and threatening portion of our Indian possessions. Its structure as regards levels for the formation of a railroad is peculiarly favourable. And your memorialists cannot forget the liberal support and encouragement which, during the past three years, their investigations have received from his Highness the Guicowar, the enlightened and influential ruler of Goozerat, whose territories occupy an important position in their line.

Indian Railways.

E. L. Company to
Governor General.

Enclosure.

3. In accomplishing the general objects set forth in paragraph 1, your memorialists propose to take advantage of water carriage by steamers for the present, from Bombay either to Tankaria Bunder in the Gulf of Cambay, or to Surat at the mouth of the Taptee river, and to commence their operations at whichever of those points may seem most fitting to your Honourable Court.

4. That the consecutive execution of the several sections of the works proposed should be carried on in the following order:—

	Miles.	Average estimated Cost at 5,000 <i>l.</i> per mile.
First Section, to comprise the distance from Tankaria to Baroda - Or otherwise from Surat to Baroda, as your Honourable Court may decide -	42	210,000
Second Section, from Basoda to near Neemuch or Rutlam -	90	450,000
Third Section, from near Neemuch to Agra, the junction with the Calcutta and north-west line -	210	1,050,000
Fourth Section, branch from Baroda through Guzerat by Ahmedabad to Cuttun -	300	1,500,000
Fifth Section, branch from Surat by Taptee Valley, to Omrawutty -	130	650,000
Sixth Section, Baroda or Surat to Tanna (Bombay) -	370	1,850,000
	190	950,000
	1,332	6,660,000

5. Your memorialists regret to be obliged to ask your Honourable Court for more than a general support with the land required, and the advantage of the same principle of close government supervision of their expenditure, which has been so judiciously applied in Bengal to the proceedings of the East India Railway Company. But they feel that as yet the operations of Indian railways have not been sufficiently matured, nor have they yet established that unflinching character for economy which it is the determined intention of this company to obtain, and which alone could make any scheme of this nature acceptable in the English money market without some guarantee, such as has been accorded in the three instances of railways now under construction in India—after the melancholy experience of railway extravagance which has been given at home.

6. Your memorialists, however, trust that the execution and results of the first section of their project shall give such public confidence in their operations as shall render unnecessary any future government guarantee to shareholders.

7. Your memorialists most fully admit the fact, that the progress of railway construction in India cannot be considered on a successful footing, until the confidence of the public shall have been established, by the judicious execution and the successful result of particular lines to such a degree as shall induce capitalists to embark their money hereafter without any government guarantee; but under the existing and well justified doubts with which all railway enterprises are regarded, it would be out of the question to look for capital in the market without some guarantee.

8. Your memorialists, therefore, earnestly hope that, in addition to the land required, your Honourable Court will, upon the first section of their line, sustain their exertions by a guarantee of $3\frac{1}{2}$ per cent. to shareholders, to the extent of a capital of 210,000*l.*, or 450,000*l.*, contingent upon the decision as to which shall be the first section selected by your Honourable Court; in consideration of which the directors feel it to be just that, for the amount so guaranteed, there should be a clause in their agreement with your Honourable Court, securing to the Government of India one half of any surplus dividends which that section of the line shall produce over and above five per cent. per annum.

Rules for management of Company.

9. Your memorialists here feel called upon to explain the principles of management upon which they propose to proceed, and upon which they rely to avert the evil consequences that have attended a different course of action in other railway undertakings.

(1.) They would, in the first place, earnestly avoid the usual stock jobbing evils, both as regards the public and the character of their own company. They have, therefore, determined that no scrip or shares shall for the present be issued or offered for sale, in the hope that the sanction of your Honourable Court shall be previously given in recognition of their company, so as to enable them to save the ensuing session of Parliament in their preliminary arrangements.

Precautions against the evils of stock-jobbing.

(2.) That their accountant's, their engineer's, and their cashier's operations shall be carried on in three separate departments, independent of each other.

Indian Railways
E I Company to
Governor General
Enclosure
System of
accounts

(3.) That they shall require monthly abstract reports of progress from their engineering department, of expenditure from their accountant's department, and of checked survey of cash balance from their cashier's department, and that the utmost facility shall be afforded to the public to investigate and understand their accounts and operations of every kind, especially at all the meetings of shareholders.

(4.) That all their liabilities are to be discharged monthly, and that the disbursements of each month shall be audited before the expiration of the following month.

(5.) That no expenditure or liabilities shall be incurred by any one under their authority, except upon previous estimates, which shall have received the sanction of your memorialists, if at home—or of their authorized agent acting under specific limitation, if in India—such sanctions in both cases to be invalid until such estimates have received the additional sanction of the local government, if abroad, or of your Honourable Court, if at home.

(6.) That no section of the work shall open for traffic until the capital account for its construction shall have been finally closed.

(7.) That all the progressive sections of the works shall be constructed for single tracks in the first instance, enclosing, however, land sufficient to lay double tracks ultimately, if required by an increasing amount of traffic.

Construction
works

(8.) That Major Kennedy's principle of short inclines not exceeding 110 yards in length, alternated with level planes not less than 330 yards long, shall be adopted on all ascents, to enable the locomotive engines to convey the full loads due to a level road.

(9.) That the maximum average expenditure shall be limited to 5,000l. per mile of single track road, but that this rate is not to include the bridging of large rivers, as the Nerbudda and Taptee, exceeding half a mile wide at flood level; such rivers are to be considered as breaks or temporary termini, where goods and passengers are to be carried across in rafts, until further experience shall justify more perfect modes of passage without the expenditure of an injurious amount of capital.

(10.) That the principle of remunerating the executive officers of the company shall be by a small fixed salary, to be increased on a fixed scale in proportion to their own exertions, by a per-centage on such saving as they shall effect on the mileage expenditure below the maximum average rate of five thousand pounds per mile. Such strict written contracts to be made with their officers as shall guard the company against the risk of litigation that might otherwise arise on claims for unsettled per-centage remuneration, in the event of their dismissal or resignation, &c.; and to secure that this principle shall not induce an injurious parsimony in the materials, or mode of work adopted, it is determined that the rails shall not be under eighty pounds per yard; that the sleepers shall be of the most satisfactory kind; that the ballasting shall be not less than eighteen inches deep; that the slopes of earth works shall not be less than four horizontal to one perpendicular, with such other precautionary rules as may from time to time appear calculated to ensure efficiency.

(11.) That where piling for foundations may be requisite, those foundations are to be laid to suit a double track, although the superstructure shall only be carried up for a single track.

(12.) That to avoid confining the competition for contracts to the small number of great monopolizing capitalists, the lots shall be tendered for contract in lengths not exceeding five miles of road per lot.

(13.) That the engines used until the dividends exceed 6 per cent per annum shall be selected with reference to their maximum power and economy in carrying load, and not to high powers of velocity.

Working of this
line.

(14.) That no more than one train daily shall run in each direction until the traffic shall furnish more goods and passengers than one engine can convey, after which a second may start daily, each way; and that when the traffic shall call for three trains fully loaded daily, then arrangements shall be made for laying down a second track of rails.

10. By the foregoing rules and principles, your memorialists seek to unite all interests and considerations affecting their operations in the essential object of

Indian Railways.

L. I. Company to
Governor General

Enclosure.

securing a remunerative return for the capital employed, without which it is clear that the progressive expansion of the principle cannot possibly be carried to the extent required by the various British and East Indian interests involved. They keep in view the first principle of advantage possessed by railway traction over all other kinds, that of enabling the smallest power to produce the greatest result; and they tend to secure that that result so absorbing the power shall as much as possible consist in the movement of effective load, and that the power shall not be unnecessarily absorbed either in the mere luxury of a superfluous velocity or in contending with gravity or inclines. They seek by the precautionary limitations laid down, combined as they are with the principle of giving to all persons employed a personal monied interest in the economy of their management, to obtain at a minimum rate of expenditure a maximum of efficiency, both in the permanent working of the lines and in their original construction.

11. Your memorialists beg to call the earnest attention of your Honourable Court to the accompanying map of India, on which they have represented in a red colour both the main line and branches of railway which they propose to execute, and on which they have likewise represented, in the colours yellow, brown, and green, what they assume must be something nearly approaching to the results that may be ultimately expected from the three railway companies that have already been sanctioned by your Honourable Court in the respective presidencies of Bengal, Bombay, and Madras. The unmistakeable object of the East India Railway Company must be the opening of the magnificent north-western route from Calcutta by the valleys of the Ganges and Jumna, crossing the latter river near Kurnaul, whence it would continue the main line to Lahore and Attock, and send a branch by the Upper Jumna and the Giree Valleys towards the hill stations of Missouri, Kussowlie, Simla, &c. The Indian Peninsula Company having directed their efforts to the ascent of the great western range of mountains (Ghâts) can only contemplate following the south-easterly course of some of the valleys of the Deccan, by the Kistna or Godavery rivers, or by both towards the Coromandel coast, and it may fairly be assumed that this company will open a railway communication between Bombay and Madras. ✓ The Ghâts themselves running north and south, with the numerous successive fierce ranges of mountain and ravines running parallel to each other, in a direction nearly east and west, must at once set aside all idea of operating to the northward by any railway carried over the Ghâts and over those additional obstacles.

Thus, then, the East Indian Railway Company are actually in progress upon the Great North-western line from Calcutta, which, if properly completed to the Indus, at Attock, will offer one of the most perfect specimens of railway intercourse in the world, combining extraordinary engineering advantages, from its favourable levels and consequent economy of tractive power in the after working, with the highest degree of commercial and political fitness, owing to the rich trading districts which it traverses, and the intercourse which it will open along 1,400 miles, connecting the rich capitals of several of our principal provinces, as well as the military stations on our great northern line of defence. The line of the Indian Peninsula Company, connecting Bombay with Madras, may be considered as nearly parallel to that of the East India Railway Company, but detached from it by an intervening distance of about 790 miles. Under these circumstances, your memorialists feel assured that your Honourable Court will agree with them as to the indispensable importance of their projects to the broadest interests of the whole continent of India, intended as it is to connect those two great isolated works at present in progress, and thus complete a great uninterrupted chain of railway intercourse throughout the northern, the central, the western, and the eastern provinces of our Indian possessions.

In a military, a political, and a commercial point of view, the project of your memorialists is perhaps of superior importance to either of the others, one terminus being at the western capital of India, and the nearest port to England, the other terminus being about the central point of the great northern commerce as well as of the Bengal army and of the northern railway, and the line intervening offering, as regards tractive power, the maximum degree of economy in the permanent working of the line, there being but one summit of 1,356 feet, with so long a base as to reduce the average ascent to about seven

feet per mile, whilst the mode in which this ascent is to be dealt with will enable the engine to carry the load due to a level road.

Without the project of your memorialists, the general interchange of Indian produce must still be intercepted,—the operations of the presidential armies must still be isolated; but with its adoption, every merchant in India can operate upon every market in India, and the corps of the three presidencies can unite at the shortest notice on any point of conflict.

Your memorialists trust they have said enough to secure your Honourable Court's co-operation in the great benefit they are anxious to confer on the Indian community, interested, as your Honourable Court is, not only as the supreme government of that great country, but likewise as the landed proprietors of the British Indian territories—the resources of which our efforts are intended to develop.

Your memorialists will now conclude, in the earnest hope that your Honourable Court will be pleased to grant them a favourable answer, with as little delay as convenient, suggesting that they have already spent three years in the investigation of their subject, and that, if much time is now allowed to pass, it will cause the additional loss of the whole of the coming year.

And your memorialists as in duty bound will ever pray.

On behalf of the Directors,

(Signed) KEANE,

Acting Chairman.

21st December 1852.

Indian Railways.

E. I. Company to
Governor General.

Enclosure.

MY LORD,

East India House, 31st December, 1852.

I HAVE laid before the Court of Directors of the East India Company the Memorial signed by yourself on behalf of the Directors of the Baroda and Central India Railway Company, submitting a proposition for the construction of a railway between Agra and Bombay by the valleys of the Chumbul and Mhye Rivers, Baroda and the Western Coast, with such lateral branches from this line as the interests of adjacent districts may require, and requesting the Court's sanction and co-operation to the undertaking.

In reply, I am commanded to inform you that the question of constructing a railway, to commence at Baroda, has already been the subject of correspondence between the Court and the Government of India, and the Court are now awaiting the receipt of information upon the subject. They have been led to hope that H.H. the Guicowar would undertake the construction of the section through his territory, and have directed that every facility should be afforded to him for the purpose.

Under these circumstances I am commanded to inform you that a copy of your communication will be forwarded for the consideration and report of the Government of India, but that until they are furnished with the views of Government, they must postpone the consideration of the proposition which you have submitted to them.

I have, &c.

(Signed) JAMES C. MELVILL,

Secretary.

The Right Hon. Lord Keane,
Chairman of the Baroda and Central India Railway Company,
141, Fenchurch Street.

Enclosure

From the Directors of the BARODA and CENTRAL INDIA RAILWAY COMPANY
to JAMES C. MELVILL, Esq., Secretary to the Honourable Court of
Directors of the EAST INDIA COMPANY.

Enclosure.

SIR,

IN reply to your letter of the 31st ultimo, the directors of this company are anxious to offer some considerations with a view to shorten the preliminary negotiation between themselves and the Court of Directors of the East India Company; and thereby to enable them in case their general project be approved by the Government of India, to commence active operations with the least possible delay.

Indian Railways.
 E. I. Company to
 Governor General.
 Enclosure

The first point in this respect that suggests itself is, that the settlement of final negotiations with the Guicowar is not essential as a preliminary to the arrangements between this company and the Honourable Court of Directors.

The territories of the Guicowar form but a small portion of the general line of country to which their project is intended to apply; and there are many other native princes with whom it will be requisite to make arrangements as well as with His Highness the Guicowar; but it is clear that no such arrangements can be brought to a close with any of them, not even with the Guicowar, until this company shall have surveyed with tolerable accuracy their line—a process which they cannot effect until after their general arrangements with the Honourable Court of Directors shall have been completed; because, having determined to abstain from issuing shares or scrip until they receive the Government sanction, there can be no means, except the private funds of the directors, forthcoming, for that or any other object connected with the progress of their project.

Of His Highness the Guicowar's concurrence and cordial co-operation in the general project there can be no doubt, after the anxiety he has already evinced for the execution of the small portion of it between Baroda and Tankaria; but as that portion will ultimately form but a branch from the general line, it would be an inversion of the natural course of proceeding to suspend the consideration of the great question until after the settlement of the minor one. In fact, the minor one, or Tankaria branch, cannot be settled until the general line from which it is to diverge has first been fixed.

It may be worthy of notice, that considering the general interlacement of British territory with that of native princes throughout India, scarcely any continuous line of railway could with certainty be constructed in that great country, if the subject were left to the chance of each prince undertaking his own work, all of them being deficient in the knowledge, and nearly all deficient in the inclination and power requisite for the conduct of such operations.

Under this view the directors of this company trust that the Court of Directors will not feel it requisite to delay giving their sanction to the company beyond the period requisite to obtain the views of the Indian Government on the subject, without waiting to open negotiations with the native princes, which must be a very tedious and inconclusive process in the present state of the subject, where the details essential to such negotiations are deficient.

The directors of this company fear that there may be some misapprehension as to the intentions of His Highness the Guicowar, as they are not aware of his ever having offered to undertake the construction of the section through his territory; the only engagement which, as far as they know, he has made, was that of giving the land required, free of charge, and taking a large number of shares in the Company's Stock without guarantee (see correspondence); but under any circumstances it is essential to keep in view that the question, hitherto discussed with His Highness, has been confined to the small branch between Baroda and Tankaria, and has had no reference to the main line between Agra and Bombay.

It is probable that the Government of India would decide upon this company commencing their operations at Surat or Barouch on the general line, rather than on the Tankaria branch; and as the territory in the neighbourhood of both those cities belongs to the British Government, there would be no necessity for delaying the commencement of the work for negotiation with the Guicowar or any other native prince.

I have, &c.

(Signed)

KEANE,
 Acting Chairman.

141, Fenchurch Street,
 25th January 1853.

East India House,
 9th February, 1853.

MY LORD,

Enclosure.

I HAVE laid before the Court of Directors of the East India Company the letter of the 25th ultimo, signed by your Lordship, on behalf of the Baroda and Central India Railway Company, in which you express a hope that any negotiations which may have been opened with the Guicowar upon the subject of constructing a railway through His Highness's territory, will not be allowed

to delay the consideration of the project which has been brought forward by the directors of the company, beyond the period when the Court are in possession of the views of the directors.

Indian Railways
E. I. Company to
Governor General.
Signature

In reply, I am commanded to inform you that it was necessary for the Court to postpone, beyond the period which you have specified, their consideration of the propositions of the Baroda and Central Indian Railway Company.

In accordance with the intimation conveyed to you in my letter of the 31st December last, a copy of your former communication has been forwarded to the Government of India, and I am directed to inform you that the Court will address your Lordship upon the subject thereof, when they are in receipt of the answer of that Government to their despatch.

I have, &c.

(Signed) JAMES C. MELVILL,

Secretary.

The Right Hon. the Lord Keane,
&c. &c. &c.

No. 5.

DIRECTORS of EAST INDIA COMPANY to the GOVERNOR GENERAL.

E. I. Company to
Governor General

Financial (Railway) Department,
16th February (No. 3) 1853.

Our Governor General of India in Council,

1. Adverting to the difficulties and dangers which attend the navigation of the river between Calcutta and its mouths, it appears to us that these evils would, in a great measure, if not altogether, be avoided, by connecting Diamond Harbour with Calcutta by means of Railway communication, and that such a work would, in other respects, be productive of much public benefit, and would materially promote the shipping and mercantile interests connected with your presidency.

2. It also appears to us that the establishment of docks at Diamond Harbour, in connection with the railway, would be highly advantageous for the public interests.

3. Before, however, coming to any decision upon the subject, we are desirous of being furnished with your views, both as regards the expediency of at once commencing the undertaking, and the measures which should be taken for its execution; acquainting us whether in your opinion there are any reasons which would render it advisable that an exception to what has been adopted as the general system for the construction of railroads in India by companies, should be made in this case, and that these works should be constructed by Government.

4. We therefore request your particular and early attention to these propositions, and desire that when communicating to us your views upon them, you will furnish us with an estimate of the cost of these works, and in the event of your deeming it desirable that they should be executed by Government, you will state the resources which you at present possess, and the means which you would require to be placed at your disposal for the purpose.

We are, &c.

(Signed)

J. W. HOGG,
R. ELLICE,
&c. &c.

No. 6.

DIRECTORS of EAST INDIA COMPANY to the GOVERNOR GENERAL.

E. I. Company to
Governor General

Financial (Railway) Department,
2nd March (No. 4) 1853.

Our Governor General of India in Council,

1. We forward No. in the packet, the deed of contract which has been entered into with Madras Railway Company.

Indian Railways.
E. I. Company to
Governor General

2. The terms thereof having been adverted to in our despatch to the Government of Madras (No. 13), dated the 13th August last, require no further comment.

We are, &c.
(Signed) J. W. HOGG,
R. ELLICE,
&c. &c.

No. 7.

E. I. Company to
Governor of
Fort St. George.

DIRECTORS OF EAST-INDIA COMPANY TO GOVERNOR OF FORT ST. GEORGE.

Financial Department, 18th August (No. 13) 1852.

Our Governor in Council at Fort St. George,

Letters from, in Public Department,

No 16, dated 7th June 1851,

„ 28, „ 8th Sept. „

„ 34, „ 11th Oct. „

„ 11, „ 6th April 1852;

Reporting proceedings in connection with the proposed railway at Madras.

1. With reference to your despatches noted in the margin, we have to acquaint you that we have entered into an agreement with the Madras Railway Company for the construction of a line of railway at your presidency.

2. The conditions of the agreement are the same as those under which the East Indian Railway of Bengal has been contracted for, and is now in progress of execution; the only difference being in the amount of the guaranteed interest, which the present state of the money market enabled us to reduce from 5 to 4½ per cent. We forward you a copy of that contract for your information and guidance.

3. You will observe that a very strict supervision and control by the East India Company is provided both in this country and in India; and we take this early opportunity of impressing upon you the importance of establishing an efficient and expeditious mode of exercising the functions thus imposed upon your government. We doubt not that your own officers, and those of the railway company, will cordially co-operate in carrying out, with skill and economy, the important object in which they will be engaged.

4. The results of the surveys, which have been made under the superintendence of Major Pears, are highly satisfactory; and we are gratified to learn the moderate cost at which it is estimated the works can be executed.

5. The amount of capital which is to be provided by the railway company in the first instance is 500,000*l.*, and there appears little doubt but that this sum will be sufficient for carrying the railway to the foot of the Ghauts.

6. The precise route which is to be followed, we leave to the determination of his Lordship the Governor General in Council, in communication with your government.

7. Should it be necessary, you will apply to that government for a legislative enactment to enable you to obtain the land for a railway; and you will then adopt measures for placing it in the possession of the railway company as soon after the arrival of their officers at Madras as may be practicable.

8. The gauge which has been fixed upon for railways in Bengal and Bombay is 5 feet 6 inches. This gauge must be adopted at your presidency. The weight of rail which has been lately determined upon is 56 lbs. to the yard.

9. Much difficulty having been experienced at Bengal and Bombay in providing a ready supply of sleepers, we direct your particular attention to the subject, in view to avoid, if possible, the necessity of consigning them from this country.

10. We shall furnish you from time to time with statements of the sums received and paid by us on account of the capital of the railway company. You will cause strict accounts to be kept of the receipts and disbursements at your presidency, and not allow any expenditure to be incurred without your previous knowledge and sanction.

11. We shall expect to receive from you periodical reports of the progress which is made in the undertaking,

We are, &c.,
(Signed) RUSSELL ELLICE,
&c. &c.

London, 18th August 1852.

The GOVERNOR GENERAL TO DIRECTORS OF EAST INDIA COMPANY.

Home Department (Railway), No. 4 of 1853.

To the Honourable the Court of Directors of the East India Company.

Home Department,
(Railway),
4th May 1853.

* Financial, No. 51 of 1852, dated 22nd September, with a Memorandum by Major Kennedy on the lines of railway proposed at Bombay, and on the subject of railways for India generally.

Financial (Railway), No. 1 of 1853, dated 19th January, with memorial from the Directors of a proposed company for the construction of a railway from Bombay to Agra, via Baroda.

Financial, No. 67 of 1852, dated 21st December, relative to the extension of the railway from Calcutta to the north-west frontier, the proper portions to be constructed, and the most eligible mode of carrying them on.

Financial (Railway), No. 4 of 1853, dated 2nd March, referring to Court's despatch to Madras, No. 13 of 1852, dated 18th August, regarding the lines of railway for that presidency.

Financial (Railway), No. 3 of 1853, dated 16th February, suggesting the construction of a railway to connect Diamond Harbour with Calcutta, and the establishment of docks at Diamond Harbour in connection with the railway.

HONOURABLE SIRS,

WE have the honour to acknowledge the receipt of your Honourable Court's several despatches, as per margin,* and to transmit herewith our proceedings on the very important questions which your Honourable Court have referred for our opinion.

2. The consideration of these questions involved the necessity of previous reference to the several presidencies, and the Governor General having conferred personally with Major Baker, the consulting engineer to Government at this presidency, and Major Pears, the consulting engineer to the Madras Government, who was summoned to Calcutta for the purpose; and having also, through the Government of Bombay, communicated with Captain Crawford, the consulting engineer at Bombay, who could not, owing to distance, be called to Calcutta—has embodied his views, and the conclusions to which he has arrived, in the accompanying minute, dated the 30th April, which we have now the honour to transmit, and with which the other members of Government have expressed their full concurrence.

3. The several questions treated in the Governor General's minute are as follows:—

1st. The question of a general system of railways for India, on which Major Kennedy has dwelt, in the memorandum transmitted by your Honourable Court.

2nd. The lines required in the presidency of Bengal.

3rd. The lines proposed and required in the presidency of Bombay.

4th. The lines projected or desirable for the presidency of Madras.

5th. The agency by which the lines shall severally be constructed.

6th. The general principles which ought to be observed in the construction of them; and

7th. The particular companies which seek permission to undertake them.

4. The recommendations which we beg to offer to your Honourable Court are as follows:—

1st. That a general system of railways, connecting the several presidencies, and constituting the great trunk lines within them, should be sanctioned, and executed without further delay.

2nd. That the trunk line in the presidency of Bengal should be carried up the valley of the Ganges to Allahabad, and thence up the Doab to Agra and Delhi, with a view to its being extended through the Punjab westward, as soon as its construction may be found practicable, and that the line to Diamond Harbour should be rejected.

3rd. That a junction line should be formed between the above-mentioned trunk line and the presidency of Bombay, either by the valley of the Nerbudda, or by the way of Baroda and Neemuch; but preferably by the latter in the first instance, if further examination should recommend it.

4th. That in Bombay, the Malsej Ghaut line should be abandoned. That the Thull Ghaut line should not be sanctioned as a great trunk line of communication between Bombay and other parts of India.

That a line to Candeish and a line to Poona should both be undertaken. That if only one can be chosen, the line to Candeish should be preferred.

That it should not be resolved to carry such line to Candeish up the

Indian Railways.

Governor General
to E. I. Company

Ghâts, unless a survey of a line by the Taptee river should show the Ghât line to be less objectionable than the river line.

That if the Ghât line should prove the better, it should not be sanctioned as now proposed by the Thull Ghât, unless further survey shall establish that no better access to the table land can be found on the Syhadree range, and that the present objectionable features in the Thull Ghaut line cannot be avoided. Lastly. That the same rule should be applied to the line by the Bhore Ghât.

5th. That a line should be formed in the Presidency of Madras by Meuil, (to which point it has already been sanctioned,) Vellore, Vameinbady and Coimbatore, and thence to the western coast with a branch to Bangalore, and a branch also to the foot of the hills towards Otacamund.

That another line should be constructed in the Presidency of Madras from that city by Cuddapah to Bellary, and that surveys, &c. should be made, with a view to its extension across the table land to Poona in the presidency of Bombay in order thereby to form a junction with the western coast.

6th. That the construction of these lines should be committed to incorporated railway companies, under the control of the Government in the manner which has been agreed upon in the case of the East Indian Railway Company.

7th. That if it be necessary to guarantee a certain interest on the capital of a company, means should be taken to ascertain approximately the probable amount required for the construction of the line; and the amount of requisite capital on which interest is to be guaranteed should be strictly defined; and that the completion of the line should be required within a certain fixed period, under the penalty of a diminution of a certain proportion of the guaranteed interest for every half year in which the line shall remain incomplete after the expiry of the period fixed.

8th. That all lines for the present should be formed with a single track, with bridges, embankment, &c. for the same; land being in all cases taken, and the foundations of extensive work laid, to suit a double track.

9th. That the officers of the Honourable Company should be required to exact the utmost economy consistent with perfect security and efficiency in the original construction of the line, and in all buildings and works of every description connected with it.

10th. That no portion of a line should be opened for traffic until the capital account for that portion of the line shall have been closed, in such manner as shall be to the satisfaction of the Government of India.

11th. That the line when opened for the conveyance of passengers and goods, shall in like manner be managed with the closest attention to economy in the working expenses, rather than with a regard to the high rate of speed and frequency of despatch, which are the practice on English lines.

12th. That the construction of lines to be managed upon the foregoing principle should be conceded to the East Indian Railway Company from Calcutta, to Allahabad; one uniform rate of interest being guaranteed upon the capital required for the whole line, if a guarantee be indispensable.

13th. That the construction of the line from Allahabad to Delhi should be granted to the East Indian Railway Company, or to the Upper India Company, but preferable to the former if it will undertake the works on terms as favourable or nearly as favourable as those offered by the latter company.

5. We submit these several recommendations to your Honourable Court with the expression, in the words of the Governor General, of our earnest hope that your Honourable Court "will resolve at once to engage in the introduction of a system of Railways into this Indian Empire, upon a scale commensurate with the magnitude of the interests that are involved, and with the vast and various benefits, political, commercial, and social, which that great measure of public improvement would unquestionably produce."

We have, &c.,

(Signed)

DALHOUSIE.

F. CURRIE.

J. LEWIS.

Fort William, 4th May, 1853.

REPORT by the CONSULTING ENGINEER to GOVERNMENT RAILWAY DEPARTMENT, on the Result of his Examination of certain Lines for the EXTENSION of RAILWAYS in the BENGAL PRESIDENCY during the cold Season of 1852-53.

Indian Railway
 Governor General
 to E I Company
 Enclosure

INDEX TO REPORT.

	Paragraph.
Plan of tour and reconnoissance	- 1 to 3
Description of the more direct line proposed by Professor Oldham	- 4 „ 13
Application of the argument to other more or less direct lines	- 14 „ 15
Description of the Ganges Valley line from Soorujghuna to the Soan crossing	- 16 „ 25
Description of the Ganges Valley line from the Sone crossing to Allahabad	- 26 „ 42
Further extension to Delhi and Ferozepore	- 43 „ 44
Anticipations of returns from goods and passenger traffic respectively	- 45 „ 48
Advantages of carrying on the entire work simultaneously	- 49 „ 50
Argument for immediate commencement in the Doab	- 51
Suggested plan for operations	- 52 „ 53
Description of subordinate agency to be employed	- 54 „ 56

In prosecution of the plan proposed in my memorandum dated 25th October, 1852, and approved by the Government, I proceeded to the examination of a direct line through the hills from Ranigunge to Patna, which had been proposed in a report addressed to Government by Professor Oldham. After following this line to the foot of the Bhattia Ghât and satisfying myself that it was not likely to answer, I proceeded due north to the nearest point on the Ganges, (Soorij Ghurra,) and thence in a westerly direction, examining the country on the right bank of that river to the termination of the hills between Muzapore and Allahabad. From this point I was returning, with the intention of completing my survey of the Ganges Valley line from Soorujghurra viâ Monghyr and Banghulpoor to Colgong, when I received instructions to proceed with all expedition to Calcutta.

2. Throughout the greater part of this tour I was accompanied by the chief engineer of the East Indian Railway, Mr. Turnbull, by whom instructions (the result of our joint examination of the country) were forwarded from time to time to the engineers employed on the trial sections between Rajmahal and Allahabad. I considered it important that Mr. Turnbull and I should reconnoitre the ground together, even at some sacrifice of mutual convenience. We were thus enabled to consider suggestions and reconcile conflicting opinions on the spot, and within reach of the facts, which alone could guide to a right decision, and I believe that we are in fact agreed upon all important points connected with the portion of the line which we examined together.

3. The surveys from Rajmahal to Allahabad have been completed, and the engineers are engaged in preparing maps and sections, and forming estimates, which will be forwarded with Mr. Turnbull's report, and will be accompanied by such further remarks from myself as they may appear to require.

4. In the mean time I beg to report the result of my personal observations, and first on the line recommended by Professor Oldham, who proposes to adopt the Ranigunge Colliery branch as part of a trunk line to the north-western provinces, and to extend it direct to Patna. The undulating character of the ground traversed by this branch, continues more or less through the hilly tract to the plains of Behar, and for twelve miles west of Ranigunge would involve ascending and descending gradients of about 1 in 300. From this point, the Chukundahar, about sixty miles, the country rises gradually, and would admit of a regularly ascending gradient varying from 1 in 250 to 1 in 600. In this length the line would cross eleven nullahs and streams, none of which are of much importance, and seven or eight hollows terraced for rice cultivation. These would provide for nearly all the drainage; as with these exceptions the line might be led, with very little deviation from a straight course, along well-drained ridges of which the drainage falls right and left into the Adjai and

Indian Railways.

 Governor General
 to E I Company.

 Enclosure

Burakur. Thus far a railway might be constructed with facility and economy, and would be liable to objection only on the score of gradients. From Chukurdahar, however, which is 1,150 feet above the sea, and the highest point on the line, the difficulties would commence: First, there is a descent of 330 feet into the valley of the Puttunjore over seven miles of very rough country, intersected by ravines and covered by a jungle, followed by a rise of 280 feet, and another fall of 200 to the valley of the Adjai, from which there is a rise of 130 feet to the Chuckai ridge.

5. The greater undulation above described might possibly be avoided by a line keeping closer to the Adjai. I believe that the valley of that river from near Elam Bazar would admit of the best line for a railway in this direction, should such ever be required; but the really obligatory point on the line, is the lowest part of the Chuckai ridge, 1,030 feet above the sea, and 600 feet above the plain at the foot of the Bhattia Ghât.

6. Supposing therefore, as I believe we may, that Chuckai might be reached on an interruptedly ascending gradient, nowhere exceeding 1 in 250, it would still remain to get over a descent of about 600 feet through a rugged belt of rocks seven or eight miles broad. The line by which the trial section was taken through the Ghât was generally that of the cart road, and appears to be the easiest passage that could be made without very expensive works, but even this would involve a gradient of 1 in 75 for six miles, with cuttings and fillings of fifty to sixty feet.

7. Of the three passages, (the Bhattia, the Kuchiva, and the Burneer,) examined by Mr. Turnbull and myself, the one which would admit of the best line, without reference to cost, would be that of the Burrwur or torrent which rises south-west from Chuckai, and breaks through the hills in a broad winding channel. The fall is very rapid, especially at two points where the river forces its way through and over barriers of granite rock. A tolerably straight line might be obtained by tunnelling under some of the projecting rocks, and by crossing and recrossing the torrent five or six times. On oblique viaducts, by these means the gradient might be slightly improved, but only in proportion to the increase of distance.

8. The prospect of success on either of these lines did not appear to Mr. Turnbull or myself sufficient to warrant the detention of the engineers to take the section of more than one of them, and for the same reason it was not considered necessary to level the line indicated by Professor Oldham from the Bhattia Ghât through Behar to Patna.

9. It appears to me that the arguments adduced by Major Kennedy, and on which Government adopted the Ganges Valley line in preference to the direct one originally proposed by the East Indian Railway Company, are equally condemnatory of Mr. Oldham's route, which possesses all the advantages and disadvantages of the more direct line, but in a less degree.

10. For my own part I should consider that neither the diminution of the direct distance between Calcutta and the north-western provinces, nor the superior facilities and economy of construction claimed for this line by Mr. Oldham, would justify the adoption for the trunk line of railway of such gradients as are now shown to be inevitable on the Ranigunge and Patna direct route, but I believe that even those advantages have been greatly over-rated by the supporters of the project. They may be resolved into two; 1st, saving of time and money in construction; 2d, saving of distance between the north-western provinces and Calcutta.

11. The small number of river crossings between the Ranigunge and Chukka would be counterbalanced, partly at least, by the heavy embankments and rock cuttings: there would be a difficulty in organizing and maintaining working parties, which the country itself could neither supply nor feed. The long land carriage of permanent-way materials would be very expensive, and that of heavy iron work or long baulks of timber would be out of the question; whereas, on the river line, water carriage would be everywhere available within two or three miles of the works.

The descent through the Bhattia or Burneer Ghaut, involving long tunnels through rock and lofty viaducts over valleys (the only possible material being stone, which must be quarried and shaped on the spot), would require an immense amount of labour and skilled supervision, and even with these at command to an indefinite extent, would inevitably occupy many years, while

the maintenance of large working parties in a country producing scarcely grain enough to support its scanty population, exceedingly unhealthy during several months in the year, and swarming with wild beasts—would of itself be no easy task. I will not attempt to estimate the cost of heavy works under the circumstances I have described, but it is evident that it would materially raise the average mileage rate of the whole line.

Indian Railways
 Governor General
 to E. I. Company.
 Enclosure

12. The admitted excess in length by seventy miles of the Ganges line, has the countervailing advantage of tapping the fertile districts north of the Ganges, and bringing into communication with each other and with the presidency a greater number of populous towns and civil stations. For military objects, the directest route is, *cæteris paribus*, the best, but the amount of advantage is directly measured by the time lost in the deviation. A detour of seventy miles to troops marching twelve miles a day, might not be justifiable, but where the distance can be got over in four hours, the objection nearly disappears.

13. Mr. Oldham describes the country traversed by his proposed line as one of rich produce and of great undeveloped mineral resources, for which the railway would provide an outlet; but to me the agricultural produce at least, appeared limited to the supply of a scanty population. I doubt not that the improvement of this as of any other tract of country would be stimulated by the introduction of a railway, but there are many provinces where this great engine of civilization would be better appreciated, while there are other and less costly means of improvement which would more immediately act on the prosperity of this. The construction of wells where water is sufficiently near the surface for purposes of irrigation, the formation of tanks, and the maintenance of a good cart road (for both of which there are great natural facilities) might soon bring the country into a condition to invite railway enterprise.

14. I would hope that the results brought out by the examination of this route will obviate further discussion of direct lines through the hills to the north-west provinces. The general features of this section resemble those of the lines first proposed for the East Indian Railway, and are such as would characterize any other line with a similar object, viz., a gradual rise to the north-west, terminating in an abrupt descent into the Ganges valley. The crest, though undulating, has been described to me by Captain Sherwill as continuous, and appears to be nowhere lower than at Chuckai, though it is probable that a descent more gradual than that of the Bhattia Ghaut may be met with elsewhere.

15. A minor deviation from the proposed line by Rajmahal has been suggested by Mr. Turnbull and has lately been examined. It would go nearly direct from Sooree (Beerbhoom) to Baughulpore, and would admit, I believe, of a ruling gradient of 1 in 300. My opinion is decidedly averse to the adoption of this line, which on a small scale has the same recommendations and objections which apply to the other more or less direct lines. And it may be said, that the smaller the scale, the less excuse is there for introducing an exceptional gradient into the otherwise admirable profile of the line, which I trust will soon stretch from Calcutta to Lahore. The saving in distance would be about thirty miles, costing the sacrifice of Rajmahal and of proximity to the river of sixty-five miles, within which the produce of Purnea, Rajeshye, and Dinajpoor, would get access to the railway. The greater part of the mere valley line would lay through an unproductive and incapable country, and though the districts traversed by the other may not at present be better cultivated, they are at least susceptible of improvement.

16. I now proceed to describe the line most suitable for a railway from Soorujghurra westward, passing over for the present the length between Soorujghurra and Colgong, my personal inspection of which was prevented by the circumstances already adverted to. I would in the first instance call attention to the very remarkable disposition of the drainage which enters the Ganges from the south, between Soorujghurra and Dinapoor, a disposition which resembles in character that described in a former report as obtaining in the Beerboom district. A mountainous tract of land extending from Chuckai to Jupla (opposite Rotasghur on the Sone,) through a length of 160 miles and breadth varying from 60 to 100 miles, pours down its drainage in six principal streams (the Kecul, Sukree Punchunee, Fulgoo, Mooihur, and Poon Poon) and innumerable minor watercourses. These all follow a general southerly direction till they meet the raised margin of the Ganges, when they unite into

Indian Railways.
 Governor General
 to E. I. Company
 Enclosure.

a vast inundation which has only two outlets into the Ganges, at Soorujhurra through the Halahur, and at Patna through the Poon Poon.

17. It is evident that the railway must pass on one side or other of this inundation; if to the southward, it must cross the drainage in detail either close to the hills where the ground is rough and undulating, and unfavourable to the maintenance of uniform gradients—or on the alluvial plain, where the rivers are capricious in their course and their channels wide and sandy. In either case there would be no communication with the large towns studding the river bank, nor with the productive districts on its northern border. If, on the other hand, it be possible to pass between the inundation and the Ganges, there need be but three considerable works in a distance of sixty miles, and the freest access will be obtained to the principal marts on the river.

18. I believe that this course is both possible and expedient, and that its advantages would far outweigh the objections which may be raised against it, on account, first, of the difficulty and expense of dealing with such accumulated masses of water; and secondly, of the risk to which the railway would be exposed from the encroachments of the river, in close proximity to it for many miles.

19. I would not understate the difficulty of the works, which, especially near Soorujhurra, would indeed be of great magnitude, in proportion to the accumulated drainage which they have to pass, and to the varying height of water, which ranges to 30 (between the rainy and dry seasons). It may further be assumed that the soil at the site of these works will be found to consist of river silt to a great depth. But it must be considered, on the other hand, that the aggregate quantity of work on the three large bridges will be greatly less than would be required for numerous smaller but still extensive works; and its concentration on a few spots would admit of the economical use of all the best modern appliances and the closest supervision of selected engineers. The proximity of the river would be the best security against a strong current or scour through the railway bridge, for the freshes invariably occur during the same season as the land inundations, which, in fact, they frequently dam back. It would also afford cheap water carriage for the heavy iron-work (which appears to me to be the material best suited to the purpose) and will thus obviate what would otherwise be the most serious difficulty—the provision of the requisite quantity of bricks in a locality where fuel of any kind is scarce and dear.

20. I believe that it would be quite possible to found a stable bridge of brickwork on the river silt at a proper depth. We have an example in the old native bridge at Futwa, which carries the united waters of the Moorhur and Poon Poon through seven arches, having an aggregate water way of 132 feet; but for the reasons above stated, and in order to obstruct the channel as little as possible, I would prefer an iron structure for this purpose.

21. At first sight it appeared advisable to cross the Hulahur at Soorujhurra, below the junction of the Keeul Nuddee, and with this view Mr. Turnbull and myself carefully examined the locality. The high bank on which stands the village of Soorujhurra, would be a good starting point; but the opposite or left bank of the Hulahur, and indeed the strip of land lying between that river and the Ganges as far as Burgobzur, is deeply inundated, and consisting only of recent alluvium, is by no means safe from the encroachment of the great river. There is, in fact, no good crossing of the Hulahur below its junction with the Keal, and it will, therefore, be necessary to pass these streams separately, returning to the proximity of the Ganges, near Barbeea, and following closely its right bank as far as the crossing of the Poon Poon at Futwa.

22. This line, for about fifty miles, would follow the northern edge of the land inundation, forming a border and barrier to the dry strip of ground above described, which is studded thickly with villages and mango groves—strongly contrasting with the treeless and houseless plain stretching southward as far as the eye can reach; an inland sea in the rainy months, but green with wheat cultivation in the winter.

23. It may be objected, as suggested in paragraph 18, that a line following the river so closely, would not be safe from being undermined and carried away by its encroachments; and this objection, if well founded, would doubtless be fatal to the project. Accordingly my most anxious attention was directed to this point, and I was enabled to satisfy myself by personal inquiry, by the appearance of the bank, and by comparison of the ground with the

Revenue Survey maps constructed in 1841-42, that the river is not generally encroaching on its right bank, and that that bank is protected by a stratum of strong red clay mixed with kumkur (a little above the cold weather level of the river), which not only has checked encroachments,* but would afford a firm basis for protective works, which, at any particular point, might possibly hereafter appear necessary. The railway would nowhere be nearer to the river than half a mile, which, under the circumstances I have described, appears to me a sufficient margin for security.

24. The crossing of the Poon Poon near Futwa, would require a work similar to that over the Hulahur, and nearly as large. The native bridge already adverted to, does not furnish a safe gauge of the water-way required. The great depth of the channel below the bridge seems to shew a scour caused by insufficient vent, while for two or three miles westward of Futwa, on the Patna road, there are unmistakeable marks of inundation crossing the country, and falling directly into the Ganges. These would require a separate provision of land arches.

25. The city of Patna occupies a narrow strip of high land extending along the river bank, and bounded on the south by swamps and inundations. In approaching and passing this important emporium, the line must necessarily occupy much valuable land now covered with houses, gardens, and religious buildings.

The course proposed for the railway will take advantage of one of the ramparts of the old fort, running east and west about 3,000 yards in length, by which it will be brought into contact with the heart of the city, in the position which will least interfere with the principal thoroughfares. This rampart is the property of Government, but it is let on long leases, and is covered with huts and inferior houses. One or both of the other ramparts, which run north and south, might afford communication with the river bank by means of tramways; and at the junction of these with the railway, there would be sidings and wharf walls for the reception of goods. The principal passenger station and offices would be at Bankipoor (the civil station of Patna), from whence the line would proceed, viâ Phoolvaree, to the point fixed for the Sone crossing; or else, by a more circuitous course, viâ Dinapoor, should it be considered advisable to touch that cantonment. Both lines have been surveyed, and on both the intermediate ground is low, and liable to inundation from the Poon Poon and the Sone, to within a quarter of a mile of the latter river.

26. In compliance with the wishes of the Honourable Court of Directors expressed in their despatch, No. 45, of 1851, dated 20th August, 1851, notifying their approval of the Ganges Valley route as recommended by Major Kennedy, I proceed to describe more minutely the portion of the line between the Sone crossing and Mirzapoor.

27. The site, which, I believe, was preferred by Major Kennedy for the passage of the Sone, near the village of Parewa, is that which to me also, on the whole, appears the most eligible. The river here flows in a well-defined channel 4,000 feet in width. The banks on each side are above the highest flood level, and consist of firm clay, calculated to afford a good foundation for works intended to resist the further encroachments of the river. I have not yet received a report on the borings made to ascertain the nature of the soil in the river bed; and on this will depend the description and cost of a structure suitable to the locality, and the expediency of constructing a bridge at once, or deferring it, as proposed by Major Kennedy, until the success of the line has been established. The former alternative would be obviously preferable, should it appear that the interest of the money to be spent on the bridge would not exceed the annual cost of the provisional arrangements which must be made for the transit of goods and passengers.

28. It may be disputed whether a river like the Sone, which is in many places three miles broad, can safely be crossed at a point where its width is about one-fourth of that distance. I believe that it may, and that the narrow and deep channel, even with a less sectional area, may be dealt with more advantageously than the broad and shallow one. The Sone in its upper course has a strong

Indian Railways.
 Governor General
 Company
 Enclosure

* There is a slight exception at the town of Bar, where there is an appearance of one or two walls having fallen in at this place; however the inhabitants have a custom of excavating and carrying away the red clay for the purpose of daubing their houses.

Indian Railways.

 Governor General
 to E. I. Company

 ~ Enclosure.

fall, and is constantly cutting into one or other of its banks. It thus enlarges its apparent channel without proportionately increasing its effective water-way, for much of the intermediate space is choked with sand drifts, and though in extraordinary floods the whole channel may be superficially filled, it will be found that in many places the water is shallow, and in another it is nearly still. Again, in the upper part of the Sone where the bed is wide, the river is subject to sudden freshes which reach their height in a few hours, and after a short continuance rapidly decrease; but on its lower course the freshes rise more gradually and continue longer. In the latter case the average discharge may be greater, and yet the channel may never be called upon to pass so much water at one time. Still, however, it must be admitted as an objection of some weight, that the channel does not here carry the whole efflux of the Sone, part of which occasionally escapes over the left bank many miles higher up, and overflows the country.

29. The high ground on the left bank of the river opposite Purewa continues for about four miles, and is exempt from inundation as far as Kaimnugger, from whence for about sixteen miles we find the drainage of the country indefinitely augmented by the overflow of the Sone.

30. The Nugree Nuddee which passes under Raimnugger has frequently been bridged by the Ferry Fund Committee, whose labours have been as frequently overthrown by the floods. Its valley shows evident traces of the violent action of floods, and will require a great extent of arching.

31. The town of Arra is situated on a spot of high ground intersected by a nullah, which is at present spanned by a bridge of ten arches, seven of them having been added since the first construction of the bridge. The local drainage is inconsiderable, but during some floods the water is said to fill the channel and to rise occasionally to the level of the roadway. The line of railway will pass south of Arra, and sufficiently near the town to pick up the passenger traffic, which I expect will be considerable.

32. Westward of Arra, within a distance of twelve miles, the line will cross ten watercourses of greater or less width and all said to be within the influence of the Sone floods; over all of these bridges have been constructed by the Ferry Fund Committee, in many instances more than once, the broken structures being replaced by others of greater width. The aggregate water-way at present provided is 450 feet, but I suppose that double or three times that width would not be more than sufficient to provide against possible floods.

33. The soil in all the inundated lands consists chiefly of the black earth known by the local name of "kurrial," which is said to be utterly unfit for the construction of embankments. I therefore examined with much interest, both in dry and wet weather, the raised road between Arra and Buxar, which is in places formed of this soil. I found it indeed very soft after rain, and the road being unmetalled was at that time very heavy for wheeled carriages, but I see no reason to fear that with the aid of a good coat of ballast it would not be sufficiently firm for railway purposes.

34. From the Gunga Nuddee, which is the least connected with the Sone, to Buxar, a distance of thirty-three miles, the line would cross the Bhynswalee, the Kova, the Bhynsa, and three other smaller channels, whose existing bridges appear to provide sufficiently for the water-way by an aggregate width of 287 feet.

35. Passing close behind the town and fort of Buxar the railway will cross the Thora Nuddee, about 200 feet wide, and at a distance of seven miles from the fort will encounter the Kurrumnassa, a considerable river flowing between high banks, with a width of 600 feet, and a difference of thirty-five feet between the flood level and that of the dry weather.

36. From the Kurumnassa to the crossing of the great trunk road, opposite Benares a distance of five miles, the country is most favourable for the construction of a railway. The only appearance of flooding is caused by the local drainage, which runs off slowly, owing to the excessive flatness of the country. An embankment raised two or three feet above the natural surface, with a few culverts at long intervals, will constitute all the work required. Kunkur for ballast is found in abundance throughout the whole line.

37. It appears to me not advisable that the railway should pass nearer to the town of Benares than Mogulserai, which is about seven miles from Raj Ghaut. By following the river more closely it would encounter nullas, ravines, and broken

ground, besides a considerable increase of length. The traffic from the station to Raj Ghaut would pass along the trunk road, unless it were found expedient to make a tramway.

38. Between Mogulserai and Chunar, a distance of nineteen miles, the country becomes undulating, especially near the river bank, and is occasionally intersected by ravines. The railway would partly avoid these by keeping well south of the river, but must cross several minor watercourses besides the Jhungoo, a considerable stream which passes under Chunar.

39. The sandstone hills which skirt the Ganges at Chunar are broken up in the vicinity of that place into detached hills, between which the railway will pass without any serious cuttings or awkward detour; but the country on which it will enter after passing Chunar is exceedingly rough, being in fact a network of nullas, gullies, and ravines. Between Chunar and Mirzapoor, in a distance of twenty-one miles, there are fourteen channels of more or less importance which will demand masonry bridges, besides a great extent of broken ground requiring numerous culverts. The material, however, for these works and for ballast may be quarried on the spot, and rock foundations will be everywhere attainable.

40. At Mirzapoor, as at Patna, the railway could not be brought up to the river bank, unless by a sweeping destruction of houses and religious buildings, attended by a great interruption of thoroughfares in the city. It appears, however, that, for Mirzapore at least, a station on the river bank, is not a matter of importance. Much of the merchandize is brought by land, and I am informed that even the goods conveyed by the river generally change hands at Mirzapore. As regards the land carried goods, and for passenger traffic, a river station would not be convenient, as being difficult of access owing to the narrowness of the river; nor would it be well placed for continuing the line towards the north-west. The most eligible site for a station would probably be near the great jail on the Jubbulpore trunk road.

41. Passing Mirzapore, the railway would cross the Oojla Nulla, about 150 feet wide, and the head of the Bindachul Jheel, and would then skirt the sandstone hills for five miles to the crossing of the Kurnowtee, between which and the Fonse (about twenty-six miles), there are no natural difficulties or impediment of any kind.

42. I was unable to extend my personal examination further than about twenty-two miles west of Mirzapore, and have not yet seen the sections taken by the railway engineer between the Fonse and the Jumna. They will be forwarded hereafter with Mr. Turnbull's report.

43. The profile of the Doab from Allahabad to Agra and Delhi, is known from the levels taken in connexion with the Ganges Canal work to be so favourable for the construction of railways, as to leave the selection of the line to be guided chiefly by political and commercial considerations, whatever route be selected. There would be in 400 miles but one important river crossing, that of the Jumna, at or near Agra, and but few bridges would be required to dispose of the local drainage.

44. From Delhi to Ferozepoor, a further distance of 220 miles, the railway would traverse a country which I can state, from personal knowledge, to be remarkably free from engineering difficulties. The Delhi and Hurianna canals and the river Cuggur are the only streams, and I believe that the only other natural obstacles would be a few belts of drifting sand, which may occasion some little trouble in keeping the line open during the prevalence of the hot winds.

45. While examining the country with reference to the engineering operations of a railway, my attention was also turned to the prospects of its use by the natives to such an extent as to ensure a remunerative return. The goods traffic has chiefly been relied upon by Mr. Stephenson, Major Kennedy and others, and I see no reason to doubt the realization of their hopes. The quantity of merchandize passing up and down the Ganges valley, even now, is enormous; and that the merchants, both native and European, are willing to pay for a safer and more expeditious conveyance than is afforded by the native boats, is abundantly proved by the growing demand for freight on the river steamers, and by the constant use of the great trunk road for the transport of goods between Calcutta and the provinces as far as Delhi.

Indian Railways
Governor General
to E. I. Company

Enclosure

Indian Railways.
 Governor General
 to E. I. Company
 Enclosure

46. My recent observations, however, have encouraged me to hope that the passenger traffic will be an equally, if not more fruitful source of profit. The population of the Ganges valley is remarkably dense, especially along the banks of the river, to which it is attracted by commerce, fertility of soil, and every association connected with the religion and ancient superstitions of the country. This population is very locomotive; wherever roads exist, they are crowded with travellers, and the inhabitants of the principal towns freely avail themselves of facilities for increased rapidity of transport afforded by metalled or other well-constructed roads.

47. The great trunk road affords the best example of the native appreciation of rapid transit; but on their thoroughfares, and especially between Mirzapore and Bernares, I witnessed a constant stream of horse conveyances, most of them hired vehicles, but not worked by relays of horses. On the trunk road, and I am informed on the other roads in the north-western provinces, the use of staging carriages drawn by relays of horses or bullocks is spreading very rapidly among the natives. Where horses are employed, and a rate of five to seven miles an hour attained, the charge is one anna per mile for each individual; while in the bullock carts, whose pace may be assumed at from two to three miles an hour, the fare is half an anna per mile for each person.

48. In the course of my tour I noticed that the better class of natives whom I met with evinced considerable interest in the object of the inquiries on which I was understood to be engaged. I have taken every opportunity of conversing with all classes on the subject, explaining to them the nature of railway, and of the accommodation it would afford to travellers, and the probable fares. In some instances I have suspected incredulity, but I have never heard a doubt expressed that all classes would avail themselves of this means of transit whenever they might have occasion to travel, on legal or commercial business, to visit their families, or for religious objects.

49. Supposing it to be the purpose of Government ultimately to connect Calcutta by railway with the north-western provinces and the Punjab, I would take this opportunity of respectfully urging the expediency of entering at once and simultaneously on the prosecution of the entire undertaking. It need scarcely be observed that the present plan of constructing the railway by successive sections, while it would indefinitely postpone the establishment of an efficient railway system, would also curtail the pecuniary returns for which each section is dependent on the distant as well as the local traffic; or, in other words, that a complete railway or system of railways would be more efficient for military, political, and commercial objects, and more remunerative to those who pay for it than any number of its parts; and that the cost and labour expended on such fractional portions, are not bearing their full fruit, but lie comparatively unproductive until the scheme be perfected.

50. Supposing that the requisite funds might be raised, (a point on which I am not in a position to offer an opinion), the possibility of simultaneously carrying on so large an undertaking, would depend on that of obtaining competent supervision in the engineering department. This may be a source of some difficulty, but I should anticipate none in commanding an adequate force of labour of all kinds, within a short range of the districts through which the railway would pass. Consideration would at once be given to the provision of permanent way materials, and thus ample time would be afforded for the best and most economical arrangement for this important item of expenditure.

51. The advantages of carrying a railway through the Doab from Allahabad to Delhi having already been insisted upon by the highest authority in this country need not be repeated here; but I would take the liberty of mentioning some circumstances which appear to me to strengthen the arguments for an immediate commencement of the work. The main lines of the Ganges Canal are approaching completion, and measures will now be taken immediately for the formation of the branch canals (or Rajbuhas) and their dependent systems, of watercourses, by which the water will be distributed over the whole surface of the country. The railway must necessarily cross many of these watercourses, and I believe that economy of arrangement may be greatly promoted, and mutual interference obviated, if the railway and the irrigation system be laid out simultaneously and with reference to each other. I would further anticipate that by the completion of the principal works on the Ganges Canal

much of the trained labour now absorbed by it will be set free, and will be available for the railway, if the latter be commenced at once.

52. I defer the remarks I shall have to offer on the probable cost of the railway in its several parts, until receipt of the sections and calculations of work which will be forwarded by the chief engineer of the East Indian Railway; but it may not be out of place to suggest the plan of operations which to me appear best suited to the circumstances of the case, and to consider the description of subordinate agency to be employed.

53. It will be readily admitted by all who have had experience in public works, on this side of India at least, that in any enterprise for magnitude, the chief difficulty and source of delay is the collection or preparation for the requisite quantity of building material. This fact should, in a great measure, regulate the arrangement for construction of the railway from Burdwan to Allahabad, which may generally be characterized as consisting of several principal works, or clusters of such, connected by long portions of mere embankment. The time required for the construction of the large works will regulate that for the completion of the whole undertaking, and half of this time will be devoted to the collection of materials. I would propose, therefore, that the line be permanently set out throughout its whole length; that the gradients be definitely fixed and the land taken; that the designs for all the principal works be prepared; that where timber or brickwork are to be employed in the construction, timely arrangements be made for the provision of the requisite material; and where iron work is preferred, that either detailed drawings or the necessary dimensions and conditions be transmitted to England, so as to give ample time for its preparation and despatch on the most economical terms. In the meantime bungalows should be built for the reception of the engineering staff, and agreements should be entered into with native contractors for the collection of natural and artificial ballast, and for the formation of all the embankments, leaving the cuttings, where not very heavy, to be executed hereafter. A small annual expense would be incurred in the maintenance of the earthwork, but its thorough consideration would be secured, and a most valuable and timely test would be obtained of the propriety and sufficiency of the provision that may be made for the passage of floods and local drainage.

54. The plan which I have suggested, and the circumstances which I have supposed to recommend it, would not suit contractors of the class with which we are connected on the present works, but it would not be unfavourable to a man of large capital and resources, competent to undertake the construction of 100 to 200 miles of railway; or failing these, it might be worked by petty contractors for the different classes of work under the general management of executive or resident engineers.

55. The partial failure of the contract system with us (for such, I fear, must be confessed as regards both economy and rapidity of construction) is attributed to causes, some of which are accidental and transitory, others permanent. The former are principally the novel nature of the work—the inexperience of the English contractors in the ways of India, and that of the Indian contractors in railway work—the absence of high professional standing, as railway contractors, of those engaged, and the want of capital which cramps their energies and renders them so dependent that no temporary suspension of monthly payments (as a penal measure) can be attempted by the railway company without risk of stopping the works altogether.

The more permanent objections are the contractor's profit, and the greater expenses necessarily involved in the contract system by the double establishment required by the contractor for supervising the work, and by the engineers for checking it. But these sources of expense would be dried up should the railway company determine to execute the works by their own engineers, and supposing that the latter were qualified to do justice to a task confessedly new to them in many respects. It is my own opinion that fit men might be found for the executive duties, but that those of account must be provided for separately and distinctly by the employment of clerks of the works—men who combine a qualification in book-keeping with a certain knowledge of railway work.

56. I would not be understood as pronouncing positively against the further employment of rich contractors, as we now have, but I would certainly wish to be independent of them; and I have seen good reason in the progress of the

Indian Railways

Governor General
to E. I. Company

Enclosure

Indian Railways.
Governor General
to E. I. Company.
Enclosure.

present works to desire that our future operations may be intrusted to a better and more efficient agency.

J. P. Grant, Esquire,
Secretary to the Government of India.

(Signed) W. E. BAKER,
Consulting Engineer to
Government of India.
Calcutta, 15th March 1853.

REMARKS by the CONSULTING ENGINEER to Government.

My report, dated the 19th instant, will stand in the place of lengthened comment on the accompanying papers.

I would merely point out that the series of unfavourable gradients at Rajmahal may be greatly improved, and near Colgong may be avoided by a very slight detour towards the river bank. The inundated and broken ground, as shown in this section near Benares, may be avoided (as mentioned in the 37th paragraph of my report) by a straight course leaving Raj Ghaut a few miles to the right.

The estimates are, in my opinion, considerably too high. Mr. Stephenson indeed remarks that the works have been advisedly estimated at excessive rates. The nearest possible approximation to the truth would, I think, have been more useful, with reference especially to the purpose of inviting tenders in England.

I am sorry to find that time would not admit of borings being taken to ascertain the nature of the soil in the bed of the Sone. The large sum, no less than four lacs and a half of rupees, at which Mr. Turnbull has estimated a part only of the provisional arrangements required in substitution for a bridge at this point, gives additional importance to the inquiry as to what would be the least cost of a bridge—the temporary substitute for which would entail so heavy an expenditure.

J. P. Grant, Esquire,
Secretary to Government of India.

(Signed) W. E. BAKER, Major,
Consulting Engineer to the
Government of India.
22nd March 1853.

(No. 1022.)

Enclosure

Report No 6 of G
Turnbull, Esq
March 9th, 1853.

Estimates, Plans, and
Sections, Nos 1 to 7
Map.

Showing alternative
directions of the line
above Allahabad as
laid down in 1843,
1845, and 1847 by the
East Indian Railway
Company.

Works, 8,804,087
Surveying Engineer,
Direction, Manage-
ment, Locomotive, and
Carrying Stock

1,995,810
10,799,897

Works added as above.
10,157,809
1,298,750
11,456,559

Works, 38,095,365,
Surveying and En-
gineering, Direction,
Management, Loco-
motives and Carrying
Stock

7,190,000
45,285,365

FROM R. MACDONALD STEPHENSON, Esquire, Managing Director and Agent of
the EAST INDIAN RAILWAY COMPANY to Major BAKER, Consulting
Engineer to Government of India.

Sir,

Calcutta, 21st March 1853.

I HAVE the honour to forward for the information of the Government of India the results of the surveys carried on during the past cold season.

The report and estimates of Mr. Turnbull, the chief engineer, with the plans and sections specified in the margin, contain the ample details of the operations which, in addition to the trial sections taken on the Direct Patna, and the More and Bhaugulpore lines have extended from Rajmahal (to which point the company had previously brought their series of levels) by the valley of the Ganges to Patna, Mirzapore and Allahabad, the route selected by the authorities to be pursued as the trunk line connecting Calcutta with the north-western provinces.

From the estimates already forwarded, it will be seen that the cost of the 121 miles of the first or Raneegunge section will not exceed Rs.10,799,897 or Rs.89,255 per mile, including all expenses of construction, surveying management, locomotive carrying stock, and maintenance for one year after completion, both of way and works.

The section to Rajmahal is estimated to cost Rs.11,456,559, or Rs.93,906 per mile, for a distance of 121 $\frac{3}{4}$ miles, and the continuation from Rajmahal to Allahabad is estimated at Co.'s Rs.45,285,365, or Rs.103,156 per mile, the distance being 439 miles, the crossing of the rivers Tonse, Kurrunnassa, and all the other large rivers, except the Sone and the Jumna (which it is proposed to cross at first by a ferry) being included.

The first section will be completed by the latter part of the next year ; portions of it being opened, and locomotives with carrying stock provided and placed upon the line within the next few months.

The construction of this section (equal in length to the English Great Western, and exceeding that of the London and Birmingham lines) will have taken four years to construct—a period which, when all the difficulties incidental to an entirely novel description of work in India are considered, will not, it is hoped, be regarded as excessive or unreasonable. Had it been the wish of the Honourable the East India Company, that a much increased length of line should have been made, the period of completion (four years) would not have been exceeded, as proportionately augmented resources would have been provided.

The extent to which during the next few years the construction of the railway lines of communication through India may be proceeded with, will depend entirely upon the views and decision of the Government of India, and of the Court of Directors of the East India Company.

As regards the practicability of widely extended and simultaneous operations, and with a view to a clear understanding of the state of preparation of the East Indian Railway Company, to carry out the intentions of the home and local authorities—I take the opportunity to state that the railway company, being empowered under the Act of Parliament to raise the necessary amount of capital, are prepared within seven years—viz., between the 1st October 1853, and the end of 1860—to complete the entire line of railway communication by the Ganges Valley through Mirzapore to Delhi, and if desired, within the same period to construct a further extension to Lahore, and a branch line through the Soane Valley, to connect Calcutta with the Bombay Presidency.

The statement is made upon data which have been in course of careful collection during the last ten years, and from present examination and knowledge of the country as far as Delhi, confirmed in all respects by the full and able reports of the engineer officers in the East India Company's service.

The accomplishment of a design which in reference to the advantages derived both by the Government and the public, will be admitted to deserve the serious consideration of Government, must depend upon early decision—upon advantage being promptly taken of the favourable state of the money market in England, and upon the exercise of the necessary foresight in providing those means and appliances which involve time as a primary and essential element.

The cost of the line to Allahabad complete, and including locomotive and rolling stock, having been advisedly estimated at excessive rates to provide for the increased cost of iron and freight, will not exceed Rs. 67,541,821 upon 681 $\frac{3}{4}$ miles, or an average of Rs. 96,300 per mile. The probable cost above Allahabad may be estimated at Rs. 60,000 per mile, the items of permanent way materials, in both cases, being liable to fluctuation from the varying price of iron.

The statement made officially to Parliament, that railway communication shall be made throughout India, and the decision by the authorities of the general direction of the route between Calcutta and the north-western provinces, have removed the only preliminary question which might have required longer delay in deciding upon the period at which future extensions in the Presidency of Bengal and the north-western provinces should be made; and two thousand miles can now be constructed by the railway company within the same period that will be occupied in completing 200 miles.

Should the Government of India consider the communications now forwarded to justify the Government in recommending that the construction of the entire lines of communication above referred to should at once be provided for, and that the instrumentality of the East Indian Railway Company under the full and direct control of the Government, offers the most suitable means by which it can be accomplished—I feel assured that extraordinary exertions, proportioned to the importance of the undertaking, will be promptly made by the directors of the railway company to ensure the due fulfilment of the contract, and I venture to express a hope that the mode of administering the affairs of the company, both in England and in India, in connexion with and under the control of the authorities, has been such as to deserve and secure their continued confidence.

I have, &c.,

(Signed) R. MACDONALD STEPHENSON,
Managing Director and Agent,

Indian Railways.
Governor General
to E. I. Company
Enclosure

Indian Railways.

EAST INDIAN RAILWAY.

Governor General
to E I Company(Report No. 6.) From GEORGE TURNBULL, Esq., to the Chairman and Directors
of the EAST INDIAN RAILWAY.

Enclosure

GENTLEMEN,

Serampore, 19th March, 1853.

1. I HAVE now the honour of transmitting to you a plan, longitudinal sections, and estimates of the proposed extension to Allahabad, on the lines which have been the subject of careful investigation during the months of November, December, January, and February last.

2. My report on this subject must necessarily be brief, on account of the necessity which exists of submitting the documents to the Government of India for consideration without delay.

3. In order to meet your wishes and those of the Government with respect to the cost of the works, I have devoted the short interval which has elapsed since the completion of the trial surveys, to the preparation of minute and careful estimates, not only of all the proposed extensions to Allahabad, but also of the 121 miles now in course of construction, in preference to attempting any very detailed description of the country traversed, which description must now be made in general terms.

4. The first part of the extension, namely, that between the junction, a few miles west of Burdwan and Rajmahal, is fully described in my report of the 23d February 1852. Orders having been received to proceed with the surveys on this portion, I detached Mr. Sibley from Chandernagore and put him in charge of the forty-five miles from the junction to the river More. Since the month of November the country has been re-examined, the centre line marked out on the ground, the working longitudinal section taken, and the surveys of properties necessary for obtaining possession of land are drawing towards completion. Some have been already finished and sent in to Government. The designs of the works are also in progress.

5. On the length of about seventy-six miles from the river More to Rajmahal nothing more has been done besides that which is described in my last report, because the number of engineers available was not more than sufficient to take the trial levels up to Allahabad and the alternative routes by Chuckai and by the valley of the river More. It was deemed more advisable to ascertain the facts of the alternative routes suggested, and settle that much debated question, and secure sections and accurate estimates up to Allahabad, than to prosecute the setting out of the line beyond the river More; this work will, however, be resumed as soon as it is possible to take the field after next rainy season.

6. I now proceed to a short account of the line from Rajmahal westwards. You are already in the possession of a plan and longitudinal sections up to Rajmahal. For the sake of distinctness, I shall state all the estimates together in a tabular form at the end of this report.

7. The course proposed is indicated by a strong red line on the map, commencing near Oodwa Nullah; the main line will take what may now be called the Oodwa Nullah or Rajmahal branch, about six miles from the river Ganges. The line here bends to the left, and turns the flank of the first of the Rajmahal hills, rising at the rate of one in 500. The line still bends to the left and then to the north, keeping between the hills and the large swamp called Jâlâ Jheel.

8. The soil here is favourable, and the works will not be attended with difficulty. There is a good deal of quartz rock, but what appears on the surface is of a loose friable nature, and excellent ballast can be obtained to any amount.

9. We next reach the old military station of Sickragully (now deserted), keeping to the south of the rocky promontory, after having passed the remains of the ancient Mahomedan road, near a place where traces of coal have been found.

10. At Sikragully the line bends into nearly a due west course, passing the outlying hill of Gunga Persand on the north, and the old ruined fortress of Taleagurne, at which place the railway must keep close to the foot of the rock on which the ruins stand. This is the last of the rocky hills which must be

passed. It is composed of basaltic boulders, and red soil, and some quartz pebbles.

11. The direction is straight to Colgong, where there should be a station, and landing wharf in river Ganges. East of Colgong the country is very jungly, but clearing is going on rapidly, and cultivation spreading.

12. From Rajmahal to Colgong the distance is about fifty miles.

By reference to the section it will be seen that we have gradients of 1 in 300, 1 in 400, and 1 in 500, &c. I should remark here that these gradients are capable of improvement either by incurring the expense of heavier works or by making bends or curves to the right or left, all which can be decided at the time of making the working sections when the estimates of alternative lines can be compared.

13. From Colgong to Bhaugulpore, about twenty miles, the country is inundated by the annual overflowing of the Ganges. The high land is as usual found close to the margin of the river, and the line should be carried at no great distance from the present dawk road, and as near to the river as it would be prudent to place it, so as to avoid any danger to the works from the encroachments of the floods of the Ganges.

14. A stiff red clay appears at intervals in the bed of the river, which promises well for foundation of our bridges, of which there will be several in this length—one over the Koah nuddy, another over the Geroah nuddy, and another over the Ghoda nuddy, are the largest. A proportion of flood openings will also be necessary.

15. We now reach the large and important station of Bhaugulpore. Two trial lines were taken here, but on more examination we found a third route would possess advantages over either of those shown on the plan and section. Here a large station and a communication with the river should be established.

16. From Bhaugulpore to Monghyr, the distance is thirty-two miles by the line; more than half of this distance is subject to annual inundation. It does not, however, appear that the works will be of a difficult character on the whole, as for a considerable distance an elevated natural bank occurs between the river margin and the railway works.

17. The principal rivers to be crossed are the Chumpun Nuddy, about 300 feet wide, besides a large extent of flooded ground on each side of it, and the Mun nullah, about 350 feet wide. About halfway stands the large thriving village and bazar of Sultangunge, close to the rocky promontory and island Jehangurah, with its temple and ruined mosque. These rocks permanently define the margin of the river Ganges at this place, and no alteration, it is stated, has ever occurred in the course of the river here, where there is always deep water and a good landing-place.

18. We now turn the end of the Kurrukpore hills and reach Monghyr by an easy curve. Future investigation must decide whether it be most advisable to bring the line close to the town or carry a short branch down to the river banks and keep the main line at a few miles' distance. The trial section shows the line as laid down on the map.

19. From Monghyr westwards for above thirty miles, the country is inundated every year. Two trial sections were taken, which are shown on the plan; one keeping near the river Ganges, passing a short distance south of Sooreygurrah; the other route keeps a direction more to the south, near the base of the hilly range, and it is almost beyond the reach of the inundations, and which is of more importance, passes through better soil, saves two bridges, and avoids the black alluvial earth called curco, which is about the worst possible material for making embankments,

This line has been adopted for the estimates; it is about five miles longer than the other, but its advantages more than counterbalance the extra length of permanent way,

20. The Keeal and the Hullohur rivers must both be crossed; both will require large and expensive bridges. That over the Hullohur will be the most formidable—the Hullohur Bridge will be 650 feet long and with an average depth of above 40 feet.

The Keeal-Bridge will be about 500 feet long and considerably less in height than the other; for both these bridges estimates have been made of cast iron cylinders, and light wrought iron superstructures. The applicability of such

Indian Railways

Governor General
to E I Company

Enclosure

Indian Railways.
 Governor General
 to E. I. Company.
 Enclosure.

a construction can better be decided when the beds of the rivers are examined by borings and otherwise.

21. After crossing the Hullohur, the best direction will be northwards by Burheea, and keeping close to the high land on the banks of the river, passing the thriving village of Barr, and on westwards by Tutwa across the Poonpoon Nuddy to the city of Patna.

From the Hullohur to Patna the distance is about sixty-three miles; there are villages all the way, and the country is rich and in high cultivation. For nearly the whole of this distance the works will be out of reach of the inundations.

A bed of good red clay appears at intervals in the bed of the Ganges, which in a great measure prevents its south margin from being washed away by the stream during the time of floods.

22. The Poonpoon Bridge will be a large and expensive work; an estimate of it has been made on the same principle as that for the river Hullohur.

23. Some low land occurs west of Tutwa, partially flooded, which will require to be provided with arching or openings for the passage of the floods.

24. The best line for the railway, through the city of Patna, will be on the old earthen mound or rampart which runs east and west for a mile and a half at a distance of three quarters of a mile from the river. The line here has some very favourable features, as the city can be traversed without the destruction of any valuable property. The old mound alluded to is stated to be the property of Government.

The best site for the Patna passengers station will probably be at the race-course or Mydan, at the west end of the city. A good station may be at any convenient point in the city, opposite to the opium factory, or at such other point as may appear preferable.

25. From Patna to the river Soane two trial sections were taken, one touching Dinapore and proceeding south-west to the small village of Purreo on the Soane; the other route goes by Phoolwarree, keeping considerably to the south of the other line, and is a much better one, inasmuch as it escapes a large extent of low inundated land south and west of Dinapore, which would require large embankments and many flood passages.

The line by Phoolwaree is that one which has been estimated.

26. River Soane.

The river Soane has been examined as far up as the crossing of the Grand Trunk road, and no better place of crossing has been found than that at the village of Parea, at the south end of a small island.

At this place the banks are steep and well defined, and the clay bottom is occasionally visible, and, especially on the east side, appears of a more tenacious character than usual.

The earliest opportunity should be taken to sink wells and borings into the bed of the river, to ascertain the nature and depth of the soil and substratum.

No estimate has been made of a bridge across the Soane; first, for want of data, and secondly, because the construction of a bridge is manifestly a work of so great expense, that it is worth consideration whether it would not be best to have a "break" in the railway, and a ferry and landing piers for transport of goods and passengers, which can be done at a comparatively light cost, leaving the construction of a bridge until the increase of traffic should demand one.

If a "break" occur here, it would be necessary to have a station on each side of the river, with engine sheds and turntables for reversing the engines, and other arrangements peculiar to a terminal station; for these I have made an approximate estimate.

27. Leaving the river Soane, the line proceeds nearly due west in a perfectly straight direction through a fertile and populous country, passing to the south of the large town of Arrah, where there is a civil station for the district of Shahabad. Here many flood openings or arches will be wanted, as the country is in part inundated, principally from the overflowings of the river Soane.

28. We then proceed on a straight line westwards, on the north side of the Buheea and south of Bhojpoor, approaching the Ganges near Buxar. The soil of the whole of this part is the ordinary alluvial clay, well adapted for brick and ballast burning in most places, but little kunkur limestone is met with. The whole country is almost a dead level, and in a high state of cultivation.

29. From the river Soane to Buxar the distance is fifty-one miles, and in that distance bridges will be wanted for the river near Arrah for the Bunnas

nullah, for the Ganges nullah, the Kao nullah, and Bhynsall; none of these will be formidable works their beds are almost dry during half the year.

30. At Buxar is a part of the large establishment for the breeding of cavalry and other horses, kept up by the Government of India; otherwise it is not a place of much importance; it is, however, well situated on the banks of the Ganges, and opposite the old fort there is deep water, and an excellent landing place for steamers, and native craft could be established here with advantage. Part of the stud of horses is on the north, and part on the south side of the Ganges.

31. A station should be built at Buxar. The line now bends to the left, keeping a short distance from the Ganges, crosses the Thora Nuddy, passes the large native village of Chowsa, and on to the crossing of the river Kurrumnassa.

32. The bridge over the Kurrumnassa will be a heavy and expensive work; the channel is about 600 feet wide and about forty-seven feet in depth; the rise and fall of the flood waters is great. The soil seems stiff clay. I have estimated this bridge to be built with cast iron cylinders, and a light iron superstructure, but until careful borings are taken and other investigations made, the propriety of this or any other design is not to be decided.

33. On leaving the Kurrumnassa the line now goes westwards, keeping in the highest ground between the Kurrumnassa and the Ganges; it then approaches a bend of the Ganges, near Lumaneeah, and afterwards proceeds nearly straight to Raj Ghaut, opposite the city of Benares, where a station may conveniently be built.

34. No heavy works will be wanted between the Kurrumnassa and Raj Ghaut; the country is almost a dead level, and the bridges and culverts are under the average.

The distance from Buxar to Benares is sixty miles and a half.

35. Leaving Raj Ghaut, the country is occasionally flooded, but not every year. The line then passes Ramnuggur, a large village of some pretensions, with a rajah, a palace, and a good bazar.

36. About fifteen miles from Benares is the first crossing of the river Jurgoo, and the second is at nineteen miles; both these will require large bridges. We now reach Chunar, where a good station should be built. The sandstone hills in this neighbourhood afford an inexhaustible supply of the finest building stone.

37. For a distance of eleven miles west of Chunar, the surface of the country is in general rough and broken up into small ravines and gullies cut by the rain water. Many bridges will be required, about twenty-four in number, but none are of any magnitude, except that over the Belwan, which has been estimated in a similar manner to the Poonpoo and others already described.

38. At Poonah Hill, a cutting of about two miles in length, through sandstone, will be necessary. The sandstone seems easily worked, and is a good building material.

39. From the above to Mirzapore, nine miles, the country is level, and the works light, with the exception of one bridge 198 feet long, over the Knajiree Nuddy.

40. The best site for the station at Mirzapore formed the subject of discussion with the authorities there, and with some of the principal merchants. The site near the hospital at the crossing of the great Jubbulpore road seems to possess the greatest advantages.

Mirzapore being the chief commercial city of these provinces, a large amount of station buildings will be required, and branch lines to the river. It is probable, also, that this will be found to be the best place for locomotive sheds, workshops, and repairing shops, as here skilled native workmen can be found, and many other facilities exist.

Mirzapore is 576 miles from Howrah, by the line of railway.

41. From Mirzapore to Allahabad, the distance is fifty-two miles.

The average cost of the works will be low, but several expensive parts occur, such as the bridge over the Ojhla, the Kurrowtee bridge, the embankment across a swamp west of the Kurrowtee, and the great bridge over the river Touse.

42. I have not gone into an estimate of a bridge over the Jumna, for the same reason which I have explained with reference to the river Soane.

43. A temporary station should be placed on the east bank of the river, opposite Allahabad, and the traffic carried on as at present by the bridge of boats. This station would be 628 miles from Howrah.

Indian Railways.

Governor General
to E I Company

Enclosure

Indian Railways.

 Governor General
 to E I Company.

Enclosure

44. An alternative line of railway was pointed out by Mr. Oldham, in his geological report on the coal producing districts of the Dawoodah and Bheerbhoom. Of this line I have made a careful examination, and trial sections have been taken connecting it with the sections of the other lines.

I was requested to report on Mr. Oldham's suggestions, and made my comments thereon in a letter to Major Baker, dated the 18th August, 1852, and it may not be necessary to repeat these remarks here.

The trial section accompanies this paper. It will be seen that the gradients are unfavourable, but there is nothing insuperable or even of much difficulty in the line, except at one place a few miles north of Chuckaj, where the line must traverse a broken country, intersected by deep ravines, the sides of which are covered with jungle, and the rocks of the hard gniess formation, intersected by masses of whinstone and quartz.

A road passes through it circuitously, at a place called Betteah Ghaut, a little to the east of the gorge through which the river Burnur discharges itself.

The part so described is eight miles broad, and the descent is so rapid that no better gradient can be obtained than one in fifty-eight, for four miles, and not without deep cuttings through these rocky hills. The only alternative is a tunnel, which in such a place, should not, I think, be entertained.

On account of the above objections, I have not considered it necessary to make any estimate of this line.

45. I have also made an examination of another alternative line, diverging near Sooree and following the valley of the river More, proceeding by Nori Haut nearly straight to Bhaugulpore.

This one suggested itself, to me, when examining the country near Sooree.

A trial section is annexed, and an estimate of the works.

46. The country traversed by it for the greater part of the way, is of a jungly and wild description, and we cannot expect much if any accession of traffic, after leaving Sooree until we reach Bhaugulpore, a distance of 110 miles.

47. The gradients are 1 in 1,000, 1 in 700, and 1 in 450, and on the north side of the summit, a gradient of 1 in 300, for fourteen and a half miles. Anything better than these need not be anticipated.

48. For a considerable length the railway must be made through the prevailing gniess rocks, the excavations in and through which, will occupy *time*. To counterbalance which, however, an ample supply of ballast will be met with.

49. I consider it my duty to lay before you the engineering facts and peculiarities of these routes. There are no very important difficulties in either, that is, between Sooree and Rajmahal, and between Sooree and Bhaugulpore direct.

50. It will be for you to decide the question whether the commercial advantages of the Rajmahal line traversing a more fertile and populous country, confessedly at present without means of transport for its valuable products—gaining whatever goods traffic may accrue by opening up the country between the river More and Rajmahal—carrying passengers so far as Rajmahal on their way to Darjeeling, and other parts, and gaining the competition with the uncertain Ganges and Bhaugrutty for the rich traffic of Purneah—should not decide you to adhere to the route via Rajmahal.

I may also call your attention to the fact which should have been stated in the engineering part of the question—that it will be seen by inspection of the sections, that the summit near Nori Hatt on the More line is 447 feet above the summit by the other line, so that all commodities destined for the Calcutta market must be taken up that extra height—an important point as regards locomotive power, and an offset against the additional twenty-five miles of the Rajmahal route.

51. Under these circumstances, and having been informed that the extension to Rajmahal has received sanction and that capital is ready to execute it, I shall, unless countermanded, make such arrangements as are in my power to prosecute the works to that place as speedily as possible.

52. With this view I have indented for two more assistant engineers who should be sent out as soon as possible, to take the field immediately after the rainy season now approaching.

I shall also require two more European inspectors *skilled in brickwork*.

53. In conclusion I would respectfully call your attention to the importance of proceeding simultaneously with all the works enumerated in this report. The general establishment would not thereby be greatly increased, but as regards the final completion of the whole, the advantages are incalculable.

54. For example, in all heavy embankments across inundated lands the banks should be thrown up at once, leaving gaps equal to the openings of the bridges. This would enable us to decide the difficult question as to the right area for the passage of the floods, by watching the effects of the first year's inundation, and might on the one hand save much expenditure in superfluous flood openings, and on the other hand might prevent serious disasters by constructing too few of them.

55. Secondly, in those places where large rivers must be crossed, such as the Hullohur, Poonpoon, the river Kurrunnassa, and the river Touse, and whose bridges would occupy a much greater time in construction than other parts of the works, a commencement cannot be made too soon.

56. I recapitulate the estimates in the table, as follows, adding the electric telegraph necessary for the safe working of a single line.

Indian Railways
 Governor General
 to E I Company
 Enclosure

	Rs.	a.	p.
1st. Works in hand from Howrah to Raneegunge, 121 miles	88,04,087	13	5
2d Works sanctioned from near Burdwan to Rajmahal, 121 $\frac{3}{4}$ miles	1,01,57,809	12	0
3rd Works proposed from Rajmahal to Allahabad, 439 miles	3,80,95,365	10	2
4th Works at the crossing of the River Soane	4,50,000	0	0
5th Electric Telegraph, 782 miles, at per mile, £100	7,82,000	0	0
Co's Rs.	5,82,89,263	3	7

19th March 1853.

I have the honour, &c.,
 (Signed) GEO. TURNBULL,

(True Copies.)
 (Signed) R. R. MACDONALD STEPHENSON,
 Managing Director and Agent.

(A.)—SUMMARY OF ESTIMATES.

Miles.	Description.	Total Cost.			Cost per Mile.
		Rs.	a.	p.	
<i>Works now in Progress.</i>					
121	Miles from Howrah to Raneegunge, including Howrah and other stations	88,04,087	13	5	72,761
<i>Extension to Rajmahal.</i>					
45	For a single Line of Railway, Miles from near Burdwan to the River More	35,33,540	0	0	78,523
76 $\frac{3}{4}$	Miles from the River More to Rajmahal	66,24,269	12	0	86,507
242 $\frac{3}{4}$	Miles. Co's Rs.	1,89,61,897	9	5	78,112

(B.)—SUMMARY OF ESTIMATES.

Miles.	Description.	Total Cost.			Cost per Mile.
		Rs.	a.	p.	
<i>Extension from Rajmahal to Allahabad, for a single Line of Railway.</i>					
77	Rajmahal to Bhaugulpore	60,55,131	0	0	78,638
157 $\frac{1}{4}$	Bhaugulpore to the Soane	1,33,76,873	0	0	88,294
112 $\frac{3}{4}$	River Soane to Benares	96,03,216	10	2	85,172
92	Benares, viâ Mirzapore, to Allahabad	85,60,145	0	0	93,045
439	Miles. Co's Rs.	3,80,95,365	10	2	86,777

Indian Railways.
 Governor General
 to E. I. Company.

(C.)—MEMORANDUM of ESTIMATE of the Line by the Valley of the
 River MORE.

Enclosure			Co.'s Rs.	a	p.
Miles. 118½	Miles from the Junction near Sooree, by Nori Hat to Bhaugulpore - - - - - Or per mile Rs. 79,634.		94,56,518	0	0
<i>Comparison of the More Valley route with that by Rajmahal.</i>					
67	Miles from the River More to near Oodwa Nullah - - - - -		57,74,060	0	0
77	Miles from ditto to Bhaugulpore - - - - -		60,55,131	0	0
144	Miles.	Co.'s Rs.	1,18,29,191.	0	0
118½	As above - - - - -		94,56,518	0	0
25½	Miles difference.	Rs.	23,72,673	0	0

(D.)—MEMORANDUM to as the River SOANE.

If, as I suppose, a break in the line should be made at the River Soane until the increase of traffic may render the construction of a bridge advisable, it will be necessary to provide two stations, one on each side of the river, with engine sheds, carriage sheds, large 42-foot turntables for reversing the engines and tenders, and other accommodations peculiar to a terminus of a long line of railway.

I assume each of these stations to cost - - - - -	Rs. 1,50,000
For two stations at the Soane - - - - -	Co.'s Rs. 300,000
Ferry boats, landing piers, wood platforms on the land, and other arrangements for facilitating the traffic across the river, say, - - - - -	150,000
	Co.'s Rs. 450,000

(E.)—NOTE.

The aggregate number of miles which have been examined, and of which the trial sections have been taken, this last cold season, including November, December, January and February, amounts to 818.

To do this, six working parties of engineers were employed, which gives an average of 156 miles to each party.

The parties so employed, were Messrs. Vigors and Denham, between Rajmahal and Monghyr.

Messrs. King and Fox between Monghyr and the river Soane.

Mr. Claxton from the river Soane to Benares.

Mr. Lancy from Benares to Allahabad; Messrs. Perry and Bourne, from Ahsensole, by Chackai, near the Ganges.

Messrs. G. and H. Smith on the More Valley Line.

MORE VALLEY LINE.

ESTIMATE of COST of WORKS on a Line of RAILWAY, commencing at a point on the Rajmahal Line, near Sooree, following the Valley of the River More by None Hat, and terminating at Bhaugulpore, being a length of 118 $\frac{3}{4}$ Miles.

		Rate	Rs.	a.	p.
Larthwork -	250,000,000 Cubic feet of clay, at per 1,000 c. ft. -	3/8	8,75,000	0	0
	126,651,353 Ditto rock ditto -	8/	10,13,210	13	2
Brickwork -	3,656,750 Ditto, at per 1,000 c. ft. -	22/	8,04,485	0	0
Wrought iron -	- - Superstructures of 20 openings, of 80 ft. each, for the Sedh and other Nuddies, each.	12,000	2,40,000	0	0
Ballast - -	14,256,000 Cubic feet natural ballast in main line, at per 100 c. ft.	4/	5,70,240	0	0
	4,714,400 Cubic feet burnt clay, for ditto ditto	6/	2,82,864	0	0
	1,425,600 Ditto natural ballast in sidings and stations, at per 100 c. ft.	4/	57,024	0	0
	471,440 Cubic feet burnt ballast in ditto ditto	6/	28,286	6	4
Permanent way materials.	130 $\frac{1}{2}$ Miles of permanent way, being 10 miles per cent. added for sidings and stations, at per mile, Co.'s Rs. 26,670	-	34,80,435	0	0
Laying permanent way.	130 $\frac{1}{2}$ Miles, at per mile, Rs. 5,280 - -	-	6,89,040	0	0
Turn-tables, &c.	- - Turn-tables, water-cranes, switches, crossings, &c., on	-	-	-	-
	118 $\frac{3}{4}$ Miles, at per mile, Rs. 1,000 - -	-	1,18,750	0	0
Fencing - -	118 $\frac{3}{4}$ Miles fencing, at per mile, Rs 2,000 -	-	2,37,500	0	0
Stations - -	- - Sooree, Roomnabad, None Hat, Dauka, and others, say,—	-	2,00,000	0	0
			85,96,835	3	6
	Add for contingencies, 10 per cent. -	-	8,59,683	8	4
	For 118 $\frac{3}{4}$ miles, total Co.'s Rs. -	-	94,56,518	11	10
	Or per mile, Co.'s Rs. 79,634.				

SUMMARY OF ESTIMATES.

Miles.		Total Cost.	Average Rate per Mile.
	<i>Works now in progress.</i>		
121	Miles from Howrah to Raneegunge, including Howrah and other stations.	Rs. 88,04,087 13 5	Rs. 72,761 0 0
	<i>Extension to Rajmahal for a Single Line of Railway.</i>		
45	From near Bardwan to the River More - - -	35,33,540 0 0	78,523 0 0
76 $\frac{3}{4}$	From the River More to Rajmahal - - -	66,24,269 12 0	86,308 0 0
242 $\frac{3}{4}$	Miles - - - - -	1,89,61,809 9 5	78,112 0 0

Indian Railways.

Governor General
to E. I. Company.

MORE VALLEY LINE—continued.

Enclosure.

Extension from Rajmahal to Allahabad for a Single Line of Railway.

Miles.		Total Cost.	Average Rate per Mile.
		Rs. a. p.	Rs. a. p.
77	Rajmahal to Bhaugulpore - - - - -	60,55,131 0 0	78,638 0 0
157½	Bhaugulpore to the Soane - - - - -	1,38,76,873 0 0	88,294 0 0
112¾	River Soane to Benares - - - - -	96,03,216 0 0	85,172 0 0
92	Benares, viâ Mirzapore, to Allahabad - - - - -	85,60,145 0 0	93,045 0 0
439	Miles - - - - -	3,80,95,365 0 0	86,777 0 0

MEMORANDUM of Estimate of the Line by the Valley of the River More.

118½	Miles from the junction near Soree, by None Hat, and to Bhaugulpore, at Or per mile, Rs. 79,634. <i>Comparison of the More Valley Route with that by Rajmahal.</i>	94,56,518 0 0	- - -
67	Miles from River More to near Oodwa Nullah - - - - -	57,74,060 0 0	- - -
77	Miles from ditto to Bhaugulpore - - - - -	60,55,131 0 0	- - -
144	Miles - - - - -	1,18,29,191 0 0	- - -
118½	" - - - - -	94,56,518 0 0	- - -
25½	" difference - - - - -	23,72,673 0 0	- - -

MORE VALLEY LINE—continued.

Indian Railways.

Governor General
to E. I. Company

Enclosure

ESTIMATE of COST of WORKS in that part of the Line commencing near Oodwa Nullah, Rajmahal, and proceeding along the South Shore of the River Ganges, by Sikragully and Colgong, and terminating at Bhargulpore, a distance of 77 Miles.—15th March 1853.

		Rate Rs.	Rs.	a	p
Earthwork	36,225,490 Cubic feet in cuttings in clay, at per 1,000 c. ft.	3 8	1,26,789	4	0
	14,370,720 Ditto in rock, at ditto - - -	3/8	1,14,965	12	0
	123,370,810 Ditto in embankments, at ditto - - -	3 8	4,31,797	13	0
	8,167,488 Ditto in sidings, at ditto - - -	3 8	28,586	3	0
	8,000,000 Ditto in road approaches and level crossings, at ditto.	3/8	28,000	0	0
Brickwork	4,217,300 Cubic feet brickwork, at per 1,000 c. ft. -	20/	8,43,460	0	0
Ballast	12,196,800 Ditto for 77 miles - - - -				
	609,840 Ditto 5 per cent. for sidings - - -				
	12,866,640 Ditto, say one half natural ballast and one half burnt clay.				
	6,403,320 Ditto burnt clay, at per 1,000 c. ft. -	6/	3,84,199	0	0
	6,403,320 Ditto natural ballast - - - -	4/	2,56,132	0	0
Memo.—Estimate of one mile of permanent way:—					
	1,760 Sleepers, at per each, 3/ - - -		5,280		
	3,520 Chains, 35 tons, at per ton, 80/ -		2,800		
	8½ Tons of fishing plates, screws, balk nuts, at per ton, 150/ - - -		1,275		
	129 Tons of rails, assumed price:—				
	Shipped in England, per ton £10				
	Freight to Calcutta - - -		2		
	Carriage to the works - - -		1		
	Co.'s Rs. 130=£13				
	— 16,770				
	9,520 Keys, at per 1,000, Co.'s Rs. 55/ -		193		
	7,040 Treenails, ditto, ditto 50/ -		352		
	Per mile - 26,670				
Permanent way	77 Miles.				
	7 " added for stations and sidings.				
	84 " permanent way, at per mile, 26,670 -		22,40,280	0	0
Laying permanent way.	84 " at per mile, Rs. 5,280 - - -		4,43,520	0	0
Gates at level crossings.	120 Gates, at per each - - - -	50/	6,000	0	0
Fencing -	25,000 Linear feet at level crossings - - -	70/	17,500	0	0
Road metal -	200,000 Cubic feet at level crossings and road approaches, at per 1,000 c. ft.	4/	8,000	0	0
Fencing -	77 Miles finding, at per per mile, Rs. 2,000 -		1,54,000	0	0
Roadside stations.	- - Assume the same proportion as on the Souree district.				
	77 Miles, at per mile, Co.'s Rs. 1,655 - - -		1,27,435	0	0
Bhargulpore Station.	- - Similar to that at Rajmahal - - -		1,50,000	0	0
Turn-tables, &c	- Turn-tables, water-cranes, switches, crossings, &c., assume same proportions as on the Souree district.				
	77 Miles, at per mile, Rs. 1,000 - - -		77,000	0	0
Bridges -	- - Add iron superstructure for one bridge of 5 openings of 80 feet each over the Geroah Nuddy, at Rs. 11,000 each. -		53,000	0	0
	Add pumping water and getting in foundation of iron bridges, each, at Co.'s Rs. 3,000.		12,000	0	0
			55,04,665	0	0
Contingencies -	- - Add 10 per cent. for contingencies - - -		5,50,466	0	0
	For 77 miles - - - - Co.'s Rs.		60,55,131	0	0
	Or per mile, Rs. 78,638.				

Indian Railways.

MORE VALLEY LINE—continued.

Governor General
to E. I. Company.ESTIMATE of COST of WORKS from Bhaugulpore, by Moonghyr, Barr, and Patna, to the East
Bank of the River Soane, being a distance of 157½ Miles.

Enclosure.

		Rate Rs.	Rs.
Earthwork -	380,000,000 Cubic feet in embankments and cuttings, including sidings, &c., at per 1,000.	3/8	13,30,000
Road approaches	17,000,000 Ditto in banks, at per 1,000 c. ft.	3/8	59,500
Brickwork -	10,432,566 Ditto of brickwork, at ditto	20/	20,86,513
Ballast for 157½ miles.	24,895,200 Ditto ballast, burnt clay, 1,244,756 Ditto 5 per cent. add for sidings.		
	26,139,956 Ditto at per 1,000 c. ft.	8/	20,91,196
Memo.—Estimate of one mile of permanent way :—			
	1,760 Sleepers, at each, 3/	-	5,280
	3,520 Chains, 35 tons, at per ton, 80/	-	2,000
	8½ Tons fishing plates, screws, bolts, nuts, &c., at 150/	-	1,275
	129 Tons of rails, assumed price :—		
	Shipped in England	-	£10
	Freight to Calcutta	-	2
	Carriage from ditto to works	-	1
			16,770
	3,520 Keys, at per 1,000, 55/	-	193
	7,040 Treenails, at per 1,000, 50/	-	352
			26,670
Permanent way	157½ Miles. 14½ „ add for stations and sidings.		
	172 „ at per Mile, Rs. 2,667	-	45,87,240
Laying permanent way.	172 „ laying permanent way, at per mile, Rs. 5,280.	-	9,08,160
Gates at level crossings.	200 Gates, at per each	50/	10,000
Fencing at ditto	42,000 Linear feet fencing, at per 100 feet	70/	29,400
Road metal at level crossings.	333,000 Cubic feet at road approaches, at per 100 c. f.	6/	19,980
Fencing -	157½ Miles fencing, at per mile, Rs. 2,000	-	3,14,333
Roadside Stations.	- - Assume the same proportion as Sooree district.		
	157½ Miles, at per mile, Rs. 1,655	-	2,60,111
Moonghyr Station.	- - Similar to Bhaugulpore	-	1,50,000
Patna Station -	- - - - -	-	2,50,000
Turn-tables, &c.	- - Turn-tables, water-cranes, switches, crossings, &c., same proportions as on the Sooree district.		
	157½ Miles, at per mile, Rs. 1,000	-	1,57,166
Ironwork in bridge over Kullohur Nuddy.			
Note.—Cast-iron cylinders, 9 feet diameter, 1 inch thick, weight 9½ cwt. per foot, flanges 9 cwt. each, cylinders cast in lengths of 9 feet.			

MORE VALLEY LINE—continued.

ESTIMATE of COST of WORKS from Bhaugulpore, &c.—continued.

Indian Railways.
 Governor General
 to E. I. Company
 Enclosure

	Rate Rs	Rs
14 Columns, 66 feet each $840 \times 10\frac{1}{2}$ cwt. = 441 tons.		
Cast in London - - -	£6 0 0	
Freight in Calcutta - - -	5 0 0	
Insurance, 5 per cent. - - -	0 11 0	
Unloading at Calcutta, and loading in boats and discharging at Nuddy - - -	0 9 0	
Fixing, in place of sinking - - -	3 0 0	
	<u>£16 0 0</u>	
441 Tons, at per ton, Co.'s Rs. 160, in 84 joints of pipe, each 2 cwt.	-	70,560
168 Cwt. of wrought iron, in screw bolts and nuts for flanges, at per cwt.	10/	1,680
Iron superstructure as before, 7 openings, at Rs. 11,000 each.		77,000
Note.—The estimate of Hulloohur Nuddy Bridge, 600 feet long, Rs. 1,49,240 ; estimate per linear foot, say Rs. 250.		
Ironwork in Rient Nullah.		
500 Feet long, at per linear foot, Rs. 250 - -		1,25,000
Ironwork in Poonpoon Nuddy.		
350 Feet long, at per linear foot, Rs. 250 - -		87,500
		<u>1,26,15,339</u>
Add contingencies, 10 per cent. - -		12,61,534
		<u>1,38,76,873</u>
Total for $157\frac{1}{8}$ miles - - -		
Or per mile, Co.'s Rs. 88,294.		

Indian Railways.

Governor General
to E. I. Company.

Enclosure.

MORE VALLEY LINE—continued.

ESTIMATE of COST of WORKS on that part of the Line commencing on the left or west bank of the River Soane, proceeding by Arrah Buxar and terminating at Raj Ghaut, opposite Benares, being a distance of 112 $\frac{3}{4}$ Miles.

		Rate Ra.	Rs.	a.	p.
Earthwork	- 281,256,700 Cubic feet earthwork, in cuttings and embankments, at per 1,000 c. ft.	3/8	9,84,398	7	1
Brickwork	- 7,441,500 Cubic feet brickwork, in bridges and culverts, &c., at per 100 c. ft.	20/	14,88,300	0	0
Ballast	- 19,819,800 Cubic feet burnt clay, including sidings, at per 100 c. ft.	7/	13,87,386	0	0
Laying permanent way.	123 Miles of permanent way, at per mile	5,280/	6,49,440	0	0
Permanent way materials.	123 Miles, at per mile, Rs. 28,507 $\frac{1}{2}$	-	35,06,422	8	0
Fencing -	112 $\frac{3}{4}$ Miles of fencing, at per mile, Rs. 2,000	-	2,25,500	0	0
Gates at level crossings.	250 Gates, each at	60/	15,000	0	0
	Arrah - - - - - Rs. 40,000				
	Beheca platform - - - - - 2,000				
	Bhogpore ditto - - - - - 2,000				
	Buxar - - - - - 40,000				
	Chowra and Wharf - - - - - 20,000				
	Teemeneah - - - - - 16,000				
	Seekuldeah - - - - - 16,000				
	Add for sundry small road stations, say 15 at 1,000 Rs. each	-	1,36,000	0	0
Turn tables, water cranes.	- - Switches, &c. for 112 $\frac{3}{4}$ miles, at per mile, 1,000 Rs.	-	15,000	0	0
Bridge over the River Kurrumnassa.	- - Similar to those over the Hullokur Keeul rivers, 600 feet, at per foot, 350 Rs.	-	1,12,750	0	0
			2,10,000	0	0
			87,30,196	15	1
	Add 10 per cent. for contingencies for 112 $\frac{3}{4}$ miles	-	8,73,019	11	1
	Total for 112 $\frac{3}{4}$ miles, Co.'s Rs.	-	96,03,216	10	2
	Or per mile, Co.'s Rs. 85,172.				

NOTE.—If, as I propose, a break in the line should be made at the River Soane, until the increase of traffic may render the construction of a bridge advisable, it will be necessary to provide two stations, one on each side of the river, with engine sheds, carriage sheds, large 42 feet turn tables for reversing the engines and tender, and other accommodations peculiar to a terminus of a long line of railway. I assume each of these stations to cost Rs. 1,50,000.

	Rs.
For two stations at the Soane	3,00,000
Ferry boats, landing piers, wood platform on the sand, and other arrangements for facilitating the traffic across the river, say	1,50,000
	<u>Co.'s Rs. 4,50,000</u>

MORE VALLEY LINE—continued.

Indian Railways
Governor General
to E I Company.

Enclosure

ESTIMATE of the WORKS from Raj Ghaut, opposite Benares, by Mirzapore to the right bank of the River Jumna at Allahabad, being a distance of 92 Miles.

		Rs.	Rate Rs	Rs
Earthwork -	10,900,000 Cubic feet rock cutting, at per 1000 c. ft., 10/	- 1,09,000		
	5,500,000 Cubic feet earth cutting, at per c. ft., 4/	- 22,000		
	118,000,000 Cubic feet embankment, at per c. ft., 4/4	- 4,72,000		
Brickwork -	5,060,000 Cubic feet brickwork, at per 100 c. ft.	-	22/	6,03,000
Ballast -	2,787,840 Cubic feet, in 16 miles natural ballast, at per 100 c. ft. 4/	- 1,11,512		11,13,200
	13,242,440 Cubic feet, in burnt clay, at 6/	- 7,94,532		
Permanent way materials.	1,760 Sleepers, each 3/	- 5,280		9,06,044
	3,520 Chains, 35 tons, at per ton, 80/	- 2,800		
	82 Tons of fishes, at per ton, 150/	- 1,275		
	129 Tons of rails, assumed price :—			
	Shipped in London, £ 10			
	Freight to Calcutta, - 2			
	Carriage - - - 1			
	£ 13 = Rs. 130	16,770		
	3,520 Keys, at per 1,000, 55/2	- 193		
	7,040 Trenails, at per 1,000, 50/	- 352		
Extra freight on 175 tons, at per ton, 10/8	- 1,837			
	28,507			
	92 Miles			
	8 Add for station and sidings			
	100 Miles, at per Co.'s Rs. - 28,507/8			
	Rs. - 28,50,750			
	Laying Permanent Way :—			
	100 Miles, at per mile, Rs. 5,280	- 5,28,000		33,78,750
Fencing -	92 Miles fencing, at per mile, Rs. 2,000	-		1,84,000
Gates at level crossing.	140 Gates, at per gate -	-	60/	8,400
Stations -	Raj Ghat (Benares)	- 50,000		
	Ramnuggur	- 20,000		
	Chimar	- 40,000		
	Mirzapore, a large station with engine sheds and workshops, as at Howrah	- 3,00,000		
	Two small roadside stations	- 30,000		
	Sirsa	- 20,000		
	Opposite Allahabad	- 50,000		
				5,10,000
Turn tables, water cranes.	Switches, crossings, &c., for 92 Miles, at per mile, 1,000 Rs.	-		92,000
Bridge over the Touse.	Wrought iron superstructure, part on cast iron cylinders, and part on brick piers.—			
	12 Wrought iron girders, each Rs. 11,000,	1,32,000		
	7 Cast iron piers, containing 198 cylinders weighing 935 tons, at per ton, 160 Rs.	- 1,49,600		
	396 Cwt. wrought iron screws, &c., in ditto, per cwt. 10 Rs.	- 3,960		
	Extra freight on 955, say	- 10,000		
				2,95,500

Indian Railways.

Governor General
to E. I. Company.

Enclosure

MORE VALLEY LINE—continued.

ESTIMATE of the WORKS from Raj Ghaut, &c.—continued.

		Rate Rs.	Rs.
Brickwork -	76,800 Cubic feet of brickwork, on piers, at per 100 c. ft. - - - - -	22/	16,896
	130,000 Ditto ditto in arching for flood openings, at per - - - - -	22/	28,600
Bridge over the Kurnowlee	- - Similar to the above, 800 feet, at per foot -	250/	2,00,000
Bridge over the Belwan river.	- - Similar to the above, 858 feet, at per foot -	250/	2,14,500
			77,81,950
Add 10 per cent for contingencies - - -			7,78,195
For 92 miles, total Co.'s Rs. - - -			85,60,145

(Signed) GEO. TURNBULL,
19th March 1853.

Enclosure.

From Messrs. HODGSON, CONCANEN, NOYES, and Co., to the Most Noble the MARQUIS of DALHOUSIE, K.T., Governor General of India in Council, Calcutta.

MY LORD,

24th December 1852.

REFERRING to the statements which we had the honour of placing before the Governor General of India in Council in the year 1845, on behalf of, and as the solicitors for the Great North of India Railway Company, we have the honour to state that the Upper India Railway is formed for the purpose of carrying out the objects of the Great North of India Railway Company, and is in part a substitution for that Company.

Understanding that the subject of railways in Upper India has been referred to your Lordship in Council by the Honourable the Board of Directors of the East India Company, we have on behalf of the Upper India Railway respectfully to beg of your Lordship in Council to give us an opportunity of stating the Company's case before your Lordship in Council gives a decision on this most important subject.

We should add that the Company has the active co-operation and support of Sir Herbert Maddock, late Deputy Governor of Bengal, and other eminent persons connected with India.

We have, &c.,

(Signed) HODGSON, CONCANEN, AND NOYES.

5, Lincoln's Inn Fields, 24th December 1852.

Enclosure.

From J. M. CAMPBELL, Esq, Chairman, to the Most Noble the MARQUIS of DALHOUSIE, K.T., Governor General of India, in Council.

Upper India Railway Company.

MY LORD,

2, Moorgate Street, London, 8th January 1853.

By the last mail, Messrs. Hodgson, Concanen, and Noyes, Solicitors to this Company, had the honour of calling your Lordship's attention to the correspondence which they had conducted with the Government of India on behalf of the Great North of India Railway Company so far back as the year 1845, and to the fact that the Upper India Railway Company was founded for the purpose of carrying out the objects of the Great North of India Railway Company, and was in fact a substitution for that Company.

I have now, as the Chairman of the Upper India Railway Company, to submit with every deference to the consideration of your Lordship in Council the following circumstances:—

1st. That the line from Allahabad to Delhi was originally projected and brought before the authorities and the public by the Great North of India Railway Company, and that a memorial to this effect, founded on acknowledged facts and authentic documents, is now in course of preparation by Mr. Harry Borradaile, late chairman of that company, for transmission to your Lordship in Council.

Indian Railways.
Governor General
to E. I. Company.
Enclosure.

2d. That the Upper India Railway Company has received the support of the public in this country, and the active and cordial co-operation of many persons of influence connected with India.

3d. That the three millions of capital set apart for this country has been taken up by a highly respectable proprietary, who would have readily subscribed for a still larger amount, and that measures will be taken to have that portion of the capital reserved for India appropriated with as little delay as possible.

4th. That on the 25th of November last, the following proposal was made to the Honourable East India Company, in a letter addressed to Mr. Secretary Melvill by the managing director, on behalf of the Upper India Railway Company, viz.:—"To undertake the construction of its proposed railway on terms more moderate than those hitherto granted to any of the other three companies to which the Honourable Court have extended their sanction and support; and I am now further instructed to state, that this company is prepared to raise capital to construct, to the satisfaction of the Honourable Court, the section from Allahabad to Cawnpore, or at the option of the Honourable Court, to carry the line on to Agra and Delhi, commencing operations simultaneously, on as many points of the route as the Court may judge expedient; the railway company being bound to complete the line or section agreed upon by a specified time, and for a specified sum."

I beg to call your Lordship's attention to the enclosed list of directors and officers of the company.

I have, &c.,
(Signed) J. M. CAMPBELL,
Chairman.

London, 8th January 1853.

The MEMORIAL of HARRY BORRADAILE, late a Member of the Bombay Civil Service, to The Most Noble the Marquis of Dalhousie, K.T., Governor General of India, in Council;

Enclosure.

Respectfully sheweth,

THAT your Memorialist, whilst a member of the said service, was deputed on special duty to Bengal once as member of the Customs and Post Office Committee for all India, and again as member of the Indian Law Commission; and whilst so employed, resided in Calcutta for a period of eight years and a half, and during that time had a favourable opportunity of making himself acquainted with the wants and resources of the upper and lower provinces of Bengal.

That after your memorialist returned to England, the attention of the English public began to be turned towards the improvement of communication in India by the formation of railways in that country; and a company was formed for the construction of a railway from Calcutta to Mizzapore, called the East Indian Railway Company.

That about three months after that company had issued its prospectus, another company was established for the construction of a railway from Allahabad (where the river steam navigation ceases) to Delhi, under the title of the Great North of India Railway Company; and of this company your memorialist became a director, and subsequently chairman of the Board of Directors.

That some time after the prospectus of the Great North of India Railway Company was issued, the East Indian Railway Company issued a new prospectus, taking up the line advocated by the Great North of India Railway Company, and asking their proprietary to raise the capital from four millions to ten millions; thus clearly showing that the line from Allahabad to Delhi, originally selected and brought before the public by the Great North of India Railway Company, had never been contemplated as part of the scheme of the East Indian Railway Company.

Indian Railways.
 ———
 Governor General
 to E. I. Company.
 ———
 Enclosure.
 ———

That prior to any steps being taken by the projectors of the Great North of India Railway Company, they ascertained that no pledge whatever had been given or promise held out by the Honourable the East India Company to any Company, regarding the country proposed to be traversed by their projected railway, which fact was afterwards confirmed by official communications to your memorialist and his co-directors.

That the Great North of India Railway Company was repeatedly recognised by the Honourable the Court of Directors of the East India Company and the Government of India, and its managing committee was invited by the latter authority on the 6th April, 1846, to forward to the Home Department the draft of the provisions for a law for its incorporation.

That ultimately, from several causes unnecessary to detail, but which were then principally produced by the unfavourable state of the money market in England, the Great North of India Railway was not further proceeded with, under the belief that more favourable circumstances might thereafter arise; and it was accordingly allowed to remain in abeyance.

That it was thus left apparently open to the East India Railway Company, to obtain powers to construct the line of railway so projected by the Great North of India Railway Company; but the directors thereof found themselves unable to raise the requisite capital, or to conclude a contract with the East Indian Company for the construction of the said line.

That such failure of the East Indian Railway Company to effect anything for the good of Upper India, led again to the formation of a company for constructing a railway from Allahabad to Delhi; and therefore, under a new name, the Great North of India Railway Company was resuscitated, and the Board of Directors thereof has been joined by several of the directors of that company; and a large number of the shareholders therein have become shareholders in such resuscitated company, and its affairs are conducted under the legal advice of the solicitors of the Great North of India Railway Company, who have already had the honour of communicating with your Lordship in Council on behalf of your memorialist and the company he now represents.

That the Great North of India Railway Company was a fully registered company, with a capital of four million pounds; and the present company having raised its capital to the same amount, steps have been taken to introduce a bill to Parliament; and application has been made to the East India Company for a grant of a concession to enable the carrying out of its objects.

That the Upper India Railway Company having had the whole of that portion of its capital set apart for England readily subscribed for by highly influential parties, is in a position to carry out the original plans of the Great North of India Railway Company, if a grant be given to it on such terms as the Government of India may recommend the home authorities to accord.

Your memorialist, and many others of the original shareholders of the Great North of India Railway Company, having merged their interests in the Upper India Railway Company, have resolved to come before your Lordship in Council, and to solicit your Lordship's favourable consideration on account of their priority of claim for permission to form a line of railway from Allahabad to Delhi.

And your memorialist will ever pray, &c.

Upper India Railway Company,
 2, Moorgate Street, London,
 24th January 1853.

(Signed) H. BORRADAILE,
 Late Bengal, C.S.,
 Late Chairman of the Great North of
 India Railway Company,

Enclosure

No 9.

From J. P. GRANT, Esq., Secretary to the Government of India, to
 Capt. T. E. ROGERS, Superintendent of Marine.

SIR,

12th April 1853.

I AM directed by the Governor General in Council to transmit to you the accompanying copy of a despatch from the Honourable the Court of Directors in the Financial (Railway) Department, dated 16th February last (No 3);

and to request you will at your earliest convenience favour the Government with your opinion generally on the project therein disclosed.

I have, &c.

(Signed) J. P. GRANT,

Secretary to the Government of India.

Council Chamber,
12th April 1853.

Indian Railway.
Governor General
to E. I. Company
Enclosure.

No. 1861.

From Capt. T. E. ROGERS, Superintendent of Marine, to J. P. GRANT, Esq.,
Secretary to the Government of India (Home Department).

Enclosure.

SIR,

23d April 1853.

1. I HAVE the honour to acknowledge the receipt of your letter (No. 9) of 12th instant, forwarding copy of a despatch from the Honourable the Court of Directors in the Financial (Railway) Department, dated 18th February last (No. 3), and requesting my opinion on the project therein disclosed.

2. The Honourable Court, in the first paragraph of the despatch, adverting to the dangers that attend the navigation of the Hooghly between Calcutta and the river's mouth, suggest that these would in a great measure, if not altogether, be avoided by connecting Diamond Harbour with Calcutta by a railway communication, and that such a work would in other respects be productive of much public benefit, and would materially promote the shipping and mercantile interests connected with this presidency. It also appears to the Honourable Court that the establishment of docks at Diamond Harbour in connection with the railway would be highly advantageous to the public.

3 With reference to the above, I beg to refer to the accompanying statement of total losses that have taken place between the outer floating light and Calcutta, during the last twenty years, of vessels entering and leaving the river, particularizing the place where each loss occurred. From this statement it will be seen that the very great majority of losses (forty-two out of fifty-one) have taken place below Diamond Harbour. I must also remark that all the losses that have taken place above Diamond Harbour, as well as below, with one exception, have been in cases when the vessels have been proceeding without steam, or having driven from their anchors when not in tow. There is but one instance on record of a ship grounding in tow of a steamer having been lost, that of the brig "Queen" below Diamond Harbour, and although seven ships have been lost on the James and Mary's and Futtah Sand (the only dangerous places above Diamond Harbour) within the last twenty years, the majority of those have been inferior ships. In fact I believe that there is no instance of a really strong ship having been lost above Diamond Harbour. The Honourable Company's steamer "Feroze" lay on the James and Mary's Sand for seven days, and was by the strength of the current driven through it into deep water, yet the hull of the vessel sustained no injury. The reason of the comparative safety of vessels that get on shore above Diamond Harbour is, that the river being much more confined, there is no room for a swell to get up, to cause the vessel to strain and make water.

4. The amount of registered tonnage arriving at and leaving Calcutta may be now taken at 400,000 tons each year, and it may be estimated that the ships land and take away 1,000,000 tons of cargo. A ship of 400 tons would therefore bring and take away 1,000 tons, which, if she is to remain at Diamond Harbour, must travel over to the rail. 1,000 rupees will, on the average, fully cover the expense of such a vessel for steam from Diamond Harbour to Calcutta and back. If, therefore, the rail can compete with the river in point of cheapness, goods must be conveyed to and from Calcutta, at a cost not exceeding one rupee per ton. But if ships are to remain at Diamond Harbour, and land their goods there, either docks or warehouses must be built, which would involve a further expense, as ships must either pay warehouse or dock line; the uncertainty of the river would interfere with the lading of the trains direct from the ships in the river.

5. It must also be remembered that the generality of commanders of smaller classes vessels live on board, but must be daily in communication with their

Indian Railways.
 ———
 Governor General
 to E. I. Company.
 ———
 Enclosure.
 ———

agents, whose offices are in Calcutta. As there must be on an average 1850 tons of cargo down, and 1450 tons up every day in the year, exclusive of Sundays, even with a double rail, trains other than cargo trains could not run many times during the day; and thus commanders would lose the benefit of frequent communication with their agents and their ships which they now enjoy.

6. Diamond Harbour has hitherto been considered no less healthy than Calcutta, and looking to all the drawbacks to remaining so far down the river, I believe that very few ships would stop there except it were made compulsory. In fact, I think it may be doubtful if anything would be added to the safety of vessels by their remaining at Diamond Harbour. If docks were constructed there, the risk would not be great, although it would occasionally happen that ships would arrive at a time of day that they could not enter the docks, and thus be obliged to remain out for the night; and a southerly gale which would not affect vessels at anchor at or near Calcutta, would wreck many riding at Diamond Harbour.

7. The idea has been started of a railroad from Calcutta to the Chilka Lake, below Powree; and if the entrance to the lake could be deepened to twenty-four feet, which it is possible might be done by steam dredges, Calcutta might then have the benefit of the class of steamers of 6,000 tons, which it is said some parties are prepared to build. Chilka Lake itself is large enough to hold half the shipping in the world.

8. As long as the Hooghly is open as at present, I do not think that the class of ships which now frequent the port would, after reaching Kedgerree, remain down the river, if they have the option of coming up. If, however, the Chilka Lake could be converted into a port, connected with Calcutta by means of a railroad, ships of all classes would resort to it. Those approaching the head of the bay in the N.E. monsoon would resort to it, because they would end their voyage a fortnight sooner than if they came on to Calcutta. In the S.W. monsoon vessels would resort to the Chilka Lake harbour, because they would on leaving that port be in a position to make a comparatively fair wind to any port to which they might be bound, and be at least one fortnight in advance of a ship leaving Calcutta at the same time.

I have, &c.
 (Signed) T. E. ROGERS,
 Superintendent of Marine.

Fort William,
 Marine Superintendent's Office,
 23rd April 1853.

STATEMENT of VESSELS lost between the OUTER FLOATING LIGHT and CALCUTTA
during the last Twenty Years.

Indian Railways.
Governor General
to E. I. Company.

Enclosure.

Names of Vessels.	Commanders.	Tonnage	When lost.	Where lost.	Pilot
Ship Lord Amherst -	J. Hicks -	507	1833	Coucolly - - -	T. McDarmond
" Brunswick -	J. Palmer -	389	"	New Anchorage - -	J. Shurling
" Duke of York -	R. Locke -	1327	"	{ Hidgelee, blown on shore in a hurricane }	No Pilot.
" Lord of the Isles -	G. Highton -	352	1834	Jellingham Sand - -	E. Bartlett.
" Asia, F. -	E. Heselton -	418	1835	Diamond Sand - -	No Pilot
" Futtle Main -	Nacoda -	"	"	Old Mud Point Channel	W. Birch
" Windsor -	W Taylor -	1418	1836	Gasper Channel - -	J Shurling
" Asia -	D Forge -	418	"	Saugor Point - -	T McDarmond
Brig Highland Chief -	J Canning -	181	1837	Long Sand - -	J G Davidson
Ship Raj Rance -	J. W. Harding	340	1838	Eastern Reef - -	J. Ghur
Barque Sir Herbert Taylor -	W. Poole -	392	"	Off Silver Tree Pagoda	J.M. Hamilton
Ship Protector -	T. Buttonshaw	512	"	Eastern Reef Head -	No Pilot
Barque Equitable -	R. Howlett -	320	1839	*Fultah Reach - -	R Arrowsmith
Ship Francis Warden -	Nacoda -	401	1840	Auckland Channel -	C Jackson.
" Lady Stormont -	J F Liddle -	358	1841	Mud Point Ridge -	G. F Clarke
Barque Water Lily -	L. H. Pearce	150	"	S E. Point of Saugor -	W. Laing
" William Banes -	J Nowie -	272	"	Hospital Point - -	W Laing
Brig Symmetry -	J Lovill -	250	1842	{ S.W Point of Auck- land Island - - }	J. Hayden.
Barque Globe -	R. Stewart -	438	"	Auckland Channel -	J. B Filby
" Strathfieldsaye -	J. G Warren	476	"	Jellingham Sand -	R. F Barlow.
" Ricardo -	J L. Goble -	353	"	*James and Mary's -	G Moxon.
Brig Floraville -	W. Branthwate	200	1843	*James and Mary's -	W Bails.
Barque Adele -	C. Rocoffort -	356	"	Diamond Sand - -	C Anderson.
" Victor and Felice -	"	"	1843 or 1844	Kedgerie Point - -	J. Hammond.
" Amoy -	"	"	1844	Reef Head - -	No Pilot.
Schooner Columbine -	J. Townsend -	146	"	Saugor Sand - -	W W. Lawes
Ship Camam -	H. Banett -	388	"	Mizen Land - -	W. Laing
Barque Brilliant -	H King -	338	"	Saugor Sand - -	C. A. Anderson
Ship Marcombe -	C. Dalatouchie	490	1845	Thornhill's Channel -	J Cleghorn.
" Anagon -	G Coffin -	740	1846	Eastern Reef - -	No Pilot.
" Saunday -	Nacoda -	414	"	Saugor Sand - -	G B Smart.
Barque Carnatic -	Ditto -	575	"	Middleton Point - -	W J Ethoridge
" Dorothea -	J Harrison -	305	1847	{ Lower part of Mud Point Channel - }	T. E. Bond.
Ship Stalkint -	A Gardner -	560	"	Saugor Point - -	W.H. Harrison.
Brig Queen -	N Pike -	189	"	Auckland Bridge -	G. B McKan
Ship Mustapha -	Nacoda -	400	"	*Western Gut - -	D. Sandeman.
" Mussor -	Chaplin -	522	1848	Reef Buoy - -	G. Spence
Schooner Highfliter -	T Ansted -	78	"	{ Lower part of Cow- colly Road - - }	G. F Atkinson
Barque Hclan -	J. P. Biale -	685	"	Near Culpee - -	J. Cleghorn.
Ship Cubras -	Nacoda -	390	1849	Saugor Sand - -	C F. Harrison.
Barque Fadge -	J. Mansfield -	350	"	{ Saygrall Sand Babro Ghaut - - }	G. F. Medley
" Hanwodge -	Nacoda -	259	1850	Saugor Reach - -	G Nooks.
" Ariadne -	T Goodier -	501	"	Saugor Sand - -	W. H Harrison.
Ship Phenomene -	A A Jansend	504	1851	Jellingham Sand -	W. H. Gill.
" Gasper -	"	"	"	*Hinand - -	R. Arrowsmith.
" John Leach -	"	"	1852	Reef Head - -	No Pilot
" Belle Isle -	"	"	1848	Ditto - -	Ditto.
Schooner Brilliant -	"	"	"	Coucolly - -	Ditto.
Barque Hamed Shaw -	T. Holford -	450	1853	*Futtah Sand - -	E. H. J. Bull
" Nizam -	T. Jarman -	412	1852	*Libgun Sand - -	G Collins.
" Parsee Merchant -	N Mayor -	636	"	Eastern Reef - -	No Pilot

The places marked thus (*) are above Diamond Harbour.

Fort William, Marine Superintendent's Office,
23d April 1853.

(Signed)

B. HOWE,
Secretary.

Indian Railways.

No. 1000.

Governor General
to E. I. Company.

Enclosure.

From R. M. STEPHENSON, Esq., Managing Director and Agent of the East Indian Railway Company, to Major W. E. BAKER, Consulting Engineer to the Government of India, in the Railway Department.

SIR,

Calcutta, 10th March 1853.

I FEEL assured that you will concur in a suggestion which deserves the consideration of the Government, at a period when new and important cities, towns, and villages, are about to be brought into existence upon the line of the railway—that before any buildings are erected, or any steps taken in that direction at the several railway stations, plans of the surrounding country shall be sent in, a valuation made of them, and a series of regulations framed for the observance of all who sell, let, or purchase any of the land which may hereafter constitute a portion of the town; with a view to its being built upon sound sanitary principles of drainage, water supply, and lighting.

The importance of early provision under this head, is much greater than is generally recognised; and I confidently believe that if a little attention is bestowed upon it at the outset, the results will, in a very few years, become apparent and universally acknowledged.

It would be premature to enter more fully at present into the subject, than to express the hope that you will deem it to be one of sufficient consequence, to recommend the Government to provide against the consequences of disregarding it.

I am, &c.,

(Signed) R. M. STEPHENSON,

Managing Director and Agent of the East Indian Railway Company.

Submitted for the Orders of Government.

(Signed) W. E. BAKER, Major,

Consulting Engineer to the Government of India, in the Railway Department.

11th March 1853.

No. 1025.

Enclosure.

From R. M. STEPHENSON, Esq., Managing Director and Agent of the East Indian Railway Company, to Major W. C. BAKER, Consulting Engineer to the Government of India.

SIR,

Calcutta, 23d March 1853.

I BEG permission to state for your information, in considering the estimates recently submitted through you to the Government, that the railway company have uniformly preferred the less popular and usual practice of adopting a high scale of charges, in estimating the probable cost of constructing their works, with a view to prevent possible disappointments afterwards, and as a more equitable course towards their proprietary, than by assuming lower rates, which from the numerous contingencies constantly arising they might be unable to obtain.

In the detailed estimates before the Government for the works below Allahabad, the mileage cost averages about Rs. 96,000, including all charges, and rolling stock for 682½ miles. The railway company contemplate works of the strongest, simplest, and most substantial character, and would scarcely be justified in putting forward a lower calculation, under the existing circumstances of the high price of iron and freight; but as the utmost economy, consistent with strength and durability, is the special object to which attention is and should be directed, the Government may depend upon every possible exertion being made to keep down the actual cost.

The Government views are and will be so scrupulously observed in all respects by the railway company, that if it was desired to limit the cost to Rs. 50,000 per mile (as even a less sum above Allahabad) it can be effected,

but it would necessarily involve a diminution in the strength of the structure, which on a trunk line with a known large traffic, would imply a questionable policy.

Indian Railways.
Governor General
to E. I. Company.

Enclosure

The company desire only to carry out the wishes and intentions of the Government, whatever they may be, and in advising any especial cause of action or expenditure, they do so only as a duty they owe, to freely express their views with the grounds on which they are based, and to act upon whatever decision the Government may come to upon the data submitted.

The preferable mode of duration is also a question upon which the company are at all times ready to pursue any course which can be indicated as holding out any prospect of advantage and economy. The contract system as hitherto applied to India is by many regarded as a failure; but it is not generally known, that so far back as 1847 the railway company invited and held out every inducement to the principal English contractors to embark in these works, but the objections outweighed the inducements. The company advised the adoption of the contract system for the first contracts because the practice has been found most advantageous in Europe and America, and is regarded as the most perfect realization of the principle of the division of labour. The company anticipated increased competition in all future contracts, from new contractors who might be brought out, and from parties who had been engaged under the first contractors, and still hope to realize these expectations. If, however, the Government consider that the works can be carried out, in part or wholly, by the company themselves, or by any other means more advantageously, the railway company will spare no exertions to give full effect to any suggestions having this object in view.

In the cost of the iron, a saving of above Rs. 10,000 per mile may be effected, by arrangements with the new Indian Iron Company, for the early construction of the necessary blast furnaces, forges, mills, and machinery to supply the whole of the wrought and cast iron required during the ensuing seven years at agreed prices, hereby securing a certain supply at a most reduced cost, and affording direct encouragement to an important branch of Indian trade.

I have, &c.
(Signed) R. M. STEPHENSON,
Managing Director and Agent.

REMARKS by the Consulting Engineer.

In my remarks dated 21st instant, I expressed an opinion that the estimates for a railway from Rajmahal to Allahabad are considerably too high; not with any idea that the strength of constructions could be safely diminished, or its quality lowered, but because I believed, after careful examination of the estimates, that a railway on the scale adopted for the present section of the East Indian Railway could be and would be executed on the line referred to, at a lower rate.

The rate of 5,000*l.* per mile assumed by Major Kennedy as generally applicable to India, is not, I think, sufficient for the Ganges Valley line, which though favourable in many respects will cross an extraordinary extent of hill drainage and inundated land.

(Signed) W. C. BAKER, Major,
Consulting Engineer.

24th March 1853.

No. 106.

Enclosure.

FROM the CHIEF SECRETARY to the Government of Fort St. George to the
SECRETARY to the Government of India.

SIR,

23rd October 1852.

1. WITH reference to a despatch from the Honourable Court of Directors in the Financial Department dated 18th August 1852, (No. 13,) I am desired to state for the information of the Most Noble the Governor General in Council

(326.)

H 4

Indian Railways
Governor General
to E. I. Company.
Enclosure.

that Major Pears has been directed to report immediately the result of the survey of the Ghauts, and of the country between them and Menil, with the view of ascertaining the most favourable line of ascent from the plain to the Bala Ghaut, and that when this further report is submitted, application will be made to the Government of India to determine the precise route which the railway at this presidency is to take.

2. It is observed that by Section 20, Act 20, of 1852 the provisions of Act 42 of 1850 for giving additional facilities for public works in Bengal have been declared applicable to this Presidency, so that no further legislative enactment appears necessary to enable this Government to obtain land for the proposed railway, if as is presumed the Act has effect within the limits of Her Majesty's Supreme Court.

Fort St. George, 23rd October 1852. I have, &c., (Signed) H. C. MONTGOMERY, Chief Secretary.

(No. 928.)

Enclosure. From A. R. YOUNG, Esq., Under Secretary to the Government of India, to Sir. H. C. MONTGOMERY, Bart., Chief Secretary to the Government of Fort St. George.

SIR, 12th November 1852.

I AM directed to acknowledge the receipt of your letter No. 106, dated the 23rd ultimo, and to state that the Most Noble the Governor General in Council awaits the promised communication from the Government of Madras regarding the route to be followed in the construction of a line of railway in that Presidency.

Fort William, 12th November 1852. I have, &c., (Signed) A. R. YOUNG, Under Secretary to the Government of India.

No. 66.

Enclosure. From Sir H. C. MONTGOMERY, Bart., Chief Secretary to the Government, Fort St. George, to the SECRETARY to the Government of India.

SIR, 9th November 1852.

WITH reference to my letter, No. 106, of the 23rd ultimo, I am directed by the Right Hon. the Governor in Council to forward, for submission to the Government of India, the accompanying printed copy of a report from Major Pears, the railway commissioner, communicating the result of his examination of the Ghauts in the neighbourhood of Vaniembady.

2. It will be seen that the lines proposed by Major Pears to be first constructed extend to nearly 260 miles in length, and consist of five parts, viz.—

1st. A trunk line to Menil	-	-	-	48 miles.
2nd. A branch to Vellore and Vaniembady	-	-	-	70 "
3rd. The trunk line continued to the foot of the Ghauts	-	-	-	53 "
4th. The Ghaut near Palmanair	-	-	-	4 "
5th. From top of the Ghauts to Bangalore	-	-	-	84 "
				<hr/>
				259 miles.

3. The Governor in Council is of opinion, as formerly stated, that the chief trunk railway should run direct west from Madras to Menil, where it will divide into two original branches; one leading up the Ghaut, near Palmanair, and the other to Vaniembady. Of these original branches, he considers that by Palmanair, and thence to Bangalore and Bellary, to be the most important in

all points of view, though it may not at the very outset prove so profitable. He would, however, also strongly urge the formation at an early date of the second line by Vellore to Vaniembady, connecting the southern and western provinces with this presidency.

Indian Railways.
Governor General
to E. I. Company.
Enclosure.

I have, &c.
(Signed) H. C. MONTGOMERY,
Chief Secretary.

Fort St. George, 9th November 1852.

From Major T. T. PEARS, C.B., Engineers, to the CHIEF SECRETARY to Government, Fort St. George.

Enclosure

SIR,

1. IN my report, dated the 6th of July last, I stated my intention of proceeding to Kongoondy, and examining the Ghauts in the neighbourhood of Vaniembady. I have now the honour of reporting the result of that examination. Par 30

2. Having previously looked at the Ghauts between Tombah Droog (north of Palmanair) and Naikenary, and satisfied myself of the best locality for a pass within those limits, I have on this occasion made a general examination of that portion which lies between Naikenary and Sholegherry, and closely and carefully examined such portions as I judged—either from my own knowledge of the country or from indications furnished by the maps—likely to offer facilities for the construction of a railway. Report 6th July,
par 20

3. Having completed this work, I passed on to Bangalore, and looked at a line which appeared to promise favourably from thence to Palmanair. On the sheet of the Indian atlas, submitted herewith, the present high roads are marked by a *red*, the proposed lines of rail by a strong *blue* line.

4. The character of the Ghauts immediately south of Naikenary and Lallpet is very unfavourable to the passage of a railway. The height to be surmounted at this particular spot I take to be (with reference to other parts of the range) about a maximum. The table land above is relatively high; the plain at the foot, bordering on the vale of the Palaur, is relatively low, and the total difference of elevation between the top and bottom is from 900 to 1,000 feet. The Ghauts, as might be expected, display in this neighbourhood features on a large scale, and more formidable difficulties present themselves to a railway projector. It appears practicable, though not without very serious expense, to run a line (marked by a blue dotted line) up from the neighbourhood of Lallpet by a valley (more open than the rest), at the head of which stands the village of Nunyalum; but, though practicable, I see nothing else to recommend it, in the present case.

5. From hence, proceeding southward, passing Ambour and Vaniembady, the Ghauts everywhere present an abrupt front; near the latter place, indeed, as seen from below, they assume almost the appearance of a natural retaining wall, the face of which has been deeply furrowed by the fall of water from above. The village passes in this neighbourhood are exceedingly steep and strong; in all cases very difficult; in some, impracticable for pack cattle, dangerous even for a led horse.

6. In this portion of the Ghaut, the Palaur comes down on to the plain below. Its course, not only where it passes down the Ghauts, but for several miles above (before it reaches their crest), is marked by steep and rocky hills, covered with thick jungle, giving no opening or encouragement whatever for a line of railway.

7. South of Vaniembady, the Ghauts take a sweep round in a direction somewhat north of west, which they continue for about twenty-five or thirty miles. At or near this bend I find two places, in either of which it seems perfectly practicable to carry on a line of railway. These have been marked in the accompanying map by a red and a yellow dotted line respectively.

8. Following on the line of the Ghauts, I discover no favourable opening till beyond Kishnagherry, where, at or near a village now deserted, but marked "Keridody" on the maps, there appear to be considerable facilities upon two or three lines for carrying a railway up from the plain about Kishnagherry to

Indian Railways. the Mysore country. The general direction of these lines is indicated on the accompanying map by lines dotted black.

Governor General
to E. I. Company.

Enclosure.

9. Between this point and Sholagherry the country becomes again very unfavourable, and the rugged belt of Ghaut, which is in some places limited to three or four miles, here becomes much broader, the country being broken and hilly for a breadth varying from seven to ten miles. The pass near Sholagherry, by which the present high road ascends the Ghauts, is unfavourable for a railway.

10. It thus appears that, between Naikenary and Sholagherry, there are several points at which a railway might be carried up without serious difficulty. In only one of these, however, should I anticipate so good or so cheap a line as that which I have selected near Palmanair; while the whole of them are so far from the course of any of the proposed trunk lines, as to place them out of the question for our present purpose. The day may come when some one of these may be taken advantage of for a branch line, but they would lead us too far out of our way now.

11. It will be observed on a reference to my report of the 5th March 1851, (par. 9) and the sketch which accompanied it, that in the completion of the principal trunk lines required in this presidency, two passes up these Ghauts, and only two, would be required—one upon the line from Madras, towards the west and north-west (Bangalore and Bellary); the other upon a line passing up the middle of the peninsula, connecting its southern and central districts with Hyderabad, Nagpore, and the north west. For the first of these, the pass near Palmanair is in the best situation; for the other, it is probable that a way down the Ghauts may be discovered hereafter, near Rutnagherry or Royacottah. Those near Vaniembady, which I have now described, are, it will be seen, far removed from either of these lines.

12. I have mentioned that only one of these passes would be likely to prove as good and cheap as that proposed near Palmanair. This one which is marked on the map by a line dotted yellow, deserves more particular notice, were it only as offering a remarkably favourable line for a common road.

13. Although not shown on any of the maps that I have seen, there is, at the present time, and has been for many years, a cart road on this line, by which the produce of the Kongoondy zemindaree is brought down to Vaniembady. There is a tolerable road over an easy country from Coppum (six miles west of Kongoondy), to the top of the Ghaut, near the village of Sadainoor—from thence the descent is effected by a road running parallel to, and occasionally in, the bed of a stream of no great magnitude, which passes down into the low country, with an apparent uniform fall, the character of which is indicated by the fine sand which forms its bed throughout. In fact there is a cleft in the Ghaut at this point, through which the stream passes this natural opening, so small as to be not distinguishable a short distance off, resembling otherwise the remarkable gap in the western Ghauts at Palghaut. The road, which as far as I can see, is wholly a natural pass, presents from bottom to top one continued and uniformly easy slope, without, in any single case, the appearance of steepness or difficulty, and is at the present moment an easier pass for a loaded bandy than any that I have seen, either on these or the western Ghauts. Had this been known before the adoption of the Sholagherry line, I cannot doubt but that the high road to Bangalore would have been carried by this route, the country being perfectly favourable the whole way, and the distance certainly not greater than by the present road.

14. It only remains for me to report that my examination of the country between Bangalore and Palmanair has been very satisfactory; the line which seems to me the most eligible for a continuation of that from Madras to Palmanair, is shown in the accompanying sheet of the atlas,—it crosses in its course three distinct valleys, that of the Gorjattum river near Palmanair, that of the Palaur between Moolwagle and Colar, and that of the Pennumkeney, between the latter place and Bangalore. These valleys with their intervening ridges constitute the principal features on the line, but the whole country is made up of minor undulations involving, in the construction of a railroad a considerable amount of earthwork.

15. A general view of the Mysore country would produce an impression of difficulty in the way of railway work, in consequence of the frequent appearance of surface rocks, but the character of the country varies much, and while in

some places the undulations appear to consist of nothing but solid rock, in others clay or loam is found to overlie the rock to a very great depth, and the line which I have now looked at appears very favourable in this respect. I should expect an average depth of earthwork of eight or ten feet to give gradients nowhere exceeding 25 feet in the mile. Bangalore is about 900 feet above Palmanair, the distance on the proposed line 80 miles, the average rise therefore 11 feet in the mile, but the greater part of the rise is effected upon the first 30 miles from Palmanair.

Indian Railways.
 Governor General
 to E. I. Company.
 Enclosure.

16. It may be well to refer again briefly to the question of the proper direction for the first line of railway. In doing so it may save trouble if I recapitulate some statements and opinions that have been already given by myself and other officers.

17. With a former report I submitted a sketch showing the general direction of the lines which would probably be considered of the first importance within the limit of this presidency, and presuming that the scheme there proposed is approved, it would now appear merely a question of time which line shall be constructed first.

5th March, 1851,
 par 9

18. The two most important of those lines, that from Bellary, and that from Vaniembady and Salem, are shown to form a junction within fifty or sixty miles of Madras, and thence to follow one trunk line.

19. There can be, I presume, no doubt as to this trunk line.

20. The question then arises whether from that point the line shall be carried on by Palmanair to Bangalore and Bellary—whether we should first construct that to Vaniembady—or whether we should do both as soon as possible.

21. The Honourable Court of Directors in their despatch to the Supreme Government (in the Financial Department, No. 17 of 1851,) dated 12th of March, desired that it should be explained that the survey of this line should have reference not to an experimental portion only, but to the ulterior destination of such a mode of conveyance; as forming part of a general system, the object of which would be to facilitate communication for political as well as commercial purposes, and to effect more ready intercourse with other presidencies.

22. In a former report I gave my opinion that the most important line as far as the interests of the country or Government are concerned, was that from Madras to or towards Bellary, having in view ultimate connexion with the Bombay Railways; but I added that as an experimental line it did not hold out such good promise of immediate results as one of less ultimate importance, viz., that to Vaniembady.

5th March, 1851,
 par 57

23. Mr. Bourdillon, in his report to Government, gives it as his opinion that we should begin with one complete line to the centre of the peninsula, as for instance Bellary or Bangalore, and subsequently if this complete line is not to be undertaken, proposes a line to Mooglee (in the direction above recommended), and a branch to Vellore or Vaniembady.

4th July, 1851,
 par 3

Par. 15.

24. Major Cotton writes strongly in favour of the direction of Bellary.

25. At the time these several reports were made, the mode as well as the particular plan by which the Ghauts might be surmounted were altogether undetermined. Having now ascertained that a pass perfectly practicable for locomotive engines may be made near Palmanair, and that the approach through North Arcot to that pass can be made at much less cost than would have been anticipated from the known character of that district, additional weight is given to the arguments in favour of the Bangalore and Bellary line.

26. As, however I observed before, it is a mere question of which shall be done first, and it is perhaps of no great importance which is first taken in hand, since there can be no doubt of a rapid extension of the railway system when a beginning has once been made.

27. The capital raised by the Madras Railway Company amounts to 500,000*l.*, and I believe that sum laid down towards Vaniembady would meet with an earlier and better return than the same taken in the direction of Palmanair and Bangalore or Bellary; not only because that road is better fed by the highways of the country as they at present exist, but because lying over a very favourable country its construction would be cheaper. In other words the same amount of capital would make a larger railway.

28. On the other hand I am satisfied that the line to Bangalore and Bellary would be of far greater ultimate value to the country, as it is of much higher

Indian Railways.
 Governor General
 to E. I. Company.

Enclosure.

importance to the Government; and seeing that the Government has undertaken to secure to the company a liberal interest on their capital, there can be no doubt as to its right to determine the direction of the line, and in so doing, to consult its own interests and those of the people of the country.

29. The reasons then in favour of the Vaniembady line, are the cheapness of the construction, and the traffic now existing upon it.

30. The extent and fertility of the two districts of Mysore and Bellary, their distance from the coast, the importance of the military stations, the peculiar nature of the chief agricultural product of Bellary and the neighbouring district of Cuddopah, viz., cotton—the circumstance that such a line would tend directly to a connexion with the western presidency; all plead strongly in favour of the Palmanair line.

* Par. 14 "Suppose
 three-fourths of
 that quantity to
 come from Banga-
 lore and Mysore.

31. The traffic from the Mysore country towards Madras at present is not great, and is, I apprehend, over-estimated by many, as it has been by Mr. Bourdillon, in his letter to Government* of the 4th July, 1851; but possessing a fine climate—enjoying periodical rains, which rarely (if ever) fail—extensively irrigated by an immense number of tanks—there is sufficient evidence of this traffic being susceptible of large increase in sugar, sooparee, coffee, cotton, silk, wool, &c.; while the peculiar character of its climate is further shown in the extensive cultivation of potatoes among the natives, and that of other foreign fruits and vegetables among European residents, the export of which to the coast and the districts below the Ghauts appears only limited by the present imperfect means of transport.

32. Having thus determined the best pass up the Ghauts, and considered the relative claims and merits of the two principal lines proposed, I conclude that the best mode in which the railway company could commence operations would be by undertaking the line to Palmanair and Bangalore, with a branch to Vellore and Vaniembady, and that the branch should take off from Menil.

33. Upon this latter point, it is necessary that I should offer a few words of explanation. In an extract from Minutes of Consultation in the Public Department, (No. 35, dated 12th January, 1852, paragraph 7,) I was instructed to "study to carry the trunk road as far forward as it can conveniently serve in common for a line in that direction, as well for one by Vellore to Vaniembady." In carrying out these instructions I expected to run it nearly to the Poiney River, *i.e.*, about sixty-five miles from Madras.

34. I find, however, that after Menil (forty-eight miles from Madras) that line rapidly steepens, and within a few miles assumes quite a different character in regard to gradients. If, therefore, the trunk line were carried beyond Menil, and near the river, the communication between Madras and Vellore would be broken at that one place by some stiff gradients, which would rule the whole line, and prove very prejudicial; whereas if the branch were made from Menil, the whole line from Madras, even to Vaniembady, would be homogeneous, characterized by gradients not exceeding 16 or 18 feet in the mile.

35. This is an important consideration, as affecting most materially the economical working of the line.

36. It may be said, however, that by thus striking off at the forty-eighth instead of the sixtieth mile, we render necessary the construction of twelve more miles of rail. Were this the case, the country being remarkably favourable, I should consider it money well spent in preserving the cheap workable character of the entire line; but, in fact, it is likely to prove otherwise, as I apprehend that before long the trunk line, and that alone, whether it is forty-eight or sixty miles, will have to be laid double, while single lines will, for many years to come, suffice for the others.

The line branching from Menil would sink rather to the south to avoid the Nelacontria cluster of hills, and would so pass at Ammoor, within four miles of Arcot and Wallajahnuggur.

37. It is of great importance to the economical and successful working of a railway, that the character, as well as the extent of the line, or of any particular section of it, should admit of a locomotive engine doing a fair day's work at its full or nearly its full power. To ensure this, it is not only necessary that there should be sufficient length for it to work upon, but that there should be no ruling gradient, such as to compel the engine to run underweighted during the greater portion of the line.

38. For example, if the line which I propose as far as Menil, with gradients

never exceeding 17 feet in a mile, were broken about midway by one of 20 or 25 feet on a length of one mile, it is evident that to meet this the engines must travel throughout the whole of the remaining forty-seven miles under-weighted.

39. I conceive that the lines which I now propose as a commencement would work very economically. They would consist of five parts.

	Miles.
1st. A trunk line to Menil - - -	48
2nd. A branch to Vellore and Vaniembady - - -	70
3rd. The trunk line continued to the foot of the Ghaut	53
4th. The Ghaut near Palmanair - - -	4
5th. From the top of the Ghaut to Bangalore - - -	84
	259

40. In working the first of these (the trunk line to Menil) it would be necessary to provide power to convey the *whole* of the traffic inland from Madras. The gradients not exceeding 17 feet in the mile, engines of moderate power would do this. The second (the branch to Vellore and Vaniembady) would receive only a portion of the above traffic, and the gradients remaining equally favourable, a much lighter engine might be substituted, and would have fair work in running to Vaniembady.

On the third portion (the trunk line continued to the foot of the Ghaut) the average rise is greater, and the gradients are consequently steeper, viz., 25 or 30 feet in the mile; but the same engine which carried a train of 80 or 100 tons (gross) from Madras to Menil, would carry up their steeper gradients that train reduced by the waggons turned off towards Vellore. The engine would thus find a good day's work in running from Madras to the bottom of the Ghaut, being 101 miles.

For the fourth portion (the Ghaut itself), an engine of special construction, of greater power and less speed, must be provided.

The fifth portion, being eighty-four miles from the top of the Ghaut to Bangalore, would require an engine similar to those used below the Ghauts.

41. The lines above proposed for first construction, amount to nearly 260 miles in length. Taking the cost of construction and stocking at an average of Rs 40,000 per mile, would give the total capital required Rs.1,04,00,000, or something more than one million sterling. The interest on this at $4\frac{1}{2}$ per cent., amounts to Rs.4,68,000, which, if we take the working expenses at 50 per cent. on the receipts, would require an annual mileage of 57,600 tons upon the whole extent of way, or traffic of various kinds equivalent to it.

42. I have already shown that the traffic between Madras and Wallajahnuggur may be *even now* taken on a very reasonable estimate at 50,000 tons of goods, besides parcels and passengers; and, when I think of the vast influence the lines now proposed would exercise upon some of the finest districts in Southern India—the impulse they would give to education and commerce—of their importance also in a political point of view, I cannot doubt either of the success of the work as a speculation, or of the great and lasting benefits it is calculated to confer on all classes of people in this part of India.

I have, &c.

(Signed)

T. T. PEARS,
Railway Commissioner.

Madras,
27th October 1852.

Report March 5th,
1851, par 29

P.S. I beg to state, that the survey of the line to Palmanair has been, after many hindrances arising from the sickness of the surveyors and the frequent rains, at length completed, and the drawings are now in course of execution. The levels, which have been much delayed from similar causes, are also near completion, and, I trust, in a few days, to be in possession of all the necessary data for the preparation of the estimate.

(Signed)

T. T. PEARS,
Railway Commissioner.

Indian Railways.

From Major T. T. PEARS, C. B. Engineers, to the CHIEF SECRETARY to
Government, Fort Saint George.Governor General
to E. I. Company.

SIR,

Enclosure.

*Rs.17,69,693 3 0.

1. WITH reference to an extract from Minutes of Consultation, No. 812, in the Public Department, dated the 29th August, 1851, I have now the honour to forward, for submission to the Right Honourable the Governor in Council, a survey and estimate,* of the first forty-eight miles of a proposed trunk line of a railway, running westward from Madras as far as Menil.

2. In my report of the 4th July last, I recommended that should the Government desire, without any special reference to the town of Wallajahnuggur, to lay down the best trunk line westward, the line marked No. 2. (and shown in the map which accompanied that report) should be adopted, and carried out as far as Menil; leaving the question of its prolongation thence forward, whether by Ammoor or Sholinghur, to depend upon the determination of the best pass up the Ghauts.

3. The survey and estimate, now submitted, have been framed for a single line of railway, as far as Menil, 48 miles 5 furlongs from Madras. A further survey, from Menil to the top of the Ghauts, will be submitted as soon as I have ascertained in a satisfactory manner the best point and mode of ascent for a railway.

4. The line if carried to Menil, as now proposed, would start from the canal basin, near the north-west corner of Black Town, pass near the villages of Peramboor, Coratoor, Avady and Thodoor, and cross the present high-road, by Naggey, to Cudilapah, at a point about four miles south-east of Trivalloor. Skirting the northern bank of the Cooum, it then crosses the valley of the Coortilliar; ascending from which it reaches, at Moshoor, the high ground which forms the watershed between the Coortilliar and the Tritany rivers, which elevated ridge continues to offer a most convenient line for a railway, until it reaches the broken and hilly country between Sholinghur and the Poiney river.

5. This line offers no difficulties of any kind. The earthwork is light, the soil generally favourable. The total amount of earthwork in forty-eight miles and five furlongs, is—

* Appendix B.

Embankment*	-	-	-	793,495 yards
Cutting	-	-	-	362,364 „
			Total	<u>1,155,859</u> cubic yards,

or, 23,822 cubic yards per mile. This is nearly the same as that found on the line to Wallajahnuggur, reported on by me on the 4th July last; but the country on this line is nevertheless much more favourable; and the earthwork has been brought to nearly the same amount, in consequence of my having adopted much better gradients in this case.

6. By the table of gradients (A.) it will be seen that the steepest is only 1 in 309, and that the character of the country has admitted of my carrying the line from Madras to Menil (rising in the aggregate 360 feet) with only three counterslopes, of which one may be considered to all practical purposes level, and the other two might be got rid of at the expense of a little heavier earthwork.

7. The tanks, through which the line has been carried, are, in almost all cases, shallow enough to admit of the road being lifted above the highest water, without much embankment. In some few instances, I allow for cutting off a portion of the tank, by an addition to the bund.

8. I would observe, here, that the line shown in the accompanying survey has been laid down for the purpose of measurement and estimate, and as showing the probable general course for a railway.

9. It has been attempted, as much as possible, to avoid encroaching on the villages themselves, and the deeper portions of the most important tanks; but in laying down the line hereafter, it will probably be found both practicable and expedient to deviate in some places from that followed in the survey, and to cut through villages occasionally, where the character of the line is likely to be prejudiced by an attempt to pass clear of them; some such probable deviations are shown by dotted lines on the survey. These will only affect the estimate as shortening, and therefore cheapening it on the one hand, while something more might be required in compensation for lands and houses.

Appendix C.

10. The works of masonry are of the commonest and most trifling description, with the one exception of the bridge over the Coortilliar.

11. I recommend here a work of sufficient length to span the entire bed, and afford ample space with the least possible headway. I would propose therefore a bridge of thirty vents, of thirty feet each, with abutments and piers of brick and chunam, and iron or teak girders for the support of the road; which of these materials shall be used is a question of economy, to be determined upon inquiring into the probable cost of each. The construction of such a bridge is a work of the simplest kind, and for a single line of rails, the sum I have allowed, viz., Rs 50,000, will, I doubt not, be found ample. In the statement of bridges and drains, will be found a great number of irrigation channels. I have allowed, I believe, very liberally for these, both as to the number and individual cost.

Indian Railways.
Governor General
to E. I. Company
Enclosure.

12. The permanent way has been calculated on my former data, and I have entered in the present estimate the same relative amount, considering the different lengths of the two lines, for building and rolling stock and contingencies. This I have done, in order that a comparison may be readily made between the total cost per mile on the Menil line, and that shown upon the former survey; not as considering Menil a desirable terminus, or with any view of representing the line carried up to that point as a complete work.

Appendix D.

13. A comparison between the two estimates shows the following results:—

<i>Amount of Earthwork, per mile.</i>	
Wallajahnuggur Line	Cubic Yds. 24,342
Menil	„ 23,822
<i>Cost of Earthwork, per mile.</i>	
Wallajahnuggur Line	Rs. 2,300
Menil	„ 1,820
<i>Cost of Bridges and Drains, per mile.</i>	
Wallajahnuggur Line	Rs. 1,568
Menil	„ 1,530
<i>Total Cost, per mile, including Stock.</i>	
Wallajahnuggur Line	Rs 36,730
Menil	„ 36,488

14. It will be seen that though the amount of earthwork per mile is nearly the same, the cost differs. This arises from the actual depth of cutting and embankment being less on the Menil than on the other line.

15. The value and extent of land through which the line passes are shown in the following statement:—

Munjah	-	-	-	24,861	Yards.
Punjab	-	-	-	12,410	„
Manium	-	-	-	1,636	„
Tope	-	-	-	520	„
Garden	-	-	-	133 $\frac{1}{3}$	„
Waste	-	-	-	45,922 $\frac{1}{3}$	„

Assuming, as in my former estimate, twenty-five yards as the average breadth of land required, the following would be the superficial extent of land of each kind taken for the work:—

Munjah	-	-	-	97,066	Cawnies.
Punjab	-	-	-	48,476	„
Manium	-	-	-	6,390	„
Tope	-	-	-	2,033	„
Garden	-	-	-	0,520	„
Waste	-	-	-	179,657	„

The estimated full value of the above, at the rates before assumed, would be as follows:

Nature of Land.	Rate.	Total Value.
Munjah, at per Cawnie,	Rs. 175	- Rs. 16,986
Punjab, ditto	50	2,423
Manium, ditto	175	1,118
Tope, ditto	100	203
Garden ditto	175	90
Waste	-	-

Total value of land, Rs. 20,820

or, about Rs. 428, per mile.

Indian Railways.

Governor General
to E. I. Company.

Enclosure.

16. I cannot pretend to great accuracy in this calculation, but I have attempted to allow sufficient for the full and absolute value of the land, and its probable cost to the railway, including the Government claim upon it, as well as the purchase of the tenant-right, the latter being a very variable quantity, and very difficult to ascertain satisfactorily.

17. I have not considered it necessary to enter again upon the subject of the traffic, the working expenses and profits. The statements and calculations, submitted with my report of the 5th March 1851, will apply with equal force to any line running from Madras westward, and monopolizing all the traffic between that port and the central districts of the peninsula, Bellary, Cuddapah, Mysore, Salem, and North Arcot.

18. The gradients on the line by Menil, being of a much better character than those on the Wallajahnuggur line, the working expenses would of course be proportionably lighter; so far, therefore, in an estimate of profits, this line would have the advantage.

19. The circumstance alluded to in the sixtieth paragraph of my Report of 5th March 1851, respecting the fall of the line being with the bulk of the traffic, is strikingly illustrated by the section now submitted. There will be seen an almost unbroken and steady fall from west to east, along the whole forty-eight miles. Since, in the total estimated traffic on this line, the amount running towards the east is to the return traffic nearly as 10 to 7, the above constitutes a very favourable feature in the working prospects of the line.

20. The extension of the line from Menil to whatever point may in the first instance be selected as a terminus, whether Vallore, Vaniembady, Gorriattum, or Palmanair, will be effected under circumstances more or less favourable, according to the result of that selection, and to the direction taken for a pass up the Ghauts; but it is to be observed that whatever may be the result of the deliberations on the above points, the extension from Menil will be made under at least as favourable circumstances as it would be on the Wallajahnuggur line.

21. If, for example, the result of my present examination of the Ghauts should lead to the adoption of the line of the Palaur for the trunk line, the run from Menil to Vellore, by Ammoor, would be across a most favourable country. If, on the other hand, it is determined to carry the line through North Arcot to, or near to, Palmanair, the position of Menil is much more favourable for such an extension than Wallajahnuggur would be. In this case, our course would be by Quodekel, near Sholinghur, to some convenient point near the left bank of the Poiney, from whence divergent lines might be carried to Palmanair on the one hand, Vellore and Vaniembady on the other.

22. Under any circumstances, therefore, this line to Menil appears the best for a trunk line.

23. In recommending this project to most favourable consideration on the part of Government, I would briefly remark on the many circumstances that conspire to prompt and encourage an undertaking of this nature in this part of the country, and at this juncture.

24. The character of the country is most favourable; labour is cheap and abundant; there are no costly or difficult works required.

For viaducts simple embankments, for bridges unpretending structures of brick and chunam, as they are the simplest, so they are the cheapest works we could construct for the purpose. We have no navigable rivers, and none that are not dry, or nearly so, during a great part of the year. We are at liberty therefore, to apply works of the cheapest and plainest description in carrying a railroad across them, laying the foundations, and raising the piers, on dry beds.

25. The greater part of the land is of small value—much of it of no value at all, and not likely for many years to be turned to so profitable an account as in carrying a railway.

26. Iron also is, or was very lately, cheaper in England than it has been for many years; I believe I may say than it ever was before. We may reasonably doubt whether it will long remain at so low a figure; at all events, the proportion which, in the Madras Railway, the rails would bear to the whole cost, renders this circumstance one of great importance, and deserving of early consideration.

27. In this part of the country the railway carried at once far enough towards the interior, would literally meet with no competition. There are no canals, and but few good roads.

28. It is obvious, therefore, that this line would commence operations under peculiarly favourable circumstances. It would not only monopolize the entire

I learn from the public papers that tenders have been made to deliver rails at Alexandria for the Egyptian Railway, at 5*l*. and 5*l*. 2*s*. 6*d*. per ton.

existing modes of transport, would attract largely from all directions, and would have the vast resources of this country, hitherto but partially developed, to draw upon, for an increase in the amount of traffic. I shall not, to prove the probability of such increase taking place, trouble Government with arguments familiar to all, and drawn from the examples of rails in Europe, but merely observe, if the increase in traffic in England, where the rails had to contend with a very perfect system of transport, has been in every case large beyond all expectation, we are entitled to assume, that under our circumstances, such increase would take place in a much higher ratio. We advance, at once, from roads of an inferior description, pack cattle and bullock bandies, to the locomotive engine and its train of waggons.

29. The proposal to lay down this line of railway has excited much interest among the natives, with many of whom I have conversed on the subject. The benefits that would arise from such a work are fully understood, and are readily acknowledged. The effect upon the people produced by one such work in operation would be very beneficial; while the Government would have, in the experience gained in its construction, as well as the commercial and social statistics furnished in the course of its working, a good basis for their deliberations on further similar projects.

30. Among the advantages possessed by us here, must not be forgotten the cheapness of labour of almost every kind, as required in the management of a railway.

31. With the exception of one department (the driver's) which must, at the outset be supplied entirely from England, the heads of departments would alone be required from home. With a few good mechanics and platelayers, as instructors, the Indo-Britons and natives would be found well fitted for any and every duty connected with a railway. Active, steady, intelligent men as Lascars (porters) or policemen, may be had for six or seven rupees a month. Common labourers to assist in the repairs of the way and works will be well paid with five rupees per month; and for this sum a class of men, not easily surpassed in activity or natural intelligence, in the quick eye, and steady hand, may be obtained to an almost unlimited extent, in the Madras cooly. I doubt not that the arsenal of Fort Saint George, and the gun carriage manufactory will show a number of men, of these classes, quick to learn, and ready to perform, any duties (not involving actual mechanical skill) required of them, in the various departments of a railway.

32. Higher pay would of course be required for mechanics, but of those too there would be no want. The extended field, offered by a railway department would affect not only the number, but the character and qualifications of the mechanics of Madras, and the supply would, I have no doubt, keep pace with the demand.

33. The railway offers, indeed, a gratifying prospect of useful and honourable occupation to the members of the Indo-British community; while that community, on the other hand, presents itself at once as the source to which we may confidently look for valuable public servants in every department.

34. In conclusion, I take this opportunity of reporting, that my examination of the Ghauts, as far as it has yet been carried, has proved much more satisfactory than I had anticipated.

35. I am not yet prepared to pronounce decisively, either upon the best line, or the best mode of ascending them; but I am satisfied that the passage up can be effected with little difficulty. We shall, I believe, require no works of serious cost or magnitude—no tunnels—but shall probably run the rail by an incline perfectly practicable for locomotives of special construction, the whole way up from the plain below to the general level of the Bala Ghaut.

36. I have arrived at this conclusion from a partial examination of the Ghauts in this neighbourhood; and, although the most favourable line for ascending the Ghauts may not prove the most favourable for approach to them, I am very sanguine that the difficulty will be got over, at much less cost than has been generally anticipated.

37. Should the Government determine on sanctioning this line of railway, I would recommend that attention be given to the completion of the first twenty-four miles and three quarters from Madras to a station near Trivalloor (and Tripasoor), and opening that portion as soon as possible. There would be found a considerable passenger traffic so far, in connexion with Trivalloor, Tripatty and Cuddapah, and besides the local traffic in firewood and ordinary agricultural produce, the contemplated improvement in the Naggery line of

Indian Railways.
Governor General
to E. I. Company.

Enclosure.

road, would probably throw an increased amount of goods traffic upon the rail at that point.

38. This first section of the line falls short of the Coortilliar river, and the works would consist merely of earthwork, and small works of masonry.

39. The line might subsequently be opened as far as Menil; to which point, by making some improvements on the present country roads, the traffic now taking the Wallajahnuggur road (or a great portion of it) might be drawn, until such further extension of the line took place as should take up that traffic completely, at Vellore, or other approved terminus.

40. It will be observed, that though the outlay upon 60 or 100 miles of railroad at Rs. 36,488 per mile is large, the actual sum expended upon the works, earth and masonry, is comparatively small; and consequently the demand for labour is not likely to be large enough to create any embarrassment, or to enhance in any great degree its cost. The earthwork, for example, amounts to about 1,160,000 cubic yards, which, assuming the small amount of two yards per diem for each man, would require less than 200 men for its completion in 300 days. I have been lately engaged in collecting information upon the capabilities of the neighbouring districts, in regard to the supply of labour and material; but there can be no doubt of a far greater amount of labour than this being available, if required, in the districts through which this line would pass, or in those adjacent. It may be as well, however, to observe that the cost of a work of this nature, if executed by Government, might be somewhat reduced by a judicious employment of convicts—the larger buildings, ultimately required at the principal stations, being at once built for their shelter and security. The services of a company of sappers would be of the greatest importance. I should employ them on this as on all similar occasions, entirely as artizans or superintendents. If not well qualified for such duties, (as I believe most of them now are,) their employment upon any public work in an inferior capacity appears to me a waste of money.

41. I should anticipate great advantages from their services, not only from their skill in various handicrafts, as carpenters, chucklers, brick and tile makers, &c., rendering us, in a great measure, independent of any possible temporary strike among the daily labourers of these classes, but also from their characteristic intelligence, general usefulness, and perhaps, more than all, from the means afforded us of introducing, through their agency, order and regularity into the management of large bodies of workmen—a point which is of the utmost importance in the conduct of large works, and one in which, unfortunately, the ordinary native superintendents very generally, and entirely, fail.

The honour of taking a leading part in the construction of the first railway in Southern India is not only well deserved, but would, I doubt not, be fully appreciated by that distinguished body of men.

I have, &c.

Poiney, 15th December 1851.

(Signed)

T. T. PEARS,

Major Engineers.

ABSTRACT STATEMENT of the probable cost of constructing and stocking a Single Line of Railway between Madras and Menil.

Nature of the Work.	Amount.			Remarks.
	Rs.	a.	p.	
Earthwork, embankment	57,633	7	0	
Ditto cutting	30,321	1	0	
Stone facings	7,179	0	0	
Side drains	16,444	11	0	
Foot bridges	31,000	0	0	
Level crossings	4,800	0	0	
Bridges and drains	74,215	0	0	
Catch drains	1,200	0	0	
Fencing, inclusive of 1,100 yards of wall	5,700	0	0	
Permanent way	9,50,000	0	0	
Rolling stock	2,20,000	0	0	
Water tanks	5,000	0	0	
Switches, crossings, guard rails, &c.	3,200	0	0	
Buildings and stations	1,20,000	0	0	
Turn tables, travelling platforms, and rails for ditto	8,000	0	0	
Furniture fittings, tools	40,000	0	0	
Superintendence	1,15,000	0	0	
Contingencies	80,000	0	0	
Total	17,69,693	3	0	

(Signed)

T. T. PEARS.

APPENDIX A.—TABLE of PLANES on the proposed Line of Railroad from Madras to
Merril.Indian Railways
Governor General
to E. I. Company.Enclosure

No. of Planes	Length in Yards.	Rate of Inclination.		REMARKS
		Rise.	Fall.	
1	1,266 $\frac{1}{2}$	Level,		
2	863 $\frac{1}{2}$	1 in 942		
3	3,427 $\frac{1}{2}$	1 in 551		
4	885 $\frac{2}{3}$	Level.		
5	658 $\frac{1}{2}$	1 in 1,795		
6	933 $\frac{1}{2}$	1 in 493		
7	1,483 $\frac{1}{2}$	1 in 3,134		
8	1,488 $\frac{2}{3}$	1 in 744		
9	1,313 $\frac{1}{2}$	1 in 24,625		
10	2,272 $\frac{1}{2}$	1 in 643		
11	140	Level.		
12	1,001 $\frac{1}{2}$	-	1 in 673	
13	348 $\frac{2}{3}$	Level.		
14	2,377 $\frac{2}{3}$	1 in 430		
15	2,660	1 in 407		
16	880	Level		
17	2,420	1 in 395		
18	353 $\frac{1}{2}$	Level.		
19	980	-	1 in 479	
20	1,426 $\frac{2}{3}$	1 in 966		
21	1,200	1 in 8,780		
22	880	1 in 596		
23	2,920	1 in 953		
24	2,624 $\frac{1}{2}$	Level.		
25	1,055 $\frac{2}{3}$	1 in 1,919		
26	660	1 in 1,261		
27	4,400	1 in 590		
28	880	1 in 696		
29	2,420	-	1 in 6,482	
30	2,640	1 in 2,010		
31	1,702	1 in 622		
32	276	1 in 4,140		
33	1,777	1 in 26,655		
34	911 $\frac{1}{2}$	1 in 882		
35	2,703	1 in 657		
36	498	1 in 4,980		
37	5,332	1 in 11,676		
38	1,540	1 in 658		
39	1,465	1 in 493		
40	15,035	1 in 309		
41	880	1 in 10,560		
42	2,640	1 in 387		
43	3,933 $\frac{1}{2}$	1 in 10,260		

(Signed.) T. T. PEARS

APPENDIX B.—ESTIMATE of the probable Cost of Earthwork, Drains,

Indian Railways.

Governor General
to E. I. Company.

Enclosure.

No. of Miles.		Description of Soil.	Embankment.				Cutting.					
Miles.	Furlongs.		Length in yards.	Cubical contents in yards.	Average height	Rate per cubic yard.	Amount.	Length in yards.	Cubical content in yards.	Average depth	Rate per cubic yard.	Amount.
					in feet.					in feet.		
1	-	Soft clay	1760	11,661	2 6	0 1 0	728 13	-	-	-	-	-
2	-	Ditto	-	-	-	-	-	13	50	1 6	0 0 10	2 10
-	-	Ditto	1747	13,483	2 9	0 1 0	842 11	-	-	-	-	-
3	-	Ditto	-	-	-	-	-	80	225	1 3	0 0 10	11 12
-	-	Ditto	1662½	16,799	3 6	0 1 0	1,049 15	-	-	-	-	-
4	-	Loose, sandy, and alluvial	1751	22,170	4 3	0 1 0	1,385 10	-	-	-	-	-
5	-	Ditto	-	-	-	-	-	22½	23	0 6	0 0 10	1 3
-	-	Ditto	1737½	8659	2 0	0 0 11	496 1	-	-	-	-	-
6	-	Loose, sandy	-	-	-	-	-	68	364	1 6	0 0 10	13 12
-	-	Ditto	1692	21,141	4 3	0 1 0	1,321 5	-	-	-	-	-
7	-	Ditto	1760	18,038	3 9	0 1 0	1,127 6	-	-	-	-	-
8	-	Loose sand and laterite gravel	1760	32,429	5 9	0 1 2	2,304 10	-	-	-	-	-
9	-	Laterite gravel	-	-	-	-	-	1027½	37,982	9 3	0 2 0	4,747 12
-	-	Loose, sandy	692½	24,082	8 9	0 1 6	2,257 11	-	-	-	-	-
10	-	Ditto	-	-	-	-	-	415½	4,711	4 0	0 0 1	294 7
-	-	Clayey	1344½	45,820	8 9	0 1 6	4,293 10	-	-	-	-	-
11	-	Red earth and gravelly	-	-	-	-	-	646	2,312	1 6	0 0 10	120 7
-	-	Loose, sandy	1094	6,804	2 4	0 1 0	425 4	-	-	-	-	-
12	-	Laterite gravel and light soft soil	-	-	-	-	-	1,150	23,054	6 0	0 1 2	1,661 6
-	-	Ditto ditto	610	4,430	2 9	0 1 0	230 0	-	-	-	-	-
13	-	Light soft soil	-	-	-	-	-	270	10,895	9 9	0 1 6	1,021 7
-	-	Ditto	1490	42,231	7 9	0 1 4	3,519 4	-	-	-	-	-
14	-	Ditto	-	-	-	-	-	780	17,898	6 4	0 1 2	1,232 12
-	-	Ditto	980	11,927	4 3	0 1 0	745 7	-	-	-	-	-
15	-	Ditto	-	-	-	-	-	700	15,915	6 4	0 1 2	1,160 7
-	-	Ditto	1060	28,126	7 6	0 1 4	2,345 13	-	-	-	-	-
16	-	Ditto	-	-	-	-	-	136½	133	0 3	0 0 10	6 15
-	-	Ditto	1620½	8,779	2 3	0 1 0	543 11	-	-	-	-	-
17	-	Ditto	-	-	-	-	-	880	10,787	0 6	0 0 10	561 12
-	-	Ditto	660	4,069	2 4	0 1 0	254 5	-	-	-	-	-
18	-	Ditto	-	-	-	-	-	432	4,351	3 9	0 1 0	271 14
-	-	Ditto	1290	29,084	6 6	0 1 2	2,120 11	-	-	-	-	-
19	-	Ditto	-	-	-	-	-	1,570	23,064	5 0	0 1 1	1,602 12
-	-	Ditto	170	1495	3 3	0 1 0	93 7	-	-	-	-	-
20	-	Ditto	-	-	-	-	-	110	112	0 6	0 0 10	5 13
-	-	Ditto	1650	21,108	4 3	0 1 0	1,319 4	-	-	-	-	-
21	-	Ditto	1760	9,084	3 0	0 0 11	520 7	-	-	-	-	-
22	-	Clayey and soft light soil	-	-	-	-	-	8½	41	2 0	0 0 11	2 6
-	-	Ditto	1751½	35,362	8 0	0 1 4	2,946 13	-	-	-	-	-
23	-	Ditto	-	-	-	-	-	163	1167	2 9	0 1 0	73 11
-	-	Ditto	1597	24,550	5 0	0 1 1	1,602 4	-	-	-	-	-
24	-	Soft loose soil	-	-	-	-	-	1090	42,443	9 6	0 1 6	3079 6
-	-	Ditto	536½	1,246	1 0	0 0 10	64 14	-	-	-	-	-

Bridges, &c., on the proposed line of Railway between Madras and Menil.

Indian Railways
 Governor General
 to E. I. Company
 Enclosure

Stone facing.				Side drains late-rite rough stone in brick and chunam.		Drains, bridges, &c. vide statement		Foot bridges		Level crossings.		Total	Remarks.
Length in yards.	Cubical contents in yards	Rate per cubic yard.	Amount	Length in yards	Amount	Number	Amount	Number.	Amount	Number.	Amount.		
		R. a. p.	R. a.		R. a.		R. a.		R. a.		R. a.	R. a.	
-	-	-	-	-	-	-	-	1	1000 0	3	450 0	2,178 13	
150	270	1 0 0	270 0	-	-	1	100 0	2	2000 0	1	150 0	} 3,365 5	
-	-	-	-	-	-	-	-	-	-	-	-		
103	157 1/2	1 0 0	157 8	-	-	2	250 0	1	1000 0	1	150 0	} 2,619 3	
-	-	-	-	-	-	-	-	-	-	-	-		
352	440	0 13 0	390 0	-	-	2	350 0	-	-	-	-	2,065 10	
-	-	-	-	-	-	6	630 0	1	1000 0	1	150 0	} 2,277 4	
-	-	-	-	-	-	1	100 0	-	-	-	-		
-	-	-	-	-	-	-	-	-	-	-	-	} 1,435 1	
480	360	0 13 0	270 0	-	-	2	200 0	1	1000 0	1	150 0		2,747 6
-	-	-	-	-	-	7	850 0	-	-	1	150 0	3,564 10	
600	1,200	0 13 0	900 0	2054 1/2	2054 11	1	750 0	-	-	-	-	} 10,710 2	
-	-	-	-	-	-	-	-	-	-	-	-		
400	2	0 13 0	150 0	-	-	2	850 0	1	1000 0	-	-	} 6,590 1	
-	-	-	-	-	-	1	850 0	-	-	1	150 0		
-	-	-	-	-	-	-	-	-	-	-	-	} 1,045 11	
-	-	-	-	2300	2300 0	1	300 0	1	1000 0	1	150 0		5,711 0
-	-	-	-	540	540 0	2	545 0	1	1000 0	1	150 0	} 6,775 11	
-	-	-	-	1560	1560 0	2	515 0	1	1000 0	-	-		5,103 3
600	900	0 13 0	675 0	1400	1400 0	2	595 0	-	-	1	150 0	} 6,324 4	
-	-	-	-	-	-	2	200 0	1	1000 0	-	-		1,755 10
-	-	-	-	-	-	1	225 0	-	-	-	-	} 1,041 2	
-	-	-	-	-	-	2	325 0	1	1000 0	-	-		3,717 0
100	150	0 13 0	113 8	-	-	-	-	1	1000 0	1	150 0	} 2,958 3	
400	600	0 13 0	517 8	-	-	5	1,200 0	-	-	-	-		} 3,042 0
-	-	-	-	-	-	3	300 0	1	1000 0	-	-	1,820 7	
800	1,200	0 13 0	900 0	-	-	5	625 0	1	1000 0	1	150 0	} 5,624 3	
-	-	-	-	-	-	2	510 0	1	1000 0	1	150 0		3,304 15
-	-	-	-	2180	2,180	-	-	-	-	-	-	} 6,233 14	
-	-	-	-	-	-	5	300 0	1	1000 0	1	150 0		2,568 3

Indian Railways.

Appendix B.—Estimate of the probable Cost of Earthwork, Drains,

Governor General
to E. I. Company.

Enclosure.

No of Miles		Description of Soil.	Embankment.				Cutting.					
Miles.	Furlongs.		Length in yards.	Cubical contents in yards.	Average height in feet	Rate per cubic yard.	Amount.	Length in yards.	Cubical contents in yards.	Average depth in feet.	Rate per cubic yard.	Amount.
				Ft. In.	R. a. p.	R. a.			Ft. In.	R. a. p.	R. a.	
26		Soft loose soil	1760	6,564	1 4	0 0 10	341 14	-	-	-	-	-
27		Ditto	-	-	-	-	-	52	184	1 6	0 0 10	9 9
		Ditto	1708	16,103	3 6	0 1 0	1006 7	-	-	-	-	-
28		Ditto	-	-	-	-	-	123½	419	1 6	0 0 10	21 13
		Ditto	1636½	12,540	2 9	0 1 0	783 12	-	-	-	-	-
29		Ditto	1760	18,944	3 9	0 1 0	1,184 0	-	-	-	-	-
30		Ditto	-	-	-	-	-	18½	12	0 3	0 0 10	0 10
		Ditto	1741½	19,559	3 0	0 1 0	1,222 7	-	-	-	-	-
31		Ditto	1494½	14,062	3 6	0 1 0	678 14	-	-	-	-	-
32		Ditto	-	-	-	-	-	99	273	1 3	0 0 10	14 4
		Ditto	1661	13,538	3 0	0 1 0	846 2	-	-	-	-	-
33		Ditto	1760	16,486	3 6	0 1 0	1,030 6	-	-	-	-	-
34		Clayey	1760	26,033	4 9	0 1 1	1,763 10	-	-	-	-	-
35		Soft loose soil	-	-	-	-	-	440	961	1 0	0 0 10	50 1
		Ditto	1320	5,716	1 3	0 0 10	297 11	-	-	-	-	-
36		Gravelly, stony, and soft clay	1740	23,673	4 6	0 1 1	1,602 14	-	-	-	-	-
37		Ditto ditto	-	-	-	-	-	480	3745	3 0	0 1 1	253 9
		Ditto ditto	1280	23,456	5 9	0 1 2	1,716 5	-	-	-	-	-
38		Gravelly, stony, and calyey	-	-	-	-	-	160	563	1 6	0 0 11	31 13
		Ditto ditto	1600	47,193	3 0	0 1 6	4,424 6	-	-	-	-	-
39		Clayey and gravelly hard soil	-	-	-	-	-	510	2511	3 0	0 1 1	170 0
		Ditto ditto	1250	8,979	2 6	0 1 1	607 15	-	-	-	-	-
40		Gravelly hard soil	-	-	-	-	-	1760	13,900	3 0	0 1 3	1,013 3
41		Gravelly and clayey	-	-	-	-	-	1100	29,161	7 0	0 1 4	2,430 1
		Ditto	660	15,275	6 6	0 1 6	1,273 15	-	-	-	-	-
42		Clayey gravelly hard soil	-	-	-	-	-	720	4161	2 3	0 1 1	281 12
		Ditto	820	7,796	3 6	0 1 2	563 7	-	-	-	-	-
43		Gravelly hard soil	-	-	-	-	-	900	6240	3 9	0 1 2	455 0
		Ditto	860	3,231	1 6	0 1 1	218 3	-	-	-	-	-
44		Ditto	-	-	-	-	-	1405	22,287	5 0	0 1 3	1,741 3
		Ditto	355	2,072	2 6	0 1 1	140 5	-	-	-	-	-
45		Ditto	-	-	-	-	-	1050	36,376	3 9	0 1 6	3,419 14
		Ditto	710	11,053	5 0	0 1 3	863 8	-	-	-	-	-
46		Ditto	-	-	-	-	-	1090	13,891	4 3	0 1 3	1,013 14
		Ditto	670	4,776	2 6	0 1 1	323 6	-	-	-	-	-
47		Ditto	-	-	-	-	-	1055	24,983	6 9	0 1 4	2,081 13
		Ditto	705	11,799	5 3	0 1 3	921 13	-	-	-	-	-
48		Ditto	-	-	-	-	-	610	6324	4 0	0 1 2	501 15
		Ditto	1150	13,362	4 0	0 1 2	974 5	-	-	-	-	-
49	4½	Ditto	1073½	13,967	4 6	0 1 2	1,013 7	-	-	-	-	-
Total			-	793,495	-	-	57,633 7	-	362,364	-	-	9321

Bridges, &c., on the proposed line of Railway between Madras and Menul—continued

Indian Railways.
Governor General
to E. I. Company
Enclosure

Stone facing				Side drains late-rite rough stone in brick and chunam		Drains, bridges &c., vide statement		Foot bridges.		Level crossings		Total	Remarks
Length in yards	Cubical contents in yards	Rate per cubic yard.	Amount	Length in yards	Amount	Number	Amount	Number	Amount	Number	Amount		
		R. a. p.	R. a.		R. a.		R. a.		R. a.		R. a.	R. a.	
-	-	-	-	-	-	5	690 0	1	1000 0	1	150 0	2,181 14	
32	57	0 12 0	380 4	-	-	-	-	-	-	1	150 0	1,546 4	
11.3	1348	0 12 0	1,007 4	-	-	3	535 0	-	-	1	150 0	3,497 13	
11.00	80	0 12 0	660 0	-	-	2	1,110 0	1	1000 0	1	150 0	4,104 0	
4.23	519	0 12 0	239 10	-	-	1	430 0	1	1000 0	-	-	2,882 11	
-	-	-	-	-	-	4	50,465 0	-	-	-	-	51,343 14	
-	-	-	-	-	-	10	1,310 0	2	2000 0	1	150 0	4,320 6	
-	-	-	-	-	-	8	500 0	-	-	-	-	1,830 6	
-	-	-	-	-	-	2	1,700 0	-	-	1	150 0	3,612 10	
-	-	-	-	-	-	6	770 0	1	1000 0	-	-	2,117 12	
-	-	-	-	-	-	1	675 0	-	-	-	-	2,277 14	
-	-	-	-	-	-	1	1,050 0	-	-	1	150 0	3,163 14	
-	-	-	-	-	-	3	550 0	1	1000 0	-	-	6,006 2	
-	-	-	-	-	-	2	350 0	1	1000 0	1	150 0	2,277 15	
-	-	-	-	-	-	-	-	-	-	1	150 0	1,163 8	
6.50	812	0 12 0	609 6	2,200	2,200 0	1	290 0	-	-	1	150 0	6,952 6	
-	-	-	-	-	-	1	225 0	1	1000 0	1	150 0	2,225 3	
-	-	-	-	-	-	1	375 0	1	1000 0	1	150 0	2,198 3	
-	-	-	-	-	-	1	375 0	1	1000 0	1	150 0	3,408 8	
-	-	-	-	2,100	2,100 0	3	805 0	1	1000 0	1	150 0	8,329 6	
-	-	-	-	-	-	1	180 0	1	1000 0	-	-	2,516 4	
-	-	-	-	2,110	2,110 0	2	420 0	-	-	1	150 0	5,683 13	
-	-	-	-	-	-	1	100 0	1	1000 0	1	150 0	2,726 4	
-	-	-	-	-	-	2	750 0	-	-	-	-	1,768 7	
-	-	-	7,179 0	-	16,444 11	-	74,213 0	-	31,000 0	-	4,800 0	221,593 3	

Indian Railways.

Governor General
to E. I. Company.

APPENDIX C.

ESTIMATE of Bridges and Drains required on the proposed line of RAILWAY between
Madras and Menil.

Enclosure.

Number.	Miles.	NATURE OF WORK.	No. of Vents.	Span.	Height of Piers.	Probable Cost of each.			Estimated Cost for each Mile.			REMARKS.
						Rs.	a.	p.	Rs.	a.	p.	
1	2	Irrigation Channel	1	3	1	100	0	0	100	0	0	
2	3	Ditto	1	3	1	100	0	0				
3	0	Culvert	1	5	2	150	0	0	250	0	0	
4	4	Ditto	1	5	2	150	0	0				
5	0	Ditto	2	5	2	200	0	0	350	0	0	
6	5	Ditto	1	4	1½	130	0	0				
7	0	Irrigation Channel	1	3	1	100	0	0				
8	0	Ditto	1	3	1	100	0	0	630	0	0	
9	0	Ditto	1	3	1	100	0	0				
10	0	Ditto	1	3	1	100	0	0				
11	0	Ditto	1	3	1	100	0	0				
12	6	Ditto	1	3	1	100	0	0	100	0	0	
13	7	Ditto	1	3	1	100	0	0				
14	0	Ditto	1	3	1	100	0	0	200	0	0	
15	8	Ditto	1	3	1	100	0	0				
16	0	Ditto	1	3	1	100	0	0				
17	0	Ditto	1	3	1	100	0	0				
18	0	Ditto	1	3	1	100	0	0	850	0	0	
19	0	Ditto	1	3	1	100	0	0				
20	0	Ditto	1	3	1	100	0	0				
21	0	Bridge	1	8	3	250	0	0				
22	9	Ditto	1	18	4	750	0	0	750	0	0	
23	10	Ditto	1	18	4	750	0	0	850	0	0	
24	0	Irrigation Channel	1	3	1	100	0	0				
25	11	Bridge	4	5	1½	350	0	0	350	0	0	
26	12	Ditto	3	6	1½	300	0	0	300	0	0	
27	13	Ditto	1	6	2	225	0	0	545	0	0	
28	0	Ditto	1	12	2	320	0	0				
29	14	Ditto	1	6	2	225	0	0	515	0	0	
30	0	Ditto	1	10	3	290	0	0				
31	15	Ditto	1	10	2	275	0	0	595	0	0	
32	0	Culvert	1	10	4	320	0	0				
33	16	Irrigation Channel	1	3	1	100	0	0				
34	0	Ditto	1	3	1	100	0	0	200	0	0	
35	17	Bridge	1	6	2	225	0	0	225	0	0	
36	18	Ditto	1	6	2	225	0	0	325	0	0	
37	0	Irrigation Channel	1	3	1	100	0	0				
38	20	Bridge	2	15	3	800	0	0				
39	0	Irrigation Channel	1	3	1	100	0	0				
40	0	Ditto	1	3	1	100	0	0	1200	0	0	
41	0	Ditto	1	3	1	100	0	0				
42	0	Ditto	1	3	1	100	0	0				
43	21	Ditto	1	3	1	100	0	0				
44	0	Ditto	1	3	1	100	0	0	300	0	0	
45	0	Ditto	1	3	1	100	0	0				
46	22	Ditto	1	3	1	100	0	0				
47	0	Ditto	1	3	1	100	0	0				
48	0	Ditto	1	3	1	100	0	0	625	0	0	
49	0	Ditto	1	3	1	100	0	0				
50	0	Culvert	1	6	2	225	0	0				
51	23	Bridge	1	6	3	225	0	0	510	0	0	
52	0	Ditto	1	6	3	225	0	0				
53	25	Irrigation Channel	1	3	1	100	0	0				
54	0	Ditto	1	3	1	100	0	0				
55	0	Ditto	1	3	1	100	0	0	500	0	0	
56	0	Ditto	1	3	1	100	0	0				
57	0	Ditto	1	3	1	100	0	0				
58	26	Bridge	1	8	4	290	0	0				
59	0	Irrigation Channel	1	3	1	100	0	0				
60	0	Ditto	1	3	1	100	0	0	690	0	0	
61	0	Ditto	1	3	1	100	0	0				
62	0	Ditto	1	3	1	100	0	0				
63	28	Culvert	1	6	2	225	0	0				
64	0	Irrigation Channel	1	3	1	100	0	0	535	0	0	
65	0	Culvert	1	8	0	210	0	0				
66	29	Ditto	1	8	0	210	0	0				
67	0	Bridge	3	15	3	900	0	0	1110	0	0	

Appendix C.—Statement of Bridges and Drains—continued.

Enclosure

Number.	Miles.	NATURE OF WORK.	No of Vents.	Span.	Height of Piers.	Probable Cost of each			Estimated Cost for each Mile			REMARKS
						Rs.	a	p	Rs.	a.	p.	
68	30	Bridge	2	8	0	420	0	0	420	0	0	
69	31	Ditto	1	3 $\frac{1}{2}$	2 $\frac{1}{2}$	140	0	0	} 50,465	0	0	
70	0	Irrigation Channel	1	3	1	100	0	0				
71	0	Culvert	1	6	2	225	0	0				
72	0	Large Bridge across Cortilliar	30	30	6	50,000	0	0				
73	32	Bridge	1	6	4	275	0	0	} 1,310	0	0	
74	0	Ditto	1	3	2	125	0	0				
75	0	Irrigation Channel	1	3	1	100	0	0				
76	0	Ditto	1	3	1	100	0	0				
77	0	Ditto	1	3	1	100	0	0				
78	0	Ditto	1	3	1	100	0	0				
79	0	Ditto	1	3	1	100	0	0				
80	0	Ditto	1	3	1	100	0	0				
81	0	Ditto	1	3	1	100	0	0	} 800	0	0	
82	0	Bridge	1	5	3	210	0	0				
83	33	Irrigation Channel	1	3	1	100	0	0				
84	0	Ditto	1	3	1	100	0	0				
85	0	Ditto	1	3	1	100	0	0				
86	0	Ditto	1	3	1	100	0	0				
87	0	Ditto	1	3	1	100	0	0				
88	0	Ditto	1	3	1	100	0	0				
89	0	Ditto	1	3	1	100	0	0	} 1,700	0	0	
90	0	Ditto	1	3	1	100	0	0				
91	34	Bridge	2	10	3 $\frac{1}{2}$	650	0	0				
92	0	Ditto	3	15	5	1,050	0	0				
93	35	Ditto	1	8	2	270	0	0	} 770	0	0	
94	0	Irrigation Channel	1	3	1	100	0	0				
95	0	Ditto	1	3	1	100	0	0				
96	0	Ditto	1	3	1	100	0	0				
97	0	Ditto	1	3	1	100	0	0				
98	0	Ditto	1	3	1	100	0	0	} 675	0	0	
99	36	Bridge	2	10	4	675	0	0				
100	37	Ditto	3	15	5	1,050	0	0				
101	38	Ditto	1	12	3	350	0	0	} 550	0	0	
102	0	Irrigation Channel	1	3	1	100	0	0				
103	0	Ditto	1	3	1	100	0	0	} 350	0	0	
104	39	Bridge	1	6	3	250	0	0				
105	0	Irrigation Channel	1	3	1	100	0	0				
106	41	Bridge	1	10	3	290	0	0	} 290	0	0	
107	42	Ditto	1	6	2	225	0	0				
108	43	Ditto	3	4	0	375	0	0	} 375	0	0	
109	44	Ditto	3	4	0	375	0	0				
110	45	Ditto	5	4	0	475	0	0	} 805	0	0	
111	0	Irrigation Channel	1	3	1	100	0	0				
112	0	Bridge	1	8	2 $\frac{1}{2}$	230	0	0				
113	46	Ditto	1	6	0	180	0	0	} 180	0	0	
114	47	Ditto	1	12	2	320	0	0				
115	0	Irrigation Channel	1	3	1	100	0	0	} 420	0	0	
116	48	Ditto	1	3	1	100	0	0				
117	49	Bridge	3	9	1 $\frac{1}{2}$	650	0	0	} 750	0	0	
118	0	Irrigation Channel	1	3	1	100	0	0				
Total Rs.									74,215	0	0	

(Signed) T. T. PEARS.

Indian Railways.

Governor General
to E. I. Company.

APPENDIX C.

ESTIMATE of the probable Cost of Laying the Permanent Way for a Single Line of Railway
from Madras to Menil, Fifty Miles, including Sidings.

Enclosure.

	Per Mile.		
	Rs.	a.	p.
Rails, 60 lbs. to the yard—			
Wrought Iron Rails, 94.3 tons @ £9	8,484	0	0
1761 Sleepers, each 8 feet by 10 in. by 5 in.			
5283 cubic feet, @ 1 rupee	5,283	0	0
Chairs, 706 joint			
Ditto, 2816 intermediate } 25 tons, @ £7	1,750	0	0
Ballast, 2200 cubic yards, @ 1 rupee	2,200	0	0
3522 Keys, @ 1 anna each	221	0	0
7750 Spikes or Trenails, @ 1 anna	487	0	0
Laying Rails	400	0	0
Sundries	172	0	0
Total, for one mile	19,000	0	0
Ditto, fifty ditto	9,50,000	0	0

(Signed) T. T. PEARS.

EXTRACT from the Minutes of Consultation, No. 35.

PUBLIC DEPARTMENT.

12th January 1852.

Enclosure.

1. IN Minutes of Consultation, (No. 812,) dated 29th August 1851, the Government, considering the line running nearly due west from Madras by Menil to be the one decidedly preferable for a trunk railway, to serve as a basis whence similar ways could be carried in the direction of the Mysore Country and the ceded districts on the one hand, and towards Vellore, Salem, &c, on the other—Major Pears was instructed to survey that line as far as Menil, or onward to some place on the right bank of the Poiney river convenient for the divergence of the lines towards Vellore and the Ghauts respectively.

2. Major Pears having completed the survey of this line as far as Menil, now submits a report upon it with an estimate of the cost of a railway to that place,—distant from Madras forty-eight miles. The survey has proved the line to be most eligible. It offers no difficulties of any kind, and the country through which it passes is much more favourable than that on the line to Walajahnuggur before surveyed. The earthwork, though the amount per mile is nearly the same as in the Walajahnuggur line, will cost less from the soil being more easily wrought. The works of masonry required are of the commonest and most trifling description, with exception of a bridge over the Coortilliar, the construction of which will be a work of the simplest kind. The cost of this bridge for a single line of rails, Major Pears estimates at Rs. 50,000.

3. The steepest gradient is only 1 on 309—the whole rise from Madras to Menil being 360 feet; the gradients in the line by Menil being more favourable than on that to Walajahnuggur, the working expenses would of course be lighter. The total cost per mile, Rs. 36,488, including permanent way, rolling stock, &c., estimated on the same data as were adopted in the estimate for the Walajahnuggur line.

4. It is not to be understood that Menil is a desirable terminus. It is only to be looked upon as a point to which, whatever may be the ulterior purpose, a railway to the westward may be carried, with certainty that it is on the right line; and the Government concur with Major Pears that the line to Menil, the best for a trunk line, should be substituted for that previously surveyed to Walajahnuggur.

5. The circumstances to which Major Pears refers, as conspiring to prompt and encourage an undertaking of this nature in this part of the country, and at this juncture, are very important. The surveys and estimate show that

this presidency offers facilities and advantages for railroad construction greatly beyond those possessed by the other presidencies; whilst its need of a superior land communication from its central district to the coast is as obvious; and upon mature consideration of the subject in all its bearings, the Government deem it decidedly their duty to make an earnest application to the Honourable the Court of Directors for their sanction to the construction of a railway on this line, as a public work at the expense of the State, and for authority to commence it immediately if sanction is accorded, beginning with the portion indicated by Major Pears in the thirty-seventh paragraph of his report; and proceeding, as he recommends, adopting his estimate for the earth-work and masonry, during the progress of which the other parts of the estimate can be tested in such manner as the Honourable Court may deem fit.

Indian Railways.
 Governor General
 to E I Company
 Enclosure

6. Major Pears's remarks on his examination of the Ghauts leading into the upper country, so far as it has gone, are highly satisfactory, as are likewise his observations with regard to the general features of the country between Madras and Menil—the facility with which labour can be rendered available—the period within which a portion at least of the railway might be completed—and the almost certain impulse which it would give to traffic, not merely on the immediate line, but to and from the districts lying within its influence. p p 34-35.

7. Major Pears will therefore proceed with his survey of the Ghauts and of the intermediate country, with a view to determine the most favourable line of ascent from the plain to the Bala Ghaut, and of approach to the place at which the ascent will best commence; studying to carry the trunk road as far forward as it can conveniently serve, in common for a line in that direction, as well as for one by Vellore to Vaniembady.

8. The Governor in Council is glad to observe, that from the partial examination he has already made of the Ghauts, Major Pears is sanguine that the difficulty of ascending them will be overcome at much less cost than has generally been anticipated.

9. Referring to Major Pears's estimate for the bridge over the Coortilliar, as for a single line, the Government consider it expedient that the bridges, at least on the trunk lines, should be adapted for a double railway.

10. Should the Honourable Court accord their sanction to the work, the necessary orders will be given for the employment of a detachment of sappers and miners on the railway; and Major Pears's suggestion regarding convicts and buildings for their accommodation, will receive consideration.

(True Extract)
 (Signed)

H. C. MONTGOMERY,
 Chief Secretary.

From Major T. T. PEARS, C.B., Engineers, to the CHIEF SECRETARY to Government, Fort Saint George.

Enclosure.

SIR,

1. By an Extract from Minutes of Consultation, in the Public Department (No. 35), dated the 12th January 1852 (p. 7), I was instructed to proceed with a survey of the Ghauts and of the intermediate country, with a view to determine the most favourable line of ascent from the plain to the Bala Ghaut, and of approach to the place at which the ascent will best commence; studying to carry the trunk road as far forward as it can conveniently serve in common for a line in that direction, as well as for one by Vellore to Vaniembady. I have now the honour to submit a report of the result of my inquiries up to the present time.

2. Assuming that a line, running nearly due west from Madras for sixty miles at least, is acknowledged to be the best for us to begin with, as the trunk from which ramifications might be made to Salem, Bangalore, and Bellary, the desiderata for a passage up the Ghauts are—

1stly. That the pass should be made with the best possible gradients and curves, at the least possible cost.

2ndly. That it should be in the most favourable position, with reference to the proposed line, from the termination of the above trunk to Bellary.

3rdly. That the same pass should serve for the Bangalore as well as the Bellary line.

Indian Railways.
Governor General
to E. I. Company
Enclosure.

3. With respect to the first of these, it is to be observed that the Eastern Ghauts, as they are commonly termed (which a line from Madras must pass to communicate with the Bombay or the north-western portion of our own Presidency), constitute here the steep and rugged slope of the Mysore table land. Their elevation above the sea, at their crest (as at Palmanair or Naikenary), is about 2,000 or 2,100 feet. The portion of the Ghauts, with which we have to do, stands at a distance of about 110 or 120 miles from Madras.

4. We have therefore to begin a line to Bellary and Bangalore, by surmounting an elevation of 2,000 feet within the first 120 miles—and are led to the consideration of two different modes of accomplishing this: the one by running to the base of the Ghauts on a nearly level plain, reserving the greater part of the height to be overcome at the Ghaut itself; the other, by selecting a line, which shall lift us gradually towards the crest of the Ghauts, and leave as small a portion as possible of the height to be overcome by an abrupt pass.

5. In looking carefully over the map, two such lines present themselves to us here, leading nearly westward from Madras to the Ghauts. The one falling on the bank of the Palaur, near Trivallum, would follow that river to Polecondah, and thence along the bank of the Goriattum river to Goriattum; and from thence, at an increased rate of ascent, to the foot of the Ghaut beyond Lallpet; at which point it would have reached an elevation of about 1,100 feet, and a distance (from Madras) of 115 miles, having risen at an average rate of 9½ feet in a mile—900 or 1,000 feet would thus be left for the Ghaut.

6. On the other hand, if we carry a line from Madras by Poiney, to the vicinity of Mooglee, we find that, on reaching there the foot of the Ghaut (a distance of 115 miles), we have ascended 1,600 feet, and that there remain but 500, or somewhat less, on the Ghaut itself.

7. Of two such projects, all other things being alike—the cost of the work, the gradients, and other characteristics of the passes the same—preference would be given to that which concentrated the rise at the Ghaut itself, running by easy gradients up to its base. It would be preferable as a whole—still more decidedly so when considered with reference to that considerable amount of traffic which has only to do with the portion below the Ghauts.

8. As far as the lateral traffic is concerned, which falls upon the line short of the Ghauts, it is evident, the greater part of it having a downward tendency toward the sea, that the line kept on the lower level would be, to a certain extent, more advantageous than one raised to a level above the resources of that traffic. Considerations, such as these are entitled to some weight, though, perhaps, not much in this case.

9. The great difficulty, however, when so great a height is reserved for the Ghaut itself, is to find a favourable pass. Thus, in the two cases above mentioned, we should in the one have to overcome, at the pass itself, 1,000 feet, in the other, 500; the length of the pass (the slopes being the same) would be in the former double that of the latter; while the difficulty and improbability of getting favourable curves would be proportionately enhanced.

10. I have examined the Ghauts between Toombah Droog (north of Palmanair) and Naikenary; and my attention has been particularly directed to the neighbourhood of the two latter places—the former appears to promise the best pass—the latter, the best approach to the pass.

11. The Ghauts, about Naikenary, and between that and Cuddapahnuttum are exceedingly rugged—the ravines generally narrow and abrupt. There is one very remarkable ravine, which appears, on the map, to run in nearly a direct line from the plain above, near Moolwagle, to the foot of the Ghauts, near the bottom of the old Naikenary pass.

12. This I examined with care; and I came to the conclusion, that, although it seemed to offer a singularly direct and convenient line for a railway, to be carried by a gradual slope up to the higher country—such a work could not be executed without a vast expenditure of money, nor be subsequently maintained but at a constant and great cost. The sides of the ravine (which is remarkably narrow) are very steep, and though apparently direct, it is tortuous enough to render the construction of a straight line of railway very expensive, while the steepness of its rocky sides would render necessary a large amount of building, and very expensive cutting, in laying a line of railway along either of them. Seeing these difficulties, and the more favourable position of Palmanair, I turned my attention to that neighbourhood.

13. It would be readily observed in looking at the map, that that part of the district of North Arcot, which lies below the Ghauts, and between the rivers Palaur and Poiney, is divided into two portions by a ridge, which sinks gradually, as it extends in an indirect line from a point, a little south of Mooglee to Trivallum, near the junction of the two rivers.

Indian Railways.
 Governor General
 to E. I. Company.
 Enclosure

14. This watershed, the sides of which are intersected by numerous bold rocky ranges of hills, throws off the water in numberless streams, to the Palaur on the one hand, to the Poiney on the other. The ridge abuts against the Ghauts at the village of Taikmana, at an elevation which only leaves about 440 feet to be surmounted in ascending to the plains above.

15. I had ascertained, as stated in my report of 5th March, 1851, that a line might be carried without difficulty to the foot of the Ghauts in this vicinity. It only remained, therefore, to find a convenient pass near Taikmana. Par. 89.

16. The line which I have selected for the pass, after a very careful examination of the neighbouring country, starts near Taikmana, and, running up a valley south of and immediately under Mooglee hill, reaches the top of the Ghauts, not far from the village of Mussulmarro, about four miles south of Palmanair. It would then be continued over an undulating but very favourable country, by the village of Pengragoonta, and, sweeping gradually to the north, would cross the present high road to Bangalore (from Madras and Chittoor) at a point two miles west of Palmanair; and here I propose that my present survey shall end.

17. The pass is four miles in length—the total ascent is 440 feet, being an average of 110 feet in a mile. The maximum slope is in thirty-six or thirty-seven, according to two sets of trial sections which have been taken. Its length is divided into four parts, beginning at the bottom, viz. :—

1st. A direct line for about	-	-	1,100 yards.
2nd. A curve (to a radius of one mile)	-	-	1,000 "
3rd. A direct line	-	-	3,600 "
4th. A curve (to a radius of one mile)	-	-	1,300 "

18. I do not anticipate, that the construction of a railway on this pass will be attended with any difficulty, or with any very great expense. I have been struck with the singularly fortunate concurrence of the point of least elevation, with one of the most direct and open valleys I have seen along the whole range.

19. With regard to the applicability of locomotive power on a slope of one in thirty-six or thirty-seven, (in an economical point of view,) although I have notes of many steeper gradients so worked, it will be sufficient to instance the case of the well-known "Lickey Incline" on the Birmingham and Gloucester Railway.

20. The length of this incline is two miles and three chains, with a uniform gradient of one in thirty-seven. This has been always worked by locomotive power—at one time by the aid of an assistant engine. Mr. M'Connell, superintendent of the locomotive department on that railway, stated before the Parliamentary (gauge) Committee in 1835, that they had constructed an engine (which he describes) to work the incline without assistance, and that the engine carried a load of from 135 to 148 tons up the incline, at a rate of eight to ten miles an hour; other examples show that trains may be worked down such inclines with perfect safety.

21. The other two desiderata for a pass up the Ghauts, may be discussed in a few words. The object in this case being to get to Bellary, it will be found that, though Palmanair appears somewhat south and west of a direct line, any attempt to pass to the northward would not only lead to a difficult part of the country below the Ghauts, but would entangle us among the hilly district of Cuddapah above. Not only, therefore, have we a favourable line to this Ghaut, and a very convenient pass up, but we have the most direct line to Bellary that is to be found on anything like a favourable country.

22. I assume that we should be obliged to pass to the westward of the Cuddapah district to run (supposing it was determined to make a direct line to Bellary) towards Bangapilly from Palmanair; and to pass, when opportunity offered, into the valley of the Pennar.

23. Further, with respect to this pass serving also for Bangalore, I need only add, that it is in the direct line to that place from Madras; and the construction

Indian Railways.
 Governor General
 to E. I. Company.

Enclosure.

of a line from the head of the pass to that station, would be attended with no difficulty.

24. Under these circumstances, I have not hesitated in undertaking a survey and estimate from Menil towards and up this pass—feeling assured, that no other will be found so favourable, upon the whole, for a great trunk line of railway; and I shall describe the course of the line in a few words, leaving a more particular report upon it to be submitted hereafter, with the survey.

25. The line starting from Menil, passes near the village of Quodekel, and follows a nearly westerly course, till it arrives at the Poiney river, when it turns up the left bank of that river, passes the village of Poiney, four miles above which it turns short round, and crosses the river. It then pursues again a nearly westerly course, by Vencatapoorum, Narsapilly (four miles south of Chuttoor), and Yadamani, passing up a succession of valleys, separated from each other by slight saddles. Approaching Vencatagherry, it has the choice of striking through, or turning by the north, a bold range of hills, which in this case cross its path; it then sweeps round the valley of Bangaroo Pollum (near Vencatagherry), and runs up, at an increasing rate of ascent, to Taikmana.

26. From Menil to the Poiney the line is generally very favourable; from thence to Taikmana, the average rate of ascent is greater, being about twenty-five feet in the mile, and the country becomes more rugged.

I shall endeavour to submit the survey and estimates with as little delay as possible

27. In the meantime, having satisfied myself that this is the most eligible line for a passage up the Ghauts, I have considered it my duty to make this preliminary report thereon; seeing that the question of the first line to be sanctioned, depends, in so great a measure, on the best position for the pass, and that Government might desire to be informed on this point without delay.

28. Although a railway up the Amboor valley to Vaniembady might doubtless be constructed at a much less cost than that now under consideration to Palmanair, the line which I have selected for the latter is much more favourable than I expected to find across a country, justly described by the late Captain Best as "covered with rocks and rocky hills," while the proposed pass up the Ghauts exhibits many unexpected and favourable features. Under these circumstances, the question of the choice between the two for an experimental line assumes a new aspect.

29. Of the superior value of this (the Bellary) line in a political point of view, there can be no doubt: neither can there be any question, I think, as to its greater ultimate importance to the agricultural and commercial interests of this Presidency. How far the first, the experimental portion of it, would fall short of the other as a remunerative undertaking, must depend greatly upon the cost of construction. Unless the estimated cost of this exceeds that of the other to a very serious extent, the Government will probably consider the superior importance of this, as a trunk line, gives it the preference over the other, as the work to be first undertaken. I may observe, here, that the pass up those Ghauts once overcome, the way to the north-west lies open, neither, as far as I know of the country, do I believe any serious difficulty to remain between that and Poonah.

30. I have not yet looked at the Ghauts south of Naikenary; but it is my intention to proceed in a few days to Kangoondy, and while this survey is under preparation, to examine the Ghauts in the neighbourhood of Vaniembady. From what I already know of that country, I have no expectation of finding any pass for a railway that shall offer in itself advantages over that near Taikmana, sufficient to counterbalance the disadvantages of its position with reference to the proposed trunk line.

I have, &c.,
 (Signed) T. T. PEARS,
 Railway Commissioner.

Palmanair, 6th July 1852.

Report 5th July,
 1851.

EXTRACT from the Minutes of Consultation, No. 724.

PUBLIC DEPARTMENT.

28th July 1852.

Indian Railways.
 Governor General
 to E. I. Company.
 Enclosure.

1. IN the foregoing Report, Major Pears lays before Government the result of his survey of the Ghauts, and of the intermediate country between them and Menil, up to which place his previous survey extended.

2. The portion of the Ghauts to be surmounted is distant about 110 or 120 miles from Madras, and rises about 2,000 or 2,100 feet above the sea. To accomplish this two modes have been considered, one by running a line to the base of the Ghauts on a nearly level plain, beyond Lallpet, whereby an elevation of about 1,100 feet, and a distance of 115 miles from Madras will be attained, leaving 900 or 1,000 feet to be overcome at the Ghaut itself; the other, by conveying a line by Poiney to the vicinity of Moogley, by which a distance of about 115 miles will be gained, and an ascent of 1,600 feet, leaving but 500 or somewhat less to be surmounted. Whatever advantages the former line may possess over the latter in its easier approach to the Ghauts, and in affording greater facilities for traffic, the greater difficulty of finding a favourable pass when a height of 1,000 feet is to be overcome at the Ghaut itself, has led Major Pears to give the preference to the latter line, which he asserts can be carried without difficulty to the foot of the Ghauts in the vicinity of Taikmana, whence the line he has selected for the pass commences, and pursuing the course described in p. 16 of the report, crosses the present high road to Bangalore, at a point two miles west of Palmanair; the pass, moreover, serving as well for the Bellary as for the Bangalore line.

Par 3
 Pars 4 and 6

p 25.

p 15

p 16.

p 21.

3. The favourable features of the portion of the country through which the railroad is proposed to be carried, coupled with the importance of this line, in a political point of view, as regards Bellary, offer, in the opinion of Major Pears, a sufficient reason for giving it preference also over a line up the Amboor Valley to Vaniembady, though the latter might be constructed at a much less cost. The Ghauts in this neighbourhood, Major Pears, it is observed, proposes now to examine.

4. In reviewing the arguments adduced by Major Pears in favour of the line he has selected for a railroad, the Governor in Council has to express his gratification at the favourable result of the careful survey conducted by the Commissioner as detailed in his present highly satisfactory Report on the Ghauts.

5. A copy of the Report, with the views of Government thereon, will be forwarded to the Honourable Court by the next mail, with an intimation that the survey and estimates promised in the 26th paragraph will, when received, be also transmitted.

6. Copies of Major Pears's report and of these proceedings, also copies of the Minutes of Consultation of the 12th August last, and the Commissioners' Report, to which they refer, will be also forwarded to the Madras Railway Committee.

(True Extract.)

(Signed)

H. C. MONTGOMERY,

Chief Secretary.

EXTRACT from the Minutes of Consultation, No. 1048.

PUBLIC DEPARTMENT.

9th November 1852.

READ the following letter from Major Pears, Railway Commissioner :

(Here enter 27th October 1852.)

Enclosure.

1. THE Right Honourable the Governor in Council has perused with great interest and satisfaction the very clear and excellent report submitted by Major Pears, the Railway Commissioner, on the result of his examination of the Ghauts in

Indian Railways.
 Governor General
 to E. I. Company.

Enclosure.

the neighbourhood of Vaniembady. It appears to him to afford the most ample information, not only as to the whole range of Ghauts over which a railway leading into the interior, from Madras, must be led, but also as to the best line.

2. The lines proposed by Major Pears to be first constructed amount to nearly 260 miles in length, and consist of five parts, viz:—

1st. A trunk line to Menil	-	-	48 Miles.
2nd. A branch to Vellore and Vaniembady	-	-	70 "
3rd. The trunk line continued to the foot of the Ghaut	-	-	53 "
4th. The Ghaut near Palmanair	-	-	4 "
5th. From top of the Ghaut to Bangalore	-	-	84 "

259 Miles.

The cost of construction and stocking is estimated at an average of Rs.40,000, per mile, which would give the total capital required Rs.10,400,000, or something more than 1,000,000*l.* sterling. The interest on this at 4½ per cent. amounts to Rs. 468,000, which, computing the working expenses at 50 per cent. on the receipts, it is stated, would require an annual mileage of 57,600 tons, upon the whole extent of way, or traffic of various kinds equivalent to it. Major Pears observes that the traffic between Madras and Wallajahnugur, may be *even now* taken, on a very reasonable estimate, at 50,000 tons of goods, besides parcels and passengers; and that when the vast influence the proposed lines would exercise upon some of the finest districts in Southern India—the impulse they would give to education and commerce, and their importance also in a political point of view, are considered—he cannot doubt either of the success of the work as a speculation, or of the great and lasting benefits it is calculated to confer on all classes of the people in this part of India.

3. The Governor in Council will briefly remark that he still retains the opinion he formerly recorded, that the chief *trunk* railway should run direct west from Madras to Menil, where it will divide into two original branches, one leading up the Ghaut near Palmanair, and the other to Vaniembady. Of these original branches, that by Palmanair and thence to Bangalore and Bellary is, in his opinion, by far the most important in all points of view, though it may not at the very outset prove so profitable. He would, however, also strongly urge the formation at an early date of the second line by Vellore to Vaniembady, connecting the southern and western provinces with the Presidency.

4. As the selection of the line has been left by the Honourable Court to the Government of India, the Governor in Council resolves to transmit to them without delay a copy of Major Pears's report, and to solicit their early orders on the subject.

5. Though not immediately connected with the railway question, the Government consider it desirable that the road described in the 13th paragraph of Major Pears's report, as leading "over an easy country, from Coppum (six miles west of Kongoody) to the top of the Ghaut near the village of Sadainoor," and "presenting from bottom to top one continued and easy slope without in any single case the appearance of steepness or difficulty," should be opened up for carts the whole way to Bangalore; and with this view they will take an early opportunity of appointing a competent officer, to be employed under the orders of Major Pears, in examining the line and framing an estimate for the formation of a road.

(True extract.)

(Signed) H. C. MONTGOMERY,
 Chief Secretary.

Enclosure.
 1852.

Home Corrs. 22d
 December, No. 26.

Madras Railway.

MINUTE by the Most Noble the Governor General.

14th December 1852.

ACQUAINT Government of Madras that as the Honourable Court has directed that the opinion of the Supreme Government should be taken regarding the line or lines of railways to be adopted in the Presidency of Madras, the Governor General in Council has been desirous of communicating his views on the subject with the least practicable delay.

But the Honourable Court has at the same time addressed to the Governor General in Council a despatch upon Indian railways generally, which they refer for his careful consideration and judgment. The subject is of the highest importance and of large scope ; and upon the decision of it must depend the judgment to be formed regarding railways in Madras. The Governor General in Council, therefore, is wholly unable to pronounce an immediate judgment on the local question, and he desires to acquaint the Government of Madras with the cause, in order that it might not be supposed that the Madras Railway is overlooked, or a decision upon it unduly delayed.

Indian Railways.
Governor General
to E. I. Company
Enclosure

2. The Governor General in Council conceives that his consideration of it would be much facilitated by the presence of Major Pears, and he requests that that officer may proceed to Calcutta by the next steamer if possible.

(Signed) DALHOUSIE.

14th December 1852.

No. 982.

From J. P. GRANT, Esq., Secretary to the Government of India, to Sir H. C. MONTGOMERY, Chief Secretary to the Government of Fort St. George.

Enclosure

SIR,

14th December 1852.

I AM directed to acknowledge the receipt of your letter No. 66, dated the 9th ultimo, forwarding a copy of the report of Major Pears, the railway engineer, on the result of his examination of the Ghauts in the neighbourhood of Vaniembady, with the sentiments of the Right Honourable the Governor in Council as to the line of railway proposed to be adopted in the Madras Presidency.

Home Department
(Railway)

2. As the Honourable the Court of Directors have desired that the opinion of the Supreme Government should be taken regarding the line or lines of railway to be adopted in the Presidency of Madras, I am directed to acquaint the Right Honourable the Governor in Council that the Most Noble the Governor General of India in Council has been desirous of communicating his views on the subject with the least practicable delay.

3. But the Honourable Court has at the same time addressed to the Governor General in Council a despatch upon Indian railways generally, which they refer for his careful consideration and judgment. The subject is of the highest importance, and of large scope ; and upon the decision of it must depend the judgment to be formed regarding railways in Madras. The Governor General in Council, therefore, is wholly unable to pronounce an immediate judgment on the local question, and he desires to acquaint the Government of Madras with the cause, in order that it may not be supposed that the Madras Railway is overlooked or a decision upon it unduly delayed.

4. The Governor General in Council conceives that his consideration of it would be much facilitated by the presence of Major Pears, and he requests that the Right Honourable the Governor in Council will instruct that officer to proceed to Calcutta by the next steamer if possible.

I have, &c.,

(Signed)

J. P. GRANT.

Fort William,
14th December 1852.

No. 75.

From Sir H. C. MONTGOMERY, Bart., Chief Secretary to Government of Fort St. George, to J. P. GRANT, Esq., Secretary to the Government of India.

Enclosure.

SIR,

23d December 1852.

I AM directed to acknowledge the receipt yesterday evening of your letter of the 14th instant, (No. 982), and to state for the information of the Most Noble the Governor General in Council, that immediate measures were adopted for summoning Major Pears to the Presidency, and it is possible he will reach Madras in time to proceed to Calcutta by one of the two steamers expected before the close of this month.

Public Department.

Indian Railways.
Governor General
to E. I. Company.
Enclosure.

Major Pears is at present on leave at Mercara, distant from Madras 370 miles, but arrangements have been made for facilitating his journey, which it is hoped will enable him to reach the Presidency by the 29th instant at latest. In the event of Major Pears being too late for the steamer, he will be directed to take advantage of any favourable opportunity that a sailing vessel may afford.

I have, &c.,
(Signed) H. C. MONTGOMERY.

Fort St. George, 23d December 1852.

No. 77.

Enclosure

From Sir H. C. MONTGOMERY, Bart., Chief Secretary to Government, Fort St. George, to J. P. GRANT, Esq., Secretary to the Government of India.

SIR,

30th December 1852.

Public Department.

WITH reference to my letter of the 23d instant, in reply to yours of the 14th idem, I have now the honour to inform you that Major Pears, C.B., of the Madras Engineers, who proceeds to Calcutta by the Peninsular and Oriental Company's steam ship hourly expected at this port, and who is the bearer of this letter, is prepared to afford to the Most Noble the Governor General of India in Council full information regarding the projected Madras Railway.

I have, &c.,
(Signed) H. C. MONTGOMERY.

Fort St. George, 30th December 1852.

Chief Secretary.

OBSERVATIONS upon a Memorandum by Major Kennedy upon Indian Railways.

1. THE subject discussed in Major Kennedy's Memorandum of the 14th September 1852, is one of such vast importance both to the interests of the Government and to the prosperity and progress of the people of this country, that it cannot be too carefully considered, neither can it be too promptly determined.

2. The writer points out the immense value to the Government as well as to the people, of a well arranged system of railways, and proposes certain general rules by an adherence to which, the required arrangement of that system may be effected.

3. Major Kennedy's observations and rules are for the most part expressed in general terms, and cannot therefore be fairly objected to when any difference of opinion may exist, by reference to any individual and it may be exceptional case or cases.

4. I differ from Major Kennedy on many points, but I give my views in opposition to his with diffidence, not forgetting that I labour under the disadvantage of forming my opinion chiefly from books or from observations made upon matters carried on, at the other side of the globe. The opportunities which I have enjoyed of seeing the practical working of railways have been merely such as the liberality of the Honourable Court during a short furlough to England some years ago afforded me.

5. Of the importance of railways in this country, whether to the people or the Government, alluded to by Major Kennedy, I need say little. There can be no doubt that their effects will be and must be very great and beneficial—greater relatively than they have produced in any country in Europe. Neither can the importance of laying down our lines judiciously, and constructing them economically, with a view to the people deriving the greatest possible amount of benefit from them, be over estimated.

6. It is difficult, it is, in fact, impossible, to say what the exact nature or the precise amount of benefit will be, nor is it of much consequence if men may reasonably differ as to the relative value of the social, the commercial, and the political results. It is quite sufficient we should feel satisfied, that, as surely as effect ever followed cause, the introduction of the most powerful of all known physical agencies, that by which rapid, safe, and cheap communication between

the different parts of the empire is at once provided, must lead to great results. Its operation upon the minds of the people is enough of itself to ensure all the rest, and great as may be the consequences of a large saving in the carriage of men and goods from point to point, the spread of science and education will effect still more in promoting the material as well as the moral well-being of the people.

7. I believe these, the indirect results of the operation of railways, inestimable as they are, to be by far the most important. I believe the best interests of Government to be identified with those of the people, and I think therefore, as I have elsewhere observed, that "we are in danger of doing great injustice to the people of this country by looking upon these great works as mere commercial speculations, and by meeting every railway project with the condition, that it shall at once pay its own expenses, together with the interest of the money laid out on its construction."

8. There are, however, direct savings in money, which may be estimated with more or less of exactness. Applied to military purposes the saving to Government effected by the railways would be great—in moving troops on occasions of ordinary periodical relief—in the conveyance of ordnance and commissariat stores, an annual saving to a large amount would be effected. There would be little difficulty in making from the returns of the several departments for a series of years, an approximate calculation of what this saving would be. The same returns would show the number of miles of railway necessary to provide for all these reliefs. I am inclined, from an experience in the south of India, during the last thirty or forty years, to value, above all these advantages, the saving of life. Movement of troops in that part of India is so frequently attended by and so commonly appears to give rise to epidemic cholera, as to give grounds for just apprehensions of its appearance in all such cases. The frightful loss of life on such occasions is not confined to troops and followers, but the unfortunate inhabitants along the whole line of march come in for their share of suffering and death. An instance came lately under my notice of a native corps in the Madras Presidency making a march of about 400 miles across the peninsula, carrying the disease with it during a great part of the way, tainting every village on its course. I cannot think it an exaggeration to estimate at several hundred lives the cost of that march from coast to coast. A steamer would have brought the regiment round in a week—a railway would have carried them safely across in one day. If we wish to form some more definite idea of the saving in money to be effected by these works, we cannot do it better than by calculating the difference between the cost of carriage of a known amount of produce by the present roads, and that by a railway over the same extent. Assuming the moderate amount of 50,000 tons to pass annually over any given 500 miles of road, and saying nothing of the loss of time, the risk and injury done to the goods, two annas per ton per mile may be taken as a fair average charge for land carriage at the present time. If the charge for rail were one anna (and I consider this a maximum), the saving in hard money to the people concerned on the supposed line of road, would be fifteen lacs of rupees per annum. Major Kennedy proposes to begin with nearly 6,000 miles of rail, the saving upon which at this rate would be 180 lacs of rupees annually. It is not possible, to say nothing of the great benefits arising from the improved means of personal communication, nor of the mode in which a reduction in the charge of transport and an increased amount of traffic, are, with respect to each other, both the cause and effect—it is not possible that the removal of these great present burdens on the raw produce of this country could fail in giving a great stimulus to production—raising the general condition of the people—increasing the demand for European manufactures—and telling most beneficially upon the public revenues.

9. It might be considered an uncalled-for extension of this paper were I to discuss the effect to be anticipated from the establishment of railways on the strength and efficiency of the army. That they must greatly contribute to promote vigour and efficiency in all our military arrangements and operations, there can be no doubt; but considering the position and duties of the great mass of the force, and the very small portion that can be considered as a reserve solely required for purposes of foreign war, I confess that Major Kennedy's estimate of the possible reduction in our standing army as the immediate consequence

Indian Railways.
Governor General
to E. I. Company
Enclosure.

Report, March 5th,
1851, par 41.

Indian Railways.

 Governor General
 E. I. Company.

 Enclosure.

of the railways, appear to me very greatly overdrawn. The operations of railways are essentially peaceful—they have arisen out of and naturally belong to an era of peace, civilization, and commerce, and their maintenance and use as a means of communication, appear to be, in a remarkable manner, dependent upon the will and pleasure of the people. Although, therefore, they greatly tend to facilitate the preliminary arrangements for aggressive war, and perhaps, though in a far less degree, contribute vigour and efficiency to preparations of a defensive character, we cannot, with any safety, calculate upon them in the case of active operations within our own frontier, or venture, in reliance upon them, to reduce materially our garrisons. They will, we may hope, though indirectly and remotely, affect the strength of the army, by so operating upon the character and pursuits of the people as to render so large a body of disciplined troops unnecessary.

10. I shall now make observations on the rules proposed in the 31st paragraph of Major Kennedy's memorandum, for our guidance in the arrangement, construction, and working of Indian railways; but, before doing so, it is necessary to say something on the important subject of *gradients* generally. The subject is doubtless an important one, but the questions which arise out of it seem to me, in almost all cases, to admit of easy solution. It is easy to propose a rule fixing the maximum slope at which lines of rail shall be laid down in this or any other country, but it is hardly possible that such general rule could be acted upon in every case with a due regard to the interests of the country. We may give up a project in obedience to the rule, where its application would be impracticable, or we may apply it at an inordinate expense; but since nature has literally given us certain gradients to work upon, and since each project for the establishment of railway communication between two points will have its peculiar characteristic features, the only general rule that it seems safe to adopt is, to take care to make the best of each particular case.

11. I attempted in my report of the 5th March 1851, to lay down a rule of this kind in the following words: "The first thing to be done in projecting a railway is to ascertain the nature and amount of work likely to be required of it; the next is to make such arrangements in the construction and subsequent maintenance of the work, that the whole annual charge including interest on capital and working expenses may be a minimum." The resolution of this problem, I observed, "will determine every important point connected with the subject, as the question of single or double line, the character of the slopes (gradients), the size and power of engines, and the weight of rails."

12. The subject of gradients, intimately connected as it is with other circumstances in each particular case, may be viewed for the present under two different aspects. The first is that under which it is most commonly considered, viz., as affecting undulating lines, wherein there may be little or no difference in point of observation between the two termini, in which, therefore, every undulation involves the necessity of lifting the load a certain height beyond that which is ultimately aimed at. Since the load which can be moved at the same cost of power becomes less nearly in direct proportion to the rate of rise in the gradient, and since it is known that in undulating lines the saving on the down runs does not compensate for the additional power required at the ascents—it is evident that such lines must be more expensive to work than one uniform plane between the termini. It becomes therefore a question in each case, whether the interest on money required for the reduction of these undulations is or is not more than the extra expense involved in working over them. Among the points that would enter into a calculation of this kind are the nature and amount of traffic, the extent to which it is likely to be augmented, the *direction* of the greater portion of the physical characteristics of the line, the cost of materials and labour; we can hardly lay down any general rule for cases which involve so many varying elements. It is important to observe, the more so as we have had no experience yet in India, that the extravagant cost of some of the lines in England, alluded to in Major Kennedy's 24th paragraph, though by no means wholly due in any, and in the most striking cases not even chiefly due to any faults of the engineers, were to certain extent attributable to a desire to obtain the best possible gradients. An opinion seems now to have become almost universal among the most distinguished practical men that this was an error. All the later lines are constructed at a much cheaper rate; first cost is much reduced by

admitting and working at an increased expense gradients that some years ago would not have been tolerated. Indian Railways.

13. But this question may be considered in another and totally different aspect. We wish to establish railway communication between two important localities; though they are but 200 miles apart, nature has placed one 2,000 feet higher than the other. We will assume the possibility of laying down a line upon a continued plane from point to point. The gradients would be one of ten feet in the mile, or one in 528, the length of line 200 miles. Now in many cases it might be perfectly practicable to construct a railway between two such points, with a uniform gradient of one in 2,000; but then the line must be upwards of 750 miles long. This may appear an extreme case, but it serves the better to illustrate a subject which in practice often becomes a fair matter of inquiry, we should have to consider the cost of the two entire lines, the nature and amount of traffic, the *direction* of its chief portion, whether up or down, the districts through which each line would lie, the advantages to be gained or conferred by the railway from or upon those districts. It is obvious without any detailed calculations that assuming the cost of construction per mile, and all other things alike, there could be no comparison between the two lines above described, and no hesitation in choosing the shorter and steeper. It seems then that a gradient on a railway must ever be considered like any other expedient, as a means to an end, its cost taken into consideration, and its applicability in each particular case of difficulty.

Governor General
to E. I. Company.

Enclosure.

14. Rules proposed by Major Kennedy,

1st Rule.

That all railways constructed in India shall belong to one of two classes, the first or second class.

Nothing can be said upon this rule till we see how these two classes are defined.

2nd Rule.

That the regulating gradient of the first class or trunk railway shall not exceed one in 2,000 (By regulating gradient is meant the gradient which shall regulate the load of the engine).

This rule may be understood to mean either that railways with such a ruling gradient, and they alone, shall be called first class, or that none of the trunk railways properly so called shall be constructed at all, unless such a gradient be attainable. Looking at the next rule, we may perhaps without error attach

to this the former of these meanings, and assume that Major Kennedy has applied the term "trunk," commonly used to indicate the importance of the direction and amount of traffic, to denote the characteristic gradients of the railway. In taking this meaning and following this rule, we should have to place all our railways with a ruling gradient not exceeding one in 2,000 among the first class as trunk lines. I think, however, that this application of the word "trunk" is likely to create some confusion. It is an old practice among engineers to *class* their railways in this manner, according to the gradients—a mere professional distinction; the word "trunk" is in common language generally applied to those roads or lines of railway which lie in the direction of greatest traffic and importance. No trunk line, so understood, could be constructed within the Madras Presidency with such a ruling gradient as this, unless by increasing the length of the line to an extravagant extent; in many cases even this would fail to effect it.

3rd Rule.

That no regulating gradient of any 2nd class or branch railway shall exceed 1 in 330.

As there are but two classes proposed, this rule may be otherwise rendered, thus:—That no railway shall be constructed in India having a ruling gradient of more than 1 in 330, or 16 feet to a mile. Now, although the

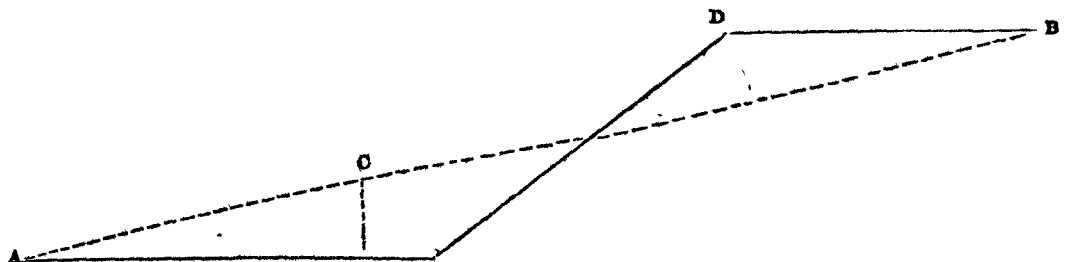
application of this rule would be attended in many cases with much less difficulty than that of the former—I apprehend it would be found in the south of India that, with the exception of lines parallel to the coast, or running but a few miles from it, none could be constructed with advantage without a departure from this law. If we cast an eye over the map of Southern India, we find that a line drawn up the middle of the peninsula will pass over towns and districts at heights above the sea. varying from 1,200 to 3,000 feet. These represent the heights of the several portions of a table land which forms the

Indian Railways.
 Governor General
 to E. I. Company.
 Enclosure

greater portion of the peninsula, and is bounded by lines of Ghauts running nearly parallel to and at varying distances from each coast. The rise to these plains from the sea is in no case uniform. For some miles from the sea it is always slight; it is subsequently quickened, either by a line of abrupt Ghauts, or through chains of hills forming a succession of valleys, which rise rapidly till they reach the average elevation of the table land. There is but one line between Bombay and Cape Cormorin where the peninsula can be crossed without passing one or two chains of Ghauts. That line would pass from the eastern coast, at or below Madras, by Paul Ghaut, to Ponany or Calicut. Even upon this, the gradients proposed in this rule could not, I fear, be maintained throughout its whole length. I will take Bangalore, a large and populous town and most important military station, as an example of a place which it would be impossible to approach (except by a most circuitous route) with anything like compliance with this rule. It is 3,000 feet above the sea, and 200 miles from Madras; but the direct line is broken by the Ghauts, which rise abruptly to a height varying from 400 to 1,000 feet. There is no way of avoiding these Ghauts, unless we can get (which is doubtful) through Cuddapah to Bellary, and thence *back* to Bangalore, making the distance from Madras to the latter place 500 miles instead of 200. Knowing these circumstances, the questions are, is it desirable to establish railway communication between Madras and Bangalore? If it is—how, and in which direction, can the line be laid down so as to confer the greatest amount of benefit upon that part of the country and its inhabitants. The direct line between those two places may be described as consisting of three parts: the first, a plane, with comparatively gentle ascent for 120 miles; the second, a steep incline for four miles; the third, a plane again for eighty miles. Now, assuming (for I am not here speaking of an undulating line,) that we do not lift our loads in the aggregate more than the 3,000 feet ultimately aimed at, it seems probable that this natural section of the country is more favourable to the operations of a railway than a continued plane from end to end of fifteen feet in a mile would be. The *through* traffic only is lifted the 3,000 feet, and much of the short traffic is confined to the two planes, upon which the rise is much less than the average upon the whole line. This concentration of the chief part of the rise, which enables us to apply special means to overcome the resistance of gravity, is advocated by many as the best mode of overcoming a difference of level between two points. The effect of such an incline upon the cost of transport is easily calculated. I will suppose that the cost (locomotive expenses) of moving a ton along the first 120 miles is one farthing per mile; that the cost for the last eighty miles is the same, and that upon the incline it is four times as much, or one penny per ton. We should have the cost for the whole distance—

	s.	d.
200 × $\frac{1}{4}d.$	= 4	2
4 × 1d.	= 0	4
	—	—
	4	6

just threepence more upon the 204 miles than it would be if there were no incline, and if Bangalore, being 400 feet lower, a similar plane extended from one terminus to the other. If however, the two planes and the intermediate Ghauts could be resolved into one uniform plane, we should find the cost of moving a ton its whole length very little less than the above, while the expenses on the several portions at each extremity would be greater; that is, the cost of conveying a ton along the whole length of the dotted line A B would be little, if anything, less than along the broad line between the same points,



while the cost of the local traffic on the portions A C and B D would be more.

I conclude, therefore, with regard to these two rules respecting gradients, that none of the lines most required within the Madras Presidency could be laid down so as to comply with either; and that the question of what the ruling gradient shall be, is one that does not admit of a determination by any general rule, but must be considered with reference to the circumstances of each particular case.

Indian Railways
Governor General
to E I Company
Enclosure

4th Rule.

That short alternate impulsive planes may be introduced to assist the ascent, not to exceed a length of half a furlong each, and not to be nearer to each other than one and a half furlongs.

I cannot agree with Major Kennedy in thinking that any advantage would be gained by this mode of construction. In any long-continued fall, however, there should be level planes at stations.

5th Rule.

That no line shall be undertaken when the estimated cost shall exceed the average rate of 5,000*l.* per mile of single track; but that this rate of cost is not expected to include the bridging of large rivers, as the Soane, Jumna, &c., exceeding half a mile wide at flood level. Such rivers are to be considered as breaks, or temporary termini, where goods and passengers are to be carried across on rafts.

This is a question which appears to me not to admit of a general rule beyond this, that the cost of bridging the river, irrespective of its breadth, should be considered with reference to the risk, the expense, the delay, and the discomfort of shifting the loads and carrying them across on rafts. There are rivers in India which exceed the half mile in breadth, and which are dry for a great portion of the year, falling occasionally with a violence and velocity which make it dangerous to attempt a passage in any

way. A river of this kind, 1,000 yards broad, might be bridged for 20,000*l.*, and as they may be supposed to occur upon a line of railway not more than once in 400 or 500 miles, I do not think an addition of 40*l.* or 50*l.* per mile, to the 5,000*l.* which the line is supposed to cost, too much for overcoming such a difficulty, and getting rid of so serious a fault in the line. The propriety of bridging a river, no matter what its width, must be determined in each separate case by the position of the river on the line, by the cost of the bridge, by the safety and facility with which the river can be otherwise crossed.

6th Rule.

That no line shall be sanctioned except for a single track of rails, with masonry, cuttings, and embankments to correspond; the ground, however, required for a double track to be in all cases secured.

I have elsewhere given my opinion on this point, and perfectly agree with Major Kennedy.

7th Rule.

That no locomotive engine shall be introduced to India for ten years, except such as the ratio between the length of stroke of piston and the diameter of the driver wheels shall sanction, with reference to the maximum load, notwithstanding any sacrifice of velocity on the journey. Rule No. 11 contains an exemption from this restriction.

This will be best considered with Nos. 10 and 11.

8th Rule.

That when piling for foundations be requisite, the foundations are to be laid to suit a double track, although the superstructure is only carried up for a single track.

I agree with Major Kennedy on this point, having made the same suggestion elsewhere.

Indian Railways.

Governor General,
to E. I. Company.

Enclosure.

9th Rule.

That no portion of any line shall be permitted to open for the transport of goods or passengers until the capital account for the construction of such portion shall have been closed.

This we have too much reason to know, from proceedings in England, to be a very important matter, and it will probably require much careful treatment here, as our railways become extended, whether that extension be effected through the instrumentality of one or of different companies. It

may be observed, however, that there will be much less chance of the same grave errors being committed here, so long as a Government guarantee places a known limit to the amount of capital. My own opinion is, that nothing but the extension of a line—its enlargement from a single to a double track—would justify an augmentation of capital when once the line has commenced working.

10th Rule.

That no more than one train daily shall run in each direction upon any line until the traffic shall furnish more goods and passengers than one engine can carry, after which, a second may start daily each way; and that when the traffic calls for three trains fully loaded per day, then arrangements shall be made for laying down a second track of rail.

This rule may be considered with No. 7 and No. 11. The "maximum load" which Major Kennedy alludes to in No. 7, may mean either the maximum as defined by rule, or the largest amount which the circumstances of the line may bring at any given moment. In neither case can it be determined with safety until the line has been sometime in work. I understand from these rules that there are to be no passenger trains as distinct from the goods until

the dividends have exceeded 6 per cent. But what will the public say to this? Are they to be conveyed cheap with the luggage trains, as cattle are carried in England, so long as the proprietors' dividends fall short of a fixed sum? Or would they not rather go faster and pay higher, and thus contribute more to the realization of those profits? In another place, paragraph 38, Major Kennedy deprecates indulgence in the "luxury of superfluous velocity," but surely it would be as impolitic as unjust for the managers of a railway to refuse to the public any velocity (within the limits of safety) for which they were willing to pay. If the Government or railway company contracted for a fixed annual payment, to furnish the means of locomotion for the whole of the country, goods and passengers, it would be natural enough for them to discourage this luxury, as involving themselves in certain loss—it would be to their interest even to keep the amount of goods to be conveyed as low as possible; but constructed and worked as railways are, it is in every way desirable that they should be made to contribute to the convenience of the public in every possible manner; the charges being so arranged that every unit of work done shall bring a fair profit to the proprietors. The question of the description of engine, the number of trains, the speed, &c., will not be satisfactorily determined till the line is in work. In the mean time, some engines must be employed to begin with; and I should have preferred the lighter ones for the first experiment to any calculated for an estimated maximum load.

11th Rule.

That notwithstanding the tenor of Rule No. 6, if on any line it shall appear that the profits exceed a dividend of 6 per cent per annum, it shall then be permitted, if thought advisable by the directors of the company interested, to introduce engines of higher powers of velocity, with a view of running passenger trains separate from goods trains.

This has been considered with the above.

12th Rule.

That the height above the sea of all obligatory points throughout India, having reference to the construction of works, draining, irrigation, &c., such as the highest points or necks of valleys, the low passes in mountain ranges—be obtained and recorded with all convenient despatch on the maps now in progress of construction by the Surveyor General's Department; and that in addition to this, the height of numerous points of inundation level to be taken upon the rivers of India, and recorded upon the maps at intervals of two or three miles, so as to admit of the protraction of approximate sections of the slope of such rivers; and that any striking peculiarity in the lines of rivers, or of the ground between adjacent rivers be reported upon to the Surveyor General by his subordinate officers—such reports to be methodically arranged in his office as records.

15. It is no doubt a matter of the very highest importance that our railways in India should be laid down judiciously, and constructed and worked with the utmost economy. We have to consider the objects of each proposed line and the difficulties which present themselves in the attainment of those objects. The first question is one for the Government to determine, with the aid of those best informed upon the commerce, the population, the resources, and the necessities of different districts and localities. In this country, where we are especially bound to get the utmost possible advantages out of every rupee expended on these works, we have to make our first lines serve in the highest degree all important purposes—commercial, political, and social.

16. I should say, therefore, that the course to be pursued is, not to begin with any general rule, limiting the gradients of our railways, but to ascertain where railways are likely to be introduced with the greatest advantage, what the best line or lines to adopt, and what encouragement we can gather from a comparison of the present probable cost with the prospective benefits.

17. It only remains for me to make a few observations on the particular lines which Major Kennedy has proposed for the railways in the Madras Presidency.

18. The propriety of determining as far as possible, before we commence upon these works, the principles upon which they shall be laid down, and the course to be followed by those great lines which should constitute the framework of the whole, will be admitted by all; and the first question connected with this subject which suggests itself on reading Major Kennedy's paper, is this—shall our lines be laid down with reference to the physical characteristics of the different parts of the country, or to the present arrangement of the population—the agricultural, commercial, and manufacturing classes.

19. The lines marked red in the map which accompanied Major Kennedy's paper, denote his proposed first class or trunk lines, and these it is intended should have no gradient above 1 in 3,000. There are coast lines from Calcutta to Tanjore about 1,200 miles. The same from Calicut to Bombay 500 miles. There is also one across the peninsula from Tanjore to Calicut about 250 miles, and another from the coast line near Rajamendry to Surat about 700 miles; the latter connects Madras with Bombay by a line of which the total length is about 1,200 or 1,300 miles. The distances are taken on mere approximation from the map above-mentioned.

20. With my report to the Madras Government, of the 3d March, 1851 (paragraph 9), I submitted a sketch, showing what I thought were the lines likely to be considered the first of importance in that part of India: and in that dated 12th July following, while considering the political importance of these

On this I have no remarks to offer, further than to express my opinion that such information would be interesting, and no doubt, on occasions, of considerable use.

Indian Railways
 ———
 Governor General
 to E I Company
 ———
 Enclosure
 ———

Indian Railways,
 Governor General
 to E. I. Company,
 Enclosure.

works I gave it as my opinion (paragraphs 7, 8,) that the coast lines were of secondary importance. I am of that opinion still. They are expensive lines to construct, of little commercial value; and, while we have command of the sea, of no great political importance.

21. The lines proposed by Major Kennedy within the Madras Presidency, whether for first or second class lines, seem to have been selected almost entirely with reference to the course of certain streams; and after describing the drainage of an extensive portion of the peninsula by the Soane, the Nerbudda, and Taptee, the Godavery, Mahanuddy, &c., he adds "these (the geographical features) force upon us the knowledge of what the great arteries of commerce must necessarily be, and with those arteries our trunk roads must necessarily correspond."

22. Now the rivers in the south are not, and never have been, the great arteries of commerce; all those rivers upon which Major Kennedy had marked lines, the Godavery, the Kristnah, the Pennar, the Polaar, and the Cavery, exhibit, in different degrees, the same characteristic features—they rise on the table land (some at the crest of the western Ghauts), they pass over it by a course more or less circuitous till they reach the eastern limit of that table, and they then plunge on to the Coromandel plain, either falling over abrupt Ghauts, or by a turned and very tortuous course among an uninhabited or very thinly peopled range of rugged hills covered with forests. Some of these rivers are dry during a great portion of the year, and all are subject to very great variations in their volume of water.

23. It is manifest that such streams as these cannot affect the condition of the people or the country as do the Ganges, the Indus, and the Nile. In the Ganges we see a large volume of water all the year round serving as a great highway for the people—a broad fertile valley subject annually to the fertilizing influence of this noble stream—and the people clustering in large numbers on its banks, exhibiting in every possible way their appreciation of the benefits they receive from it. Here, then, we have a great artery of commerce; and we must recollect it has become so, not merely because the country drains down the valley, but because that valley, and the stream which flows down it, are favourable to the ordinary commercial, manufacturing, and agricultural pursuits of mankind. The traffic to which the railway company look for their dividend, is greatly due to the river in its operations as a highway. We may take encouragement from this in other parts of the country where the traffic is now less, and trust that denied; as they have hitherto been, the great advantages of cheap transport, the railways may do for them what the Ganges has done for Bengal.

24. The Mahanuddy, the Godavery, the Kristnah, are rivers, as I have above shewn, of a different character. Instead of being the great arteries of commerce, no populous or busy towns are found on their banks during their whole length,—instead of passing through a dense and industrious population, their course, for several hundred miles, lies through a region of mountain and forest, where the sound of man's voice is never heard, a great portion of which has never been surveyed or explored. It is to be observed that the principal lines here shown are not drawn with primary reference to Madras, the southern capital, but fall upon the coast at Ceringa and Masulipatam, leaving a coast line of two and three hundred miles to be traversed in order to reach Madras. We may believe that Madras, with the large amount of capital invested in its fortress and its public and private buildings, its 700,000 inhabitants, is wrongly placed; but can we venture thus far to act upon our belief, to consider it as of secondary importance in our railway arrangements?

25. Of the second class lines two run nearly parallel to each other, and to the first class lines above mentioned; they constitute in fact, trunks, having no connexion with each other. Three lines from coast to coast are thus laid down; one starts from Masulipatam, follows up the Kristna a few miles, crossing over the intervening high land by Hyderabad, falls on the Godavery, which it follows to the vicinity of the western Ghauts. The other starts from the same point, Masulipatam, and continuing to follow the Kristnah, passes by Kurnool, in the ceded districts, up the valley of the Beemah to Poonah. The latter portion of the line (from Bellary instead of Kurnool,) is that which I propose as the continuation of a line from Madras (not from Masulipatam,) to Bombay, whenever such continuation is thought advisable. Another second class line marked on the map, is from Madras to Bangalore up the Ghauts. The last to be noticed

is one from Trichinopoly to Seringapatam, from which I see no advantage, the line to Bangalore having already brought the rail to within 80 miles of Seringapatam, a continuation of which would throw the latter place into direct connexion with Madras, avoiding a second Ghaut between Seringapatam and Trichinopoly.

Indian Railways.
 ———
 Governor General
 to E. I. Company.
 ———
 Enclosure
 ———

26 I think then that Major Kennedy is in error in acting upon the assumption that the *lines of drainage* in any country necessarily constitute the great arteries of commerce. The line of a large navigable river flowing through a broad and fertile valley will become of course a great artery of commerce, created, fostered, and carried on by itself; but, apart from the fact that the line of a *navigable* river is not that which, as a general rule, we should choose to begin railway operations in a country elsewhere without any means of communication, I think it will be found in those countries where railways have been already established, that the great arteries, whether discovered or established by the railways, do not lie down the drainage in all cases; in some, lie directly across it.

27. One more observation may be made upon this point, viz., that these streams do not necessarily give us good gradients, unless by a sacrifice in length and straightness. If we take any plain, such as that of Coromandel, inclined generally to the sea at such an angle that a direct line drawn across perpendicular to the coast would fall ten feet in a mile, the *general* course of a river will have precisely the same fall, and it is only by following the numerous sharp sinuosities of the river, and so proportionately increasing our distance, that we could reduce the fall to that of the river's bed.

28. I conclude this paper, already, I fear much too long, with the following summary:—

1st. Our lines are to be laid down, I think, with reference to the existing state of the country, the commerce, the population, the resources and necessities of the several districts and localities; not with reference to the physical characteristics of particular lines of country.

2nd. We have to bear in mind that "the profitable permanent working of a line" alluded to by Major Kennedy in Par. 50, depends upon the amount of traffic, the length, the original mileage cost, no less than upon the gradients, and that a line laid along a river may, and certainly would, in some of these cases, be a very expensive one.

3rd. A short line with steep gradients *may* be a cheaper line to *work* as well as to construct, than a longer one with easier gradients: it may also lie through more profitable districts.

4th. Where for political purposes we desire to connect by a railway two distant termini, we should try to make the most out of the line; not lay it down with the sole view to communication between those points, but as it were coax the traffic of the country by seeking the more important localities adjacent to its general direction; direct lines will come in their turn, "when those first made will take their proper places as valuable, though it may be they are subordinate members of the entire system."

5th. In the case of navigable rivers, and such (as the Godavery) which it appears probable might at no great cost be rendered navigable; that part of the country to which they already furnish a cheap and ready means of transport may, as a general rule, be left without railway till the more pressing necessities of other portions of the country have been provided for.

Report to Madras
 Government,
 12th July 1851.

29. I have only further to remark that the line proposed on the eastern coast of Madras lies over a country singularly favourable for the construction and supply of canals. The construction and working of a canal near Madras so short as to produce little effect on the *development* of traffic, has been attended with very favourable results. A proposition has been made, and I believe sanctioned, for extending it a few miles; and there is no doubt that communication by canal might be opened along the coast between the now fertile deltas of the Godavery and the Cavery, at a far less cost than a railway, and far more capable of competing with the present cheap coasting traffic.

30. Should the Government determine upon taking into serious consideration any grand trunk line or lines such as that proposed between Bombay and Agra, I would suggest that preliminary inquiries be made for the purpose of obtaining

Indian Railways.
Governor General
to E. I. Company.
Enclosure.

what may be called information *in the rough*, from civil and political officers employed in the intervening districts, as to the probable political effects, the nature and amount of traffic, and the cost, which the general features of the country seem to point out. Documents containing information of this nature placed in the hands of an engineer at starting, would direct his attention at once in the right way, and save a good deal of time, labour, and expense.

(Signed) T. T. PEARS, Major,
Madras Engineers.

Calcutta, 1st February 1853.

No. 13.

From Sir H. C. MONTGOMERY, Bart., Chief Secretary to Government, to
J. P. GRANT, Esq., Secretary to the Government of India.

Public Department.

SIR,

5th February 1853.

WITH reference to my letters of the 23d October, 9th November, and 23d December last, I am directed to state, for the information of the Most Noble the Governor General of India in Council, that Mr. Smalley, the agent to the Madras Railway Company, has reported his arrival on the 31st ultimo; and that this Government awaits the decision of the Government of India regarding the direction of the line to be followed, to permit of the orders of the Honourable Court, quoted in the margin, being carried out.

I have, &c.,
(Signed) H. C. MONTGOMERY.

MINUTE on the above.

UPON the arrival of the railway company's agent or chief engineer, we desire that you will adopt immediate steps, in co-operation with either of those officers, for the early commencement of operations.

No. 164.

From J. P. GRANT, Esq., Secretary to the Government of India, to Sir
H. C. MONTGOMERY, Bart., Chief Secretary to the Government of Fort
St. George.

No. 75.
Home Department,
Railway.

SIR,

4th March 1853.

I AM directed by the Most Noble the Governor General of India in Council to acknowledge the receipt of your letter dated the 5th ultimo, (No. 13) reporting the arrival at Madras of Mr. Smalley, the agent of the Madras Railway Company.

2. Major Pears, with whom whilst in Calcutta the Most Noble the Governor General communicated personally on the subject of the Madras Railway, and who, before his departure, was put in possession of his Lordship's views on the questions under consideration, returned to his Presidency in the steamer of the 6th ultimo.

3. The Governor General in Council is not prepared, at present, to decide positively upon the general line which the railway now to be made should take. The south-westerly line, from Madras by Menil to Vaniembady, to be ultimately extended by Salim and Coimbatore to the west coast, is admitted to be one of the lines which is essentially required in any good railway system for the Madras Presidency. As far as Vaniembady the line presents all the engineering facilities that can be expected, and beyond it, with the exception of one pass, which is not expected to be a serious obstacle, no engineering difficulties are anticipated in the whole course of the line. Even when made only to Vaniembady, it is the expectation of the Madras authorities that the line will pay as a commercial speculation, and when completed throughout, uniting as it will do the two coasts, nearly approaching the great sanatorium on the Neilgherries, and affording a ready means of communication between the troops on either side of the peninsula and those in the Mysore country, it will add to its commercial advantages the character of an admirable line in a political and

military point of view.. In this view, which in the opinion of his Lordship in Council, in a railway constructed under a Government guarantee, should never be lost sight of, the advantages of the line will be greatly enhanced if the new pass up to the table land, near Vaniembady, discovered by Major Pears, is found upon survey to afford, as it promises to do, the best known line for a railway from the low country to Bangalore, and to the table land generally.

Indian Railways.
 ———
 Governor General
 to E. I. Company
 ———
 Enclosure
 ———

4. On the other hand, the line to the top of the Palamanair Ghaut, to which upon the whole the Madras Government are inclined to give the precedence, on the supposition that it will be immediately extended to Bellary, or to Bangalore, or to both places, promises many advantages, but as compared with the other, it is not wholly free from objections. Amongst the objections are the ascent of a severe Ghaut to a height of 2,100 feet above the sea, part of which ascent will be lost in descending again to Bellary; and the circumstance that in opening up the Bellary country, this line would fail to benefit the Cuddahpah district, between which and Madras at present the trade is shown by the papers before Government to be very much greater than the existing trade between Madras and Bellary.

5. It is obvious that *if such a line be feasible*, by far the best line to Bellary in every point of view, would be one through the Cuddapah district. Now, although access to the Cuddah district is known to be very difficult, the Governor General learns from Major Pears that we are not in a position yet to pronounce absolutely against the feasibility of such a line; no survey with such an object having been ever made. In the present state of our information, therefore, the Governor General in Council is of opinion that nothing should be done which would commit us to the adoption of any other line.

6. As far as Meml, the Governor General understands that the line recommended by the Madras Government is the best line, whether considered simply as a part of the Vaniembady line, or as a trunk line common to the Vaniembady line and the Palamanair line. Whether the Palamanair line be determined upon or not, the line recommended as far as Meml will be part of a line admitted on all hands to be essential to a good railway system for the Madras Presidency, and one, of the importance of which, in a political and military view, the Governor General in Council is convinced. His Lordship in Council therefore authorizes the immediate construction of the line proposed from Madras to Meml.

7. In the meantime he requests with reference to the Vaniembady project, that a line be fully surveyed and estimated for, up Major Pears's new Ghaut near Vaniembady, from the point where a line from Bangalore would join the low country line to the level of the table land above the Ghaut; also that a general survey be made of the line beyond Vaniembady by Salim and Coimbatore to the Malabar coast, including a short branch from the neighbourhood of Coimbatore to the foot of the Neilgherry Hills. Further, he requests with reference to the other object in view, namely, the attainment of Bellary, that such a survey of the country be made as will set at rest the question of the practicability of a line from Madras to that place, through the district of Cuddapah.

I have, &c.,
 (Signed) J. P. GRANT,
 Fort William, 4th March 1853. Secretary to the Government of India.

No. 23.

From the CHIEF SECRETARY to Government of Fort St. George, to the SECRETARY to the Government of India.

SIR,

22d March 1853.

I AM directed to acknowledge the receipt of your letter of the 4th instant, (No. 164) and to state for the information of the Most Noble the Governor General of India in Council, that the authority therein conveyed for commencing a line of railway to be carried as far as Meml, and his Lordship's general views on the subject, have been communicated to Major Pears and the agent of the railway company; and that Major Pears has been requested

Public Department.

Indian Railways. to propose his arrangements for early carrying out the instructions of the
 Government of India regarding the survey of the lines denoted in par. 7 of
 your communication.

Governor General
 to E. I. Company.

Enclosure.

2. I am at the same time desired to submit copies of the correspondence noted in the margin, and of the orders issued thereon, which will acquaint the Government of India with the arrangements that have already been sanctioned by this Government for the early commencement of railway operations, and for the survey of a line to Bellary through the Cuddapah district, and of the pass from Vaniembady to Coopum leading to Bangalore; and to state that the Right Honourable the Governor in Council has appointed Major Pears to be "consulting engineer for railways" at this presidency; and with reference to the salaries paid to corresponding officers at Calcutta and Bombay, has authorized that officer, in anticipation of the sanction of the Supreme Government, to draw while so employed a consolidated allowance of 2000 rupees per mensem, a proceeding which he trusts will receive the approval of the Governor General of India in Council.

From Major Pears, C.B., dated
 15th February 1853.
 Extract Minutes of Consultation,
 4th March 1853, No. 207.
 From Major Pears, 12th March
 1853.
 Extract Minutes of Consultation,
 22d March 1853, No. 289.

3. Major Pears has been authorized to entertain for the present, the establishment to the extent marginally noted, for which also the authority of his Lordship in Council is solicited.

1 Writer - - -	Rs. 50
1 Second ditto - -	25
2 Peons at 7 Rs. each - -	14
2 Lascars - - -	14
Total	Rs. 103

I have, &c.,
 (Signed) H. C. MONTGOMERY.

Fort St. George, 22d March 1853.

From Major T. T. PEARS, C.B., Engineers, to the Chief SECRETARY to
 Government, Fort Saint George.

SIR,

Madras, 16th February 1853.

1. WHEN reporting to you in person my return from Calcutta, I had the honour of communicating for the information of Government, and by command of the Most Noble the Governor General, his Lordship's views regarding the proposed Madras Railway. I had been instructed at the same time to state that a communication will be made upon the subject in the usual manner, as soon as the press of business connected with the English mail then under despatch admitted of it.

2. As you have been good enough to make known to me the intention of the Right Honourable the Governor in Council to confer upon me the important office of Government engineer in the railway department—I beg to submit a few observations upon the work that appears to be immediately before us.

3. I understood his Lordship the Governor General to be of opinion, that, while the construction of a line of railway as far as Menil appears under any circumstances desirable, its prolongation thence forward by the projected line of Palmanair depends mainly upon that being the best line that could be discovered to Bellary; since, if a practicable line of this latter place could be found by Cuddapah, the Palmanair Ghaut might be given up, and a very convenient line to Bangalore found from Vaniembady, by the pass mentioned in my report of the 27th October 1852, (par. 13). A trunk line to Vaniembady, 120 miles in length, would thus serve both for an extension to Salim and the Malabar Coast, and for a line to Bangalore.

4. In approving therefore of the immediate commencement of the line to Menil, his Lordship considered that the determination of its course beyond that point might be left until an inquiry had been made into the practicability of reaching Bellary by Cuddapah—into the character of the above mentioned pass from Vaniembady to the Mysore country—and also into the nature of the country lying between Vaniembady and Salim and the western coast.

5. I was given to understand that Mr. Bruce, the gentleman who has been appointed chief engineer of the Madras Railway, would leave Calcutta by the

steamer of the 6th proximo, a difficulty in finding any one qualified to take charge of his present office having prevented his leaving sooner.

6. Upon his arrival at Madras, measures may at once be adopted for laying out the line, obtaining possession of the land, and commencing active operations between Madras and Menil.

7. With respect to the surveys, I have been informed that the Honourable Court have determined that all surveys upon lines allotted to any railway company shall be carried out (under the general direction of the Government engineer) by the engineers of that company.

8. I apprehend that it cannot now be determined what line shall be allotted to the Madras Railway Company, whether that by Palmanan or that by Vaniembady or Salim, or both. It may be assumed, however, that a line to Bellary by Cuddapah (should such be found practicable) will be kept distinct from any line by Menil, either to be made over to a separate company, or executed by Government, and the survey in that direction must therefore be made by Government servants.

9. Should such a line prove practicable and expedient, the present company will, I presume, take up that to Vaniembady, Salim, and the other coast, which will leave in their hands the survey of the line from Menil to Penang or Calcut, a distance of about 375 miles.

10. I purpose, pending Mr. Bruce's arrival, to take a look at the Ghauts about Naggery between this and Cuddapah, and have instructed Surveyor Oliver to proceed to Vaniembady and survey the pass in that neighbourhood as far as Coopum. My time and attention will be necessarily too much occupied with the commencement of active operations near Madras to admit of my taking in hand the survey through Cuddapah, even with the aid of a surveyor; and I trust therefore the Government will be pleased to place at my disposal some qualified officer, to conduct under my directions this survey, as far as Bellary, or until his reports may show the scheme to be impracticable. What assistance such officer would require, I cannot at this moment say, but I should think that one assistant surveyor, in addition to the ordinary establishment of an assistant civil engineer, would be sufficient.

11. I would take this opportunity of observing, that although this application is made in reference to a particular line, and therefore for a temporary purpose—it seems to me very desirable, when once the construction of railways has commenced, that a Government railway survey department should be constantly at work, making upon such lines as the Government may consider deserving of attention, these preliminary surveys or reconnoissances—being in fact the pioneers of the railway executive bodies. Taking the work of examination thus in time, the establishment need be neither large nor costly; while if the work is conducted by an active intelligent officer, possessed of a fair share of professional skill, its performance will greatly tend to economize both time and money, in subsequently putting the executive officers at once upon the right course. We might hope too, by thus deliberately and thoroughly examining the country beforehand, to avoid many of those errors which have in so many cases been found to result from these preliminary proceedings being undertaken too late. Considering the great extent of country, and the imperfect acquaintance that we have with many parts of it, such careful examinations seem to be more necessary here than they would be in any country in Europe. They should be carried on too, if possible, not only upon any line where it may be proposed first to lay down the rails, but even far ahead, until means are obtained for determining the proper course for the line between the two ultimate termini.

12. In illustration of my meaning I would observe, that in laying down a line from Madras to Bellary we furnish the country with a most important work; but Bellary is not the ultimate destination of the line, and it would hardly be safe (so long as any political importance is attached to a trunk line from Madras to Bombay) to carry such a line actually up to the vicinity of the town of Bellary until we have formed a tolerably correct notion of the course it would have to follow on towards Bombay.

13. It appears that when once a few miles of railway have been completed and brought into operation, a desire for their extension will become general and urgent; and it would be well to be in some measure prepared at once to point out the best lines for the purpose.

Indian Railways.
—
Governor General
to E. I. Company.
—
Enclosure
—

Indian Railways.
Governor General
to E. I. Company.
Enclosure.

14. The first lines to be examined, (for I should propose little more than an examination,) would be that from Madras to Bellary, thence towards Bombay—those from Vaniembady to Calicut and to Bangalore, and one from Palghaut-cherry to Negapatam.

15. Should it be determined to await no longer the result of "experimental" lines, and to adopt at once measures for constructing the principal trunk lines across the face of the country, the remarks which I have now ventured to make upon the expediency of having a railway survey continually in advance of the works themselves, will, I trust, be considered not undeserving of attention.

I have, &c.,
(Signed) T. T. PEARS.
Railway Commissioner.

Madras, 16th February 1853.

No. 207.

Resolution of Government (D)
4th March, 1853.

Financial Despatch, 24th Nov.
(No. 20 of 1852.)

1. MAJOR PEARS, C.B., having reported his return from Calcutta, and offered certain suggestions for giving effect to the orders of the Honourable Court of Directors and of the Governor General of India, with respect to the Madras Railway, which it appears it is decided is to be carried at first to Menil—and as Mr. Smalley, the railway company's agent, has already arrived, and the arrival of Mr. Bruce, the company's chief engineer, may be shortly expected—the Right Honourable the Governor in Council considers it highly desirable to make all preliminary arrangements possible, so that no delay may occur in the commencement of operations as directed by the Honourable Court, so soon as the instructions of the Governor General of India in Council shall have been officially communicated. He accordingly resolves to appoint Major Pears to be "consulting engineer for railways," and with reference to the salaries paid to corresponding officers at Calcutta and Bombay, to recommend to the Government of India that this officer be allowed to draw, while so employed, a consolidated salary of (2000) two thousand rupees per mensem, and, in anticipation of the approval of the Government of India, he authorizes that amount being passed to him from the 1st January last.

2. The Right Honourable the Governor in Council considers, that the views of the Honourable Court with regard to the exercise of the supervision and control of railways will be best carried out, by adopting the practice which has obtained in Bengal, and is reported to have been found to work well, and to answer the ends contemplated by the Honourable Court of making the "consulting engineer" the medium of communication between the officers of the railway company and the Government; and he, therefore, determines to request Mr. Smalley, the company's agent, to correspond with the "consulting engineer," through whom he will receive the orders and decisions of this Government on all points referred for this purpose.

3. The Governor in Council believes it is unnecessary to give Major Pears any detailed instruction for his guidance; he will only, therefore, direct that he preserve a careful record of all his proceedings, and he anticipates from his judgment, and the character of the agent, that by the cordial co-operation of all parties, the affairs of the Madras Railway will be conducted with efficiency and economy to a successful issue.

4. The Government concur in the remarks of Major Pears on the expediency of having a railway survey continually in advance of the works themselves; and under the circumstances represented in paragraph 10 of his letter, they will be prepared to place at his disposal the services of an officer, to conduct under his directions the survey of a line to Bellary by Cuddapah, on his selecting an officer whom he may consider qualified to undertake the duty.

5. Major Pears, under date the 23th November 1850, was permitted to entertain the establishment noted in the margin, and the services of a surveyor were also given to him. He will now report what establishment he considers he will require to exercise the supervision of the railway affairs of this Presidency.

1 Writer	-	-	Rs. 50
2 Peons, at 7 Rs. each	-	-	14
4 Lascars, at 7 Rs. each	-	-	28
			—
			Rs. 92
			—

From Major T. T. PEARs, C.B., to the CHIEF SECRETARY to Government,
Fort St. George.

Indian Railways.
Governor General
to E. I. Company
Enclosure.

SIR,

Madras, 12th March 1853.

I HAVE the honour to acknowledge the receipt of an extract from Minutes of Consultation of the 4th March 1853, in which the Right Honourable the Governor in Council has been pleased to honour me by conferring the appointment of "consulting engineer for railways" in this Presidency.

With reference to the 4th paragraph of the same extract, I beg to report, that during my late tour, which, in the expectation of Mr. Bruce's arrival, I was compelled to cut rather short, I have examined the country towards Cuddapah as far as Baulpilly, which is about ninety miles from Madras.

The three principal difficulties encountered in constructing a road into Cuddapah occur within that distance; viz., the passes of Naggery, Warramully and Baulpilly. I had been induced partly from common report, and partly from my own experience in the course of a march along that road with troops in 1840, greatly to over estimate the difficulties which these several passes present in the formation of a road. I now find, moreover, that the two former may be altogether turned and avoided by a line running up from Madras by the valley of the Namavoram river as far as Naglapooram, thence towards Calastry, falling into the old line of road near Cucumlandy. I am now sanguine in my expectation that this beautiful and important district of Cuddapah may be entered by a railway at far less cost than I had anticipated; I feel encouraged, therefore, in proposing that a detailed survey should be made of a line through that district to Bellary.

The officer whom I would propose for this duty is Lieutenant Roberts, of the Engineers. The determination of the best line for a railway through such a country as this requires peculiar intelligence and judgment, while the labour involved in the work demands a good deal of personal energy. I believe Mr. Roberts to be well qualified for the duty, and have ascertained that he is prepared to undertake it with cheerfulness and zeal. As the weather is almost insufferably hot in Cuddapah during the next two or three months, and it would take some time for this officer's relief and journey, it might be as well perhaps if he carried the operations upon which he is now engaged to a close for the present season, and joined me at the end of May, when the work ceases on the other coast, and when the climate in Cuddapah becomes more tolerable.

In case the Government should consider Mr. Roberts' services too valuable where he now is, I beg to submit the names of Lieutenants Tyrrell and Norton, of the 18th Regiment Native Infantry, both of which officers, I have been informed on good authority, are well qualified for duties of this nature. Should the Government be pleased to place at my disposal one of these officers I beg to recommend that, in addition to the establishment of a first Assistant Civil Engineer, an active and intelligent Assistant Surveyor may be placed under his orders.

In reply to the eighth paragraph of the extract from Minutes of Consultation under acknowledgment, I beg to state that, in addition to the establishment therein named, I have, since the 16th of October 1851, had the service of a draughtsman, sanctioned in Minutes of Consultation under date the 9th January 1852, but that I would recommend the following as the establishment of my office, at least until some experience has been gained on the actual amount of work to be done.

				Rs.		Rs.
1 Writer	-	-	-	50	-	50
1 Second Writer	-	-	-	25	-	25
2 Peons	-	-	-	7 each		14
2 Lascars	-	-	-	7	„	14
						<hr/>
				Total		Rs. 103
						<hr/>

I propose this limited establishment for the present, from having observed that, according to the system in Bengal, which has been found to work well thus far, the consulting engineer has the office of the secretary to Government, and that of the manager of the railway, open to him for such records as he may

Indian Railways.
Governor General
to E. I. Company.

Enclosure.

have occasion to refer to; and it has been considered desirable that his own movements should be encumbered as little as possible with records or office establishment. I apprehend, however, that the organization of the department cannot be considered yet final, and that more effectual means of auditing the railway accounts will require yet to be furnished to the consulting engineer; I would, therefore, suggest that the establishment now recommended be considered experimental.

I beg, in conclusion, to solicit the sanction of Government to the services of Surveyor Oliver being granted to me for a further period of six months. I am about to employ him in surveying the pass from Vaniembady to Coopum, and when that is completed I anticipate much advantage from being enabled occasionally to place him at the disposal of the railway officers. The assistance which, from his long experience and local knowledge, he may thus render, are the more important from the circumstance of not one of Mr. Bruce's assistants having yet arrived.

I have, &c.,
(Signed) T. T. PEARS,
Consulting Engineer,
Railway Department.

Madras, 12th March 1853.

No. 289.

Resolution of Government (D.)
22nd March, 1853
Letter from Board,
(Department of
Public Works,)
1st Nov. 1852
No. 704

1. Lieutenant Roberts having been deputed by the Board of Revenue in the Department of Public Works, to proceed to the Munzerabad Ghaut to carry on the work sanctioned under date 16th November last, the Right Honourable the Governor in Council desires that, so soon as the present working season at the Ghaut is over, the services of that officer may be placed at the disposal of Major Pears, consulting engineer for railways, for the proposed survey of a railway line to Bellary, through the Cuddapah district, and that an active and intelligent assistant surveyor may also be placed under his orders for this duty. The establishment of a first assistant civil engineer, required for Lieutenant Roberts, will be entertained by Major Pears on that officer joining him.

	Rs.
1 Writer -	50
1 Second Writer -	25
2 Peons at 7 Rs each	14
2 Lascars ditto	14
Total -	Rs.103

2. Major Pears is authorized to retain the services of Surveyor Oliver so long as they may be required for the survey of the pass from Vaniembady to Coopum, and for aiding the railway officers in their operations, and sanction is also granted for the office establishment proposed by him for the present at a monthly charge of Rs.103.

(True Copies.)
(Signed) H. C. MONTGOMERY,
Chief Secretary.

NOTE by the SECRETARY to the Government of India (Home Department.)

Memo. regarding the
Madras Railway
Three Printed Papers
Two Maps

* See in No. 1, par. 4,
Major Pears, par 8
and 9.

P 38, Mr. Bourdillon,
par. 3.

P. 50, Major Cotton,
par. 4. and

P. 53, Major Pears'
whole letter.

† For the discussion of
the large view see in
No. 1 —

P. 4, Major Pears,
par. 8 and 9.

P. 38, Mr. Bourdillon,
par 3

P 50, Major Cotton,
par 4.

P 53, Major Pears's
whole letter.

THE Madras engineers were hampered at first in their selection of lines, by the experimental character which had been given by authority to the line to be made.* Till this idea of a short experimental line is abandoned, and a large view of the subject is taken, no good will be done, and now happily the Court of Directors have admitted this and instructed the Indian Government accordingly.†

No mile of railroad can claim a right to the public guarantee, unless it forms a part of a good national system of railroads.

The practical question, as actually referred to the Government of India by the Madras Government, is this—shall the line now first to be made run from Madras nearly west, up to the Palmanair Ghaut, to the Mysore table land, or south-westerly, keeping entirely in the low country to Vaniembady towards Salim. Both lines are approved by the Madras engineers and Government; the only question raised is, which should have precedence.

Both lines are proposed with ulterior objects, as part of a system of railroads; the Palmanair line, in order to extension to Bangalore and Bellary, and eventually to Bombay; the Vaniembady line, in order to extension to Salem, Coimbatore, and the west coast. Coimbatore is a cotton country, and Bellary is the great cotton country of the south of India. From both the cotton now goes to the west coast.

Indian Railways.
 Governor General
 to E I Company
 Enclosure

The existing traffic of Madras takes two main lines. One of these, for the south-westerly traffic, runs by Wallajahnuggur (Arcot), Vellore, through the Amboor valley at Vaniembady, to Salim, the Buriamabel, and the south-east portion of Mysore. The present high road to Bangalore runs along this line. The other of these, for the north-westerly traffic, runs also by Wallajahnuggur, through Chittoor, to Cuddapah, Bellary, and the northward portion of Mysore. The projected lines are directed with the view of securing both lines of traffic respectively.

The Madras Government think that the Vaniembady or south-west line will be more remunerative immediately, but they would give precedence to the Palmanair or west line, because of its greater ulterior importance.

The railway committee selected the Vaniembady line, as far as Wallajahnuggur (Arcot), 60 miles, as being of all possible lines of equal length, that on which the most traffic exists. Good reasons are given why this line, if resolved upon, should be produced at once to Vaniembady, 130 miles. The half-million subscribed, Major Pears reports, will do this. The line presents no engineering difficulty, and is remarkably cheap, being estimated at considerably less than Rs.40,000 a mile.

The line to Palmanair, if not quite an equal length, will not be so cheaply constructed, having the Ghaut to surmount and the difficult country at the foot of it to get over. Palmanair is 2,100 feet above the sea.

A very attentive perusal of all the papers, and examination of the maps, after conversation with Major Pears have led me to the conviction, that to give precedence as proposed to the Palmanair line, would be very objectionable. My reasons may be thus summed up. It is only with a view to an ulterior object, viz., the Bellary extension, that the Palmanair line is preferred. Now no such examination of the country has been made as justifies any one in saying that the Palmanair line is the best line to Bellary. It is about 70 miles longer than the direct line; it rises at least 500 feet only to fall again, and it misses the Cuddapah traffic, now eight times greater than the Bellary traffic, without any equivalent. The direct line by Cuddapah passes, it is known, through a difficult country, but it is not known to pass through an impracticable country. Till that country is surveyed it seems to me unjustifiable to pronounce against what is obviously, if practicable, infinitely the best line for all the north-west traffic. The Vaniembady line, apart from ulterior objects, is acknowledged to be the most remunerative; it involves no engineering difficulty, and it forms part of the system which has been adopted as the great ultimate object, equally with the Palmanair line. It is true that the extension of the Vaniembady line to the west coast through the gap in the Ghauts has not been surveyed, but the country is so well known to be favourable,* that no doubt can be entertained of its feasibility. The actual proposition of the Madras Government is to have a trunk line of 48½ miles running due west and from Madras to an unimportant spot named Menil, whence hereafter, a track can go south-west to Vaniembady and the west coast; and whence ultimately a branch shall be made running a little north of west up to the top of the Palmanair Ghaut, to be thence extended to Bangalore, and from Bangalore to Bellary, or else from Palmanair to Bellary. The trunk line to Menil is not stated to be the best line for either the Palmanair or Vaniembady railway. It is perhaps not materially different from the best line to Palmanair, but it is admitted to be materially different from the best line to Vaniembady, as it takes the rail quite off the existing line of the south-west traffic, and away from the large towns on that line. If there is certainly to be one railroad to the top of the Palmanair Ghaut, then a trunk line to Menil is a good place. But if there is not to be a railroad to Palmanair, then a trunk or other line to Menil is unquestionably a bad plan. Thus before the direction of the first mile of railway out of Madras can be properly determined, the question, shall there be a railway up the Palmanair Ghaut or

* The height of Palypatcherry in the gap, is only 800 feet.

Indian Railways.
 Governor General
 to E. I. Company.
 Enclosure.

not, must first be determined. One great reason for the Palmanair line is, that by producing it eighty miles west, Bangalore is reached. But this consideration I think should be discarded, because Major Pears has just discovered at Vaniembady itself a passage up to the Mysore table land that promises to be much better than the Palmanair Ghaut. A railroad from Bangalore by this passage to Vaniembady will be shorter than one to Palmanair, and thereby the whole distance from Madras to Bangalore by rail will be very little more than it would be by the Palmanair. The Vaniembady line will be close to the present line of the high road to Bangalore, and Major Pears thinks his pass is the one up which the high road would have been taken had it been known to exist.*

Two reasons in favour of the Palmanair line only remain—first, that it will catch below the Ghauts so much of the existing traffic of the ceded districts † as now passes the Chittoor way; second, that it may be extended in a direct line from Palmanair to Bellary.

The first of these is only an immediate and temporary consideration, and on such considerations the other line is admitted to have the advantage. It is maintained that Bellary must be eventually reached by a railroad to be probably produced beyond it, and there can be no doubt that the cotton of Bellary is a great object. The making of a railroad to Palmanair will not obviate the necessity of making one all the way to Bellary. At present the Bellary cotton goes to the west coast by very bad roads.

The second consideration is no reason at all, unless it is true that Palmanair is the best line for a railroad from Madras to Bellary; it is not pretended that we are now in a position to pronounce that it is. Such a line would leave out Cuddapah, from which the existing traffic is estimated at 25½ lacs of rupees, whilst that of Bellary itself is only 23½ lacs of rupees. If feasible, unquestionably the proper line is through Cuddapah. Major Pears tells me he is anxious to survey the country with this object.

Cuddapah 490 feet above sea.

Bellary 1600 feet.

Adoni north of Bellary 1400.

Palmanair 2100.

Bangalore 3,000

The distance by road from Madras to Bellary by Cuddapah is 316 miles, by Bangalore it is about 100 miles more.

Salem 900 feet; Coimbatore 900 feet; Palyhatcherry, the gap. 800 feet.

3. A branch from north at Vaniembady to Bangalore, say seventy miles.

No. 1	-	-	-	-	316
" 2	-	-	-	-	428
" 3	-	-	-	-	70
" 4	-	-	-	-	30
					844

be a complete work of the first order, in a military and political view.

The want of all information sufficient to justify any decision on a line for the north-west traffic, should not stand in the way of a railroad for the south-west traffic, about which the information is satisfactory.

The grand system of Madras railroads seems to be this,—

1. A line from Madras to Cuddapah and Bellary 316 miles.

2. A line from Madras by Vaniembady, Salim, Coimbatore, to the west coast at Calicut, Penang, or Cochin, 428 miles.

3. A branch from north at Vaniembady to Bangalore, say seventy miles.

4. A branch from north at Coimbatore to the foot of the Neilgherry hills, say thirty miles.

The second of these lines involves no steep gradients, and will be a very easy and cheap line.

When completed only to Salim, it will be so far a complete commercial line, as it will tap the centre of the peninsula; when made throughout, it will

No. 1,026.

Enclosure.

From J. P. GRANT, Esquire, Secretary to the Government of India, to A. MALLETT, Esquire, Chief Secretary to the Government of Bombay.

SIR,

22d December 1852.

1. I AM directed by the Most Noble the Governor General of India in Council to acknowledge the receipt of your letter dated the 15th October last, (No. 450.)

2. In reply I am desired to transmit the accompanying copy of a despatch from the Honourable the Court of Directors (in the Financial Department,

Home Department
 Railway.

* See in No. 3. p. 3, pars. 12 and 13.

† Cuddapah and Bellary.

No. 516,) dated 22d September 1852, and of the memoir by Major Kennedy referred to therein, and to request that this Government may be favoured as early as practicable with such remarks on it as may occur to the Right Honourable the Governor in Council. On receipt of his Lordship's observations on Major Kennedy's paper, the Governor General in Council will take into immediate consideration the question of the extension of the Bombay line of railway beyond Callian.

Indian Railways
Governor General
to E. I. Company
Enclosure

3. His Lordship in Council will perceive that Major Kennedy approves of none of the lines which have been proposed as a line to be immediately executed. The line which Major Kennedy proposes to be first made, avoids the Ghauts and runs to Surat, where it would branch off towards Agra and the east coast.

4 I am desired to take this opportunity of forwarding for the information of the Government of Bombay a copy of a letter addressed to the Government of Fort St. George on the 14th instant.

Fort William, 22d December 1852.

I have, &c.
(Signed) J. P. GRANT.

No. 57 of 1853.

Enclosure

(Financial Department, Railway Branch.)

From H. E. GOLDSMID, Esq., Secretary to the Government of Bombay, to J. P. GRANT, Esq., Secretary to the Government of India (Home Department).

SIR,

11th February 1853.

1. I HAVE been instructed by the Governor in Council to annex for submission to the Most Noble the Governor General of India in Council, copy of a report received from Captain Crawford, the Government consulting engineer, before whom there had been placed the memoir by Major Kennedy, forwarded with your letter of 22d December last, (No. 1,026,) on the subject of railways in India.

No 17, dated 31st Jan 1853, with a Map of the Caudergh Collectorate referred to in para 30.

2. His Lordship in Council considers that it is clearly and forcibly shown by Captain Crawford that the scheme which Major Kennedy proposes for adoption in this Presidency is not feasible.

3. The opinions of this Government in favour of the lines proposed by the Great Indian Peninsula Railway Company, and which were advocated in the paper submitted to the Government of India with Mr. Chief Secretary Mallet's letter, (No 450,) dated 15th October last, are strengthened by the facts stated and the arguments advanced by Captain Crawford.

4. A simultaneous extension of the railway system throughout India is no doubt desirable; while a line such as that to which Major Kennedy's proposition more particularly refers, namely, to connect Bombay and Agra, is a line which would probably answer better for Government purposes than that contemplated by the railway company. Yet it is one which it appears to the Governor in Council that a company seeking a dividend cannot be expected to adopt; and moreover it is a line which, even if capable of construction, Captain Crawford shows could not be carried out by Government without alterations of the "desk designs" as they may be termed of Major Kennedy's alterations requiring to be made after surveys and calculations that would entail a large expenditure of time and money.

5. His Lordship in Council is further of opinion that if he were to withdraw his support from the railway company, and thus prevent them from carrying out their design until a determination could be arrived at as to the propriety of constructing, on account of the State, such a line as that suggested by Major Kennedy—the progress of railways on this side of India would be stayed for a long period, and the effect on capitalists at home and in this country be such, that if at a future period he had to revert to the original lines, as in all probability he would, or to other lines which he might wish to construct through the agency of a company, it would be difficult to raise the capital required.

6. Under these circumstances the Governor in Council trusts that the Government of India will see fit to support the designs of the Great India Penin-

Indian Railways.
Governor General
to E. I. Company.

Enclosure.

See par. 4 of Letter
to Secretary Great P.
Railway Company,
(No 448) of which
copy accompanied let-
ter to Government of
India, No. 450 dated
15th October, 1852.

sula Railway Company, as set forth in the Reports forwarded with the Chief Secretary's letter of the 15th October last, No. 450.

7. The Government of India have already been informed that in the opinion of this Government it is of great importance that the present experimental line should be at once extended, at any rate so far as to meet the general traffic of the country.

Bombay Castle, 11th February 1852.

I have, &c.,
(Signed) H. E. GOLDSMID.

(No. 17 of 1853.)

Financial Department, (Railway Branch.)

Enclosure

To H. E. GOLDSMID, Esq., Secretary to Government.

SIR,

1. THE memoir on Indian railways by Major Kennedy, forwarded to the Government of India by the Honourable Court, and transmitted to the address of Mr. Chief Secretary Mallet, in a letter (No. 1026,) under date 22d December, embraces questions of so vast and extended importance that it seems to me useless to attempt the discussion of many of them in a paper like the present, which must necessarily be comparatively short, even if I were in possession of the requisite documents and information and felt myself qualified for the undertaking.

2. I propose, therefore, after some slight allusion to those matters which appear to be almost beyond my province, to confine myself to the portions of Major Kennedy's memoir more particularly affecting the question of railways on the Bombay side of the peninsula; and I trust to be able to show that the lines now selected and laid down after so much expenditure of time and money, and so much labour and skill on the part of those employed in the operations, are to be preferred on every ground to that suggested by Major Kennedy, apparently with the aid only of a map of the country before him.

3. The first twenty-two paragraphs of the memoir allude generally to the vast influence for good which will attend the introduction of railways in India. All this, few will be found to dispute. The writer, however, appears to dwell principally upon their influence on military affairs, and the increased efficiency that will be given thereby to the army, when the system is advanced to a certain point. This also will be readily granted, but when it is attempted to value in money the advantage thus gained, and to deduce therefrom with anything like precision the amount the Indian Government may at once raise, as capital or guarantee to private companies to push on the system in all directions at once, I must then confess that the interests involved are too vast, and the questions, political and financial, much too complex to warrant an individual in my position entering on the discussion, and it is therefore one of those subjects that I shall avoid.

4. Passing over, for the present, paragraphs 23 and 26 inclusive, which I shall consider in connexion with Appendix No. 3, "On opening a Railway from Bombay to the Table Land across the Lyhadree Range," to which they principally apply—we come to paragraph 37, which is subdivided into 12 sections of rules, by which it is proposed to govern railway affairs in India.

5. Propositions 1, 2, and 3 suggest that railways in India shall be ranged under two classes; in the first, the regulating gradient not to exceed 1 in 2,000, and in the second class 1 in 330.

1st. That all railways constructed in India shall belong to one of two classes; the first or the second class.

2nd. That the regulating gradient of the first class or trunk railway shall not exceed 1 in 2,000. (By regulating gradient is meant the gradient which shall regulate the load of the engine.)

3rd. That no regulating gradient of any second class or branch railway shall exceed one in 330.

6. Under peculiar circumstances, where the traffic of rail is all one way, as

for instance from the mouth of a coal pit to the shipping point, a down incline is an advantage; but under ordinary circumstances, where it may be hoped that the traffic, though possibly not equal, will be of considerable amount both ways—every one will allow that the nearer the railway can be brought to a perfect level, the better.

Indian Railways.
 —
 Governor General
 to E. I. Company.
 —
 Enclosure.
 —

7. Few countries, however, will admit of any considerable extent of line on a perfect level; and the more the surface of a country is varied by undulations, the more expensive does the preservation of easy gradients become. Supposing no difference of actual level to exist between two termini, still, if the intermediate country be of a very diversified character, an approach to a level line between them can only be preserved, either by heavy and costly works, or if the features of the ground will admit of it, by a very considerable extension of the line in its length, so as to follow the contour of the country. In practice, the object would probably be attained by partial resort to both methods, and then the talent of the engineer is called into play, so to balance these, that when combined with the estimated expense of working the line so completed, the best return may be given for the capital expended.

8. Railways are of comparatively such recent introduction, that many of us may remember what are frequently, though improperly, called the absurd ideas that were entertained with regard to the possibility of working them, not by the general public only, but by men of scientific note. It was, for instance, gravely asserted that an engine with a plain driving wheel, acting on a plain rail, would not advance, and that the wheel would simply revolve without propelling the engine: when the contrary was shown to be the case, equally incorrect views were advanced regarding the power of ascending inclines, the rates of speed attainable, the powers of traction, &c. In fact, with all our boasted power of reason, railways, like every other improvement in art and science, have been completely established by experiments, after a series of trials and errors.

9. The consequence of all this was that, as is now freely confessed, enormous sums of money were sunk in costly embankments, viaducts, tunnels, &c., with a view of preserving that close approach to true level which after-experience showed to be not absolutely requisite; and by this experience all parties are now profiting in setting out new lines. For it is to be remembered that, whilst the costliness of works must remain pretty nearly constant, especially those, such as heavy embankments and tunnels, in which the principal expense is the labour employed—vast improvements are yearly being effected in the adaptation of our own native powers, and there is therefore the less reason to sacrifice money in the construction of costly works, which may be in a measure avoided by some increase of gradients.

10. Admitting therefore that the nearer the line of railway can be made to approach a true level, the better—I still do not see the necessity of hampering ourselves with specific rules on the subject. It would appear quite sufficient when a line of railway is proposed between any two places, that care should be taken that it be laid out with as easy gradients as possible, consistent with a due regard to economy in construction and working.

11. I shall say little on the subject of the 4th proposal. The plan may possibly be a good one where the slope of a country is very flat, such as perhaps in Bengal, Sind, the desert between Suez and Cairo, where the intervening summit is attained by a regular and almost unbroken ascent. Western India, on this side of the summit of the Ghauts.

4th. That short alternate planes may be introduced to assist the ascent, not to exceed a length of half a furlong each, and not to be nearer to each other than one furlong and a-half.

12. Proposition 5 is one of those which had much better be left open for consideration in any particular case. I can see no sound reason for tying ourselves down not to undertake a line, merely because it is estimated to cost more than 5,000*l.* per mile of single line. If, on account of physical difficulties, the construction of a line to connect any

It is, however, hardly applicable to

5th. That no line shall be undertaken when estimated cost shall exceed the average rate of 5,000*l.* per mile of single track; but that this rate of cost is not expected to include the bridging of large rivers, as the Soane, Jumma, &c., exceeding half a mile wide at flood level; such rivers are to be considered as breaks or temporary termini, where

Indian Railways.
Governor General
to E. I. Company.

Enclosure

two places must necessarily cost from 8,000*l.* to 10,000*l.* per mile, surely, if the traffic between them offered every prospect of being a paying one, there is no sound reason in refusing to commence such a line merely because it exceeds an arbitrary amount per mile.

13. The proposition laid down as the 6th, is at present the rule observed on this side of India, with the exception of the short line through the islands of Bombay and Salsette, which has been laid down as a double line, for reasons on record.

14. Proposition 7, determining the character of engine to be used in India for the next ten years; proposition 10, relating to the number of trains daily on a line; and proposition 11, relative to passenger trains with engines of higher powers—are questions that might, I think, be also left for consideration by the directors of a company when the occasion offers, and would probably be better arranged at the time, with the concurrence of Government, than by attempting to dispose of the subject by fixed rules at present.

15. On proposition 8, I have little to remark—the circumstances of any particular case would be the best guide, but I do not anticipate any extensive application of piled foundations on this side of India.

16. The instructions conveyed in paragraph 20 of the Honourable Court's despatch, meet this point fully, as far as the real object of proposition 9 is concerned. As no expenditure whatever can be made by the railway company, without the sanction of Government, and it is determined at the time to which account it is to be charge, the great object of preventing anything being charged to capital which is properly chargeable to income is attained. If the letter of this proposition were enforced much difficulty might be experienced with Indian railways. A very large portion of the expenditure will necessarily be incurred in England, and if the opening of a line were delayed until the actual and final closing of every account at home, vast delay might occur, and the capital expended in the meantime be

goods or passengers are to be carried across on rafts.

6th. That no line shall be sanctioned except for a single track of rails, with masonry cuttings and embankments to correspond; the ground, however, required for a double track, to be in all cases secured.

7th. That no locomotive engine shall be introduced to India for ten years, except such as the rates between the length of stroke of piston, and the diameter of the driver wheels, shall sanction, with reference to the maximum load, notwithstanding any sacrifice of velocity on the journey. Rule No. 11 contains an exemption from this restrictions.

10th. That no more than one train daily shall run in each direction upon any line, until the traffic shall furnish more goods and passengers than one engine can carry; after which a second may start daily each way; and that when the traffic calls for three trains fully loaded per day, the arrangements shall be made for laying down a second track of rails.

11th. That notwithstanding the tenor of Rule No. 6, if on any line it shall appear that the profits exceed a dividend of six per cent. per annum, it shall then be permitted, if thought advisable by the directors of the company interested, to introduce engines of higher powers of velocity, with a view of running passenger trains separate from goods trains.

8th. That when piling for foundations be requisite, the foundations are to be laid to suit a double track, although the superstructure is only carried up for a single track.

9th. That no portion of any line shall be permitted to open for the transport of goods or passengers, until the capital account for the construction of such portion shall have been closed.

No. 27 of 1849 to
the address of the
Government of
India.

unproductive. Government on the terms of the guarantee being obliged to pay the interest agreed upon, I trust, at any rate, that this rule will not be made applicable in its strict letter to our present line between Bombay and Tannah. The contractor is about to claim his completion certificate, from which date his year's maintenance of the line will commence, and should the line not be worked for that period, or the greater portion of it, the contractor will make an extremely good profit out of the Rs.20,000 for which he is bound to maintain the line in working order for twelve months.

17. On proposition 12 I shall offer no remark; the information alluded to if collected and recorded, would no doubt be of great value, but is applicable to many other improvements besides railways.

12th. That the height above the sea of all obligatory points throughout India, having reference to the construction of works, draining, irrigation, &c., such as the highest points or necks of valleys, the low passes in mountain ranges, be obtained and recorded with all convenient despatch on the maps now in progress of construction by the surveyor general's department; and that in addition to this, the height of numerous points of inundation level to be taken upon the rivers of India, and recorded upon the maps at intervals of two or three miles, so as to admit of the protraction of proximate sections of the slope of such rivers, and that any striking peculiarity in the lines of rivers or of the ground between adjacent rivers be reported upon to the surveyor general by his subordinate officers, such reports to be methodically arranged in his office as records.

18. Paragraphs 59 to 58 treat of matters of such vast political and financial importance, that I feel it would only be presumption on my part to enter in any detail upon such questions as the relative position of the Government and the natives of this country as landlords and tenants, or what percentage of the revenues is applicable to public works. Even the subject more particularly dwelt upon from pars. 50 to 55 of the memoir, the Appendix No. 1, and Table referring to fly sketch No. 2—viz., the grand trunk lines for the whole of India—I feel to be a question requiring much larger sources of information than is contained in a map of the country spread before me; and at any rate, it is not one to be discussed in a paper like the present, nor I trust will the progress of railways in this country be retarded for the full and final consideration of such an immense subject. (We may, I think, whilst laying out our lines so as to occupy such parts of the country as offer fair chances of profitable working, at the same time keeping in view the grand communication of the country, very well leave the railway system in some degree to develop itself, for as the whole project suggested by Major Kennedy cannot be laid out and brought into action at once, the very progress of railways will probably tend in some measure to modify their future circumstances.) I would also deprecate the attempting things on too great a scale in the first instance, and thereby risking failures and delays which may cool the rising confidence which seems to be entertained at home with regard to India as a country for investment of capital.

19. I shall now proceed to notice the subject alluded to in pars. 28 to 36 of the memoir, and Appendix No. 3, in which Bombay is more particularly interested.

20. It will be seen from par. 30, and also from the opening of Appendix No. 3, that Major Kennedy is not aware that the whole project for reaching the table land of Candeish by the Malsej Ghaut route has, after a most careful reconsideration and survey of other routes, been rejected for that by the Thull Ghaut, and that there is no intention now of attempting the ascent by a "fixed engine incline of about six miles, with a gradient of about 1 in 18, or by an alternative incline of thirteen miles long with a somewhat reduced gradient." All exceptions therefore taken by Major Kennedy to these points, or to the

Indian Railways
 Governor General
 to E. I. Company
 Enclosure

Indian Railways.
 Governor General
 to E. I. Company.

Enclosure.

With letter No.
 548, dated 27th
 Sept. 1852
 Copy sent to Go-
 vernment of India,
 with letter No.
 450, dated 15th
 October, 1852.

Dated 14th Sept.
 1852 Copy sent
 to Government of
 India, with letter
 dated 15th Octo-
 ber, 1852, No, 450.

branches from Alleh to Candeish and south-eastward to Sholapoor, are now of no force. Neither is it the intention that the grand trunk line between Bombay and Agra "should pass over no fewer than four *unnecessary* and *fierce* " *ranges* of mountains;" indeed it is no object, at any rate at present, with those in Bombay interested in railways, to look towards Agra at all. Our object is to reach the table land of the Deccan and Candeish as speedily as possible; and this, I am fully persuaded, is provided for in the project now before Government in the report forwarded by the railway company.

21. It is difficult to place in favourable contrast the magnificent projects put forward in the 31st and 32d pars. of the memoir, viz., for establishing a railway communication between Agra, Candeish, and Berar, the valleys of the Nerbudda and Soane, and west by Guzerat, Kurrachee, the Indus, &c., and the present more humble views of the railway company—the one plan being of so very general and extended a nature, and the other, comparatively speaking, so small; and, therefore, whilst not disputing the eligibility of Major Kennedy's mode for opening the communication of all those districts with Bombay, (vide conclusion of para. 32,) it will suffice to say that the views of the capitalists interested in our present line are of a much less extensive description. Whether an immediate railway communication with Surat and thence onward to Agra, is desirable or not, in a political point of view, Government will of course be the best judges, and if necessary will probably undertake the project; in the meantime there seems to be no necessity for such interfering with the plans for an entirely different line of railway into Candeish now before Government.

22. It will therefore be as well to narrow the limits of the discussion as much as possible; and with this object, I will take the one point of opening up Candeish, one of our richest provinces, by railway communication with Bombay, and compare Major Kennedy's suggestions for doing this with those proposed by the railway company.

23. Major Kennedy in his 31st par. writes—"The same reasoning which overthrows this project as a general trunk line between Bombay and Agra, holds equally against that portion of it intended to open an intercourse between Bombay and the districts of Candeish and Berar. On this portion of it the aggregate amount of rise and fall would probably exceed considerably 4,000 feet, whilst by the coast we go level to Surat and branch off by the Tapter Valley at the slight gradient of the river without passing any range whatever, nor would the distance by this route exceed that over the Ghauts."

24th. It will be observed from the Railway Extension Report, that the proposed line has been surveyed and roughly estimated from Callian to Mumnaur, just within the borders of the province of Candeish, and the aggregate amount of rise and fall will not be anything like the quantity named by Major Kennedy. It would be unfair to judge of the proposition in the memoir by bringing Major Kennedy's line, after entering Candeish, down to Mumnaur, as it would place him at a great disadvantage, by carrying him through the very worst part of the Daung jungle, and making an unnecessary bend to the southward in his line. I shall suppose, therefore, that it is intended by both lines to reach Lowda, which, situated towards the eastern extremity of Candeish and in the grand route for central India, will admit, I think, of a fair comparison of the two lines.

25. To quote again the conclusion of par. 31: Major Kennedy writes, speaking of the intercourse between Bombay and Candeish—"By the coast we go level to Surat, and branch off by the Tapter Valley at the slight gradient of the river, without passing any range whatever; nor would the distance by this route exceed that near the Ghauts." Perhaps no stronger instance exists than is contained in the above quotation, of the uselessness of attempting by the mere aid of a map, without personal local knowledge of a country, to set out the course of a railroad. Of the physical nature of the country through which he proposes the line to run, Major Kennedy would appear to be absolutely ignorant, for I am obliged to conclude from the whole tenor of his memoir as regards the western side of India, and the Ghauts in particular, that he has never visited it or them.

26. In the first place, if we take the coast road from Bombay to Surat, we find it, it is true, pretty level, but interrupted constantly by the mouths of considerable rivers, two or three of them amounting to arms of the sea, one and two miles wide; probably, however, the inner route might be chosen, and this,

it is true, would avoid the broadest portions of some of these, but even here they would interpose, in some cases, as most serious obstacles. In fact, whether by the immediate coast line, or the inner route, the whole line of 190 miles in length to Surat is open to the serious objection of directly crossing the whole drainage of the country, and that at the lowest, and, consequently, broadest portions of all the rivers; the line would be interrupted by ferries in certain instances, and in others these could only be avoided by heavy works in the shape of viaducts.

Indian Railways
 ———
 Governor General
 to E. I. Company
 ———
 Enclosure
 ———

27. From Surat turning eastward, no great difficulty would probably be experienced through the province of Guzerat, but at the entrance to Candeish where the Taptee breaks through the line of Ghauts, having the Sat Poora hills on the north bank, and the end of the Western Ghauts on the south, the case is very different; at this point, where so much is expected to be gained by turning the range of hills, it will be necessary to give a general description of the country, in order that an idea may be formed of its eligibility for railway purposes.

28. In the first place I may mention, that for seventy or eighty miles along this part of the river's banks the neighbouring country is, for the greater portion of the year, deadly to all but the few scattered tribes of Bheels dwelling in its dense jungles and ravines. I have made particular inquiries in these matters from those who have, when occasion permitted, passed through these districts, but, perhaps, I could not put the case in a stronger light than by quoting a report, now before Government in the General Department, being one made by Mr. Edwards of his survey during last year of the river Taptee, with a view to the rendering it navigable. As this report was framed with no view to railway affairs, the incidental notices of the features of the country will have the greater weight, as being unbiassed in any degree.

29. Here then is his description of the break in the hills through which the Taptee flows from Candeish into Guzerat: to prevent confusion it is to be observed, that in his survey he is proceeding down in the river, and we are now advancing up it; he writes, (paragraph 10,) "As we advance into the Daung Jungle, the spurs from the Sat Poora hills and the tail of the western Ghauts converge towards the river, the banks become very high, as much in some places as 150 to 200 feet." Again, (in paragraph 12,) he says, "At Pukassah, however, the jungle begins, the villages and the cultivation gradually disappear, until we arrive at Kookurmoonda, beyond which nothing but a few Bheel huts in clusters of three or four, and an almost impenetrable jungle, without a vestige of even a bullock track, exists, the surrounding country is also ragged and hilly, and is very much infested with tigers. This state of the country continues as far as Cairanjeeah, a distance of seventy-five miles." If to the above is added the fact, that the climate of this part of the country is, to all but the few savages bred in it, for the greater portion of the year deadly, little further, I think, need be said to make it clear that the immediate vicinity of the river must be avoided; and how far this would be done without becoming entangled in the rough ground of the hills on either side, a special survey only could determine. It will be seen, from further quotations, that the river is liable to heavy floods, and that safety from them is to be found only in keeping the general level of the country; this in a district intersected in every direction with ravines 150 and 200 feet deep, will admit of some judgment being formed of the probable costly nature of the requisite viaducts and embankments. The above is, I think, quite sufficient to shew that the facilities of this route are not so great as Major Kennedy would seem to suppose.

30. But now, having reached the province of Candeish, the greater difficulties no longer exist; still Major Kennedy's route generally must hold to the immediate vicinity of the river. The accompanying map of the province of Candeish will probably give a better idea of the features of the country than can be gained from a smaller one. I have laid down an imaginary route, supposing Major Kennedy to enter the province on the north bank of the river. As this, however, it may be remarked, would have entailed the necessity of crossing the Taptee somewhere within the province of Guzerat, where it is very wide, it is not likely that it would be selected by him. It will be seen that the route crosses the whole drainage of the country; the line by the north bank, after clearing the teak forest, would probably be found the more

Indian Railways,
 Governor General
 to E. I. Company.

Enclosure.

preferable, still it will be seen that it must cross considerable rivers and water-courses. Let us now see what is the character of the river and its immediate vicinity.

31. Mr. Edwards writes, (paragraph 10,) "In the province of Candeish the banks are about sixty feet high, consisting of an upper and lower one,—the upper is composed of black earth, and is on a level with the surrounding country, but the lower bank is of yellow earth, and is *very much cut up into ravines.*" And again, (in paragraph 13,) "*I think it was in a flood fourteen years ago, that several of the villages in Kandeish, which were situated on the lower bank of the river, were swept away.* The devastation of life and property was great, and those that had the good fortune to escape were left destitute. I have observed that in no instance had any village that was situated in the black earth suffered injury, whilst almost without exception those in the yellow earth suffered more or less, and, in fact, the inhabitants have now deserted several of their old villages, and founded new ones on higher ground." If the above had been written with a sole view to railway matters it would not have been more to the purpose. It is clear that the railway could only be carried on in the vicinity of the river at the cost of most extensive works; but under the supposition that the line might be kept at such a distance from it as to avoid the greatest of these difficulties—still this portion from the entrance to Candeish by the Taptee to Sowda, cannot compare with the portion from Mumnaur to Sowda.

32. The line from Callian to Mumnaur has been surveyed, and the results are now before Government. From Mumnaur I mark down the possible route to Sowda, and a mere inspection will show the very different conditions of this line from that of Major Kennedy with respect to the crossing of the drainage of the country.

33. It would seem that nearly enough has been said with respect to the route to Candeish viâ Surat and the valley of the Taptee, but there is one more point upon which I must meet Major Kennedy. To quote again the conclusion of paragraph 31 of his Memoir, "By the coast we go level to Surat, and branch off by the Taptee valley and the slight gradient of the river, without passing any range whatever. *Nor would the distance by this route exceed that over the Ghauts.*"

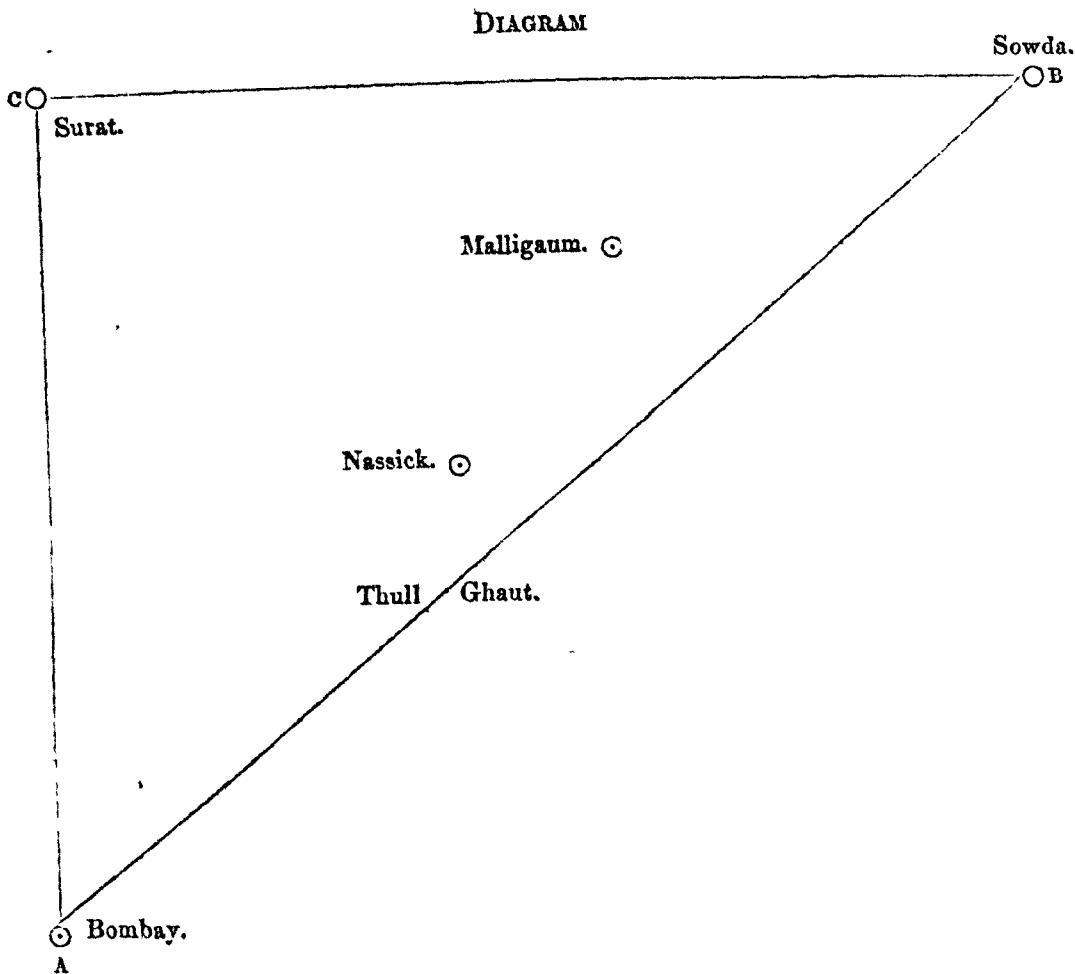
34. Major Kennedy evidently here has in view the route first proposed, but now rejected, viâ the Malsej Ghaut; but, even in this case, the assertion in the concluding portion of the paragraph would not be strictly true, for by simple measurement in the map the route viâ Surat and Taptee would be to that viâ the Malsej Ghaut as sixteen to twelve nearly, while it is still less favourable compared with the present line viâ the Thull Ghaut. The three points, Bombay, Surat, and Sowda, or any other town in Candeish, if connected, would constitute very nearly a right-angled triangle, (vide accompanying diagram,) of which the route viâ the Thull Ghaut, would be the hypotenuse. One leg of this triangle, from Bombay to Surat, measures 190 miles—the other, from Surat to Sowda, without allowing anything for deviations of the railroad, is in a straight course at least 200 miles, making a total, if Major Kennedy's route were followed, of 390 miles. The distance from Bombay to Callian by the line at present in construction is thirty-two miles; from Callian by the Thull Ghaut to Mumnaur by the line already surveyed, and of which the plans are before Government, is 128 miles, and from Mumnaur on to Sowda may be put down at 115 miles; making thus a total of 275 miles only against 390 miles in the route by Surat and the valley of the Taptee.

35. We will assume that either line is constructed at Major Kennedy's minimum of 5,000*l.* per mile; not admitting, however, the sufficiency of such a sum, yet, for the sake of comparison, that amount will do as well as any other. We have then the first cost of the one line 1,950,000*l.*, whilst the Thull Ghaut route would be only 1,375,000*l.* But, in addition to this, due weight must be given to a further very important point—not only would there be this difference of first cost of construction, but the cost of working and maintaining thenceforward 115 miles of unnecessary railway.

36. That the traffic would bear this I think highly problematical, the more so as in a commercial point of view (I put political questions aside), the line of 190 miles between Bombay and Surat cannot be calculated upon as one that could be worked at a profit. Surat is still a port of considerable importance, and for

(390 Miles at
 5,000*l.*)
 (275 Miles at
 5,000*l.*)

Indian Railways.
 Governor General
 to E. I. Company.
 Enclosure.



A. C 190 miles } 390 miles ; route proposed by Major Kennedy
 C B. 200 miles }
 A. B. 278 miles , route selected by railway company

eight or nine months of the twelve, the communication between it and Bombay, by boats and steamers, is constant and regular. Taking the cost of tonnage between the two ports at 4s. and 8s. per ton, for heavy and light goods respectively, by the sea route, it is evident, that unless the rates by rail could be reduced to somewhere about one farthing and halfpenny per ton per mile for these 190 miles, there would be little prospect of any considerable portion of the staple traffic, cotton, being conveyed by its means.

37. I think that I have advanced sufficient to show that Major Kennedy's proposal for opening the communication between Bombay and Candesh, via Surat and the valley of the Taptee is in the first place, under the present circumstances of the country, hardly practicable; and that were it otherwise, it could not compete profitably with the route now proposed for adoption by the Great Indian Peninsula Railway Company. On the merits or demerits of this fact I shall not now enter; it has already been placed before Government in a clear and practical report, and the nature of the works required, the probable cost of the undertaking, and all other points of importance are deduced from close actual and laborious survey of the country. It is, therefore, deserving of support against any propositions which are not based on equally sure data; and the crowning argument in favour, of the Thull Ghaut route into Candesh over that by Surat, is this,—that by it we occupy a line of large present and yearly increasing traffic; the Thull Ghaut road, bad as it is in many portions, being the great line of communication between Bombay and central India. By the route of Surat and the valley of Taptee we should pass through a line of country on the first 190 miles, in which, at present, nothing to be called a traffic exists, that being all sea borne; whilst through a large portion of the remainder we should pass through a country in which, at present, not even a foot track exists. It is a hazardous experiment, even under far more favourable circumstances than that now before us, to attempt to interfere largely with the established commercial routes; and no sound reason exists for attempting to disarrange that already adopted by the traffic of the country.

Indian Railways.
 Governor General
 to E. I. Company.

Enclosure.

38. If, in what I have now said, I have succeeded in showing that the route by the Thull Ghaut to Candeish is preferable in every respect to that proposed in Major Kennedy's memoir, but one more point remains for me to enter upon; viz., the method suggested by Major Kennedy for ascending the Ghauts.

39. I feel the greater difficulty in this matter, because I have to argue seriously against a project which I am confident could never have been for a moment entertained by any person who had, I will not say carefully examined this range of mountains, but merely ridden along their base and looked at them. I shall, however, treat the question as shortly as possible; and for this purpose will take up the case of the ascent of the Bhore Ghaut, under the circumstances that will be most favourable to Major Kennedy, viz., to assume the steepest gradient, (he admits 1 in 176, requiring a base of fifty miles in length to overcome the ascent,) and suppose it for the present, for the sake of argument, a practicable scheme in an engineering-point of view.

40. The present line of railway is now in course of completion up to Callian; we may, therefore, take this as the starting point:—first, then, as to mere mileage.

From Callian to a point fifteen miles south of the Malsej Ghaut, the point selected by Major Kennedy for the commencement of the incline, the distance is about	-	35 Miles.
Ghaut incline	-	50 "
From top of Ghaut to Poonah	-	40 "
"	-	125 "
By the route surveyed and mapped, and which is now before Government, the distance from Callian to Poonah is	-	81½ "
Difference in favour of the Great Indian Peninsular Railway route over that now proposed	-	43½ "
Valuing this at Major Kennedy's rate of 5,000 <i>l.</i> per mile, his line would cost	-	£625,000
Whilst that now before Government would cost	-	407,500
Difference in favour of present line	-	£217,500

Although this price of 5,000*l.* per mile is far too low, it serves as well as any other amount for the sake of comparison—for, of course, the same prices must be applied to both projects. Major Kennedy's rate cannot be assumed for his line, and our higher one, obtained by survey and calculation on the ground, used for the other route.

41. Thus much then for the mere first cost of the lines; but what is to be said in favour of that one, which so unnecessarily lengthens the distance between two places upwards of fifty per cent.; or if, to quote Major Kennedy's own words, (paragraph 57,) "the traffic of India has no broad margin like that of England, to cover grave errors," to what are we to look to compensate for the annual maintenance and working of forty-three miles and a half of unnecessary line, contemplated in laying out that between Callian and Poonah with a length of 125 miles, when the same can be accomplished efficiently with eighty-one miles and a half of railway? If the traffic of India should prove to be of the character supposed by Major Kennedy, is it likely that it would easily bear an addition of upwards of fifty per cent. to its mileage?

42. But I have now to take up the subject of the feasibility of the scheme proposed by Major Kennedy for the ascent of the Ghaut. Major Kennedy commences this part of his case with an estimate of the cost of tunnelling, premising that the Ghauts are most favourable for work of this description. Not to take up too much time on this part of the question, I will merely refer to paragraphs 11 and 13 of my report (No. 126), of the 7th October 1852, and mention that whatever may have been the opinions formed by those engaged in the first examination of the Ghauts in 1845-6, actual experience in tunnelling operations on the present line of railway, and a knowledge that the nature of the rocks to be encountered on the Ghauts differs in no material degree from that with which we are now engaged, has led us to decide that, by every possible means, tunnelling operations are to be avoided in India. To say nothing of the

expense, there is the element of time—one perhaps of even greater consequence. I need only mention, that in our present operations on two comparatively insignificant tunnels, the progress in the one, under the most favourable circumstances, has averaged only five yards per month on each face, or ten yards on the two faces; and this, working night and day, with free labour and skilled European superintendence. In the other tunnel, where greater difficulties have been experienced, so much as twelve weeks were consumed in one instance in completing fifteen feet in length. The question of time is, I am confident, quite sufficient to upset any scheme involving the execution of very extensive tunnelling. What, then, must we conclude with reference to Major Kennedy's plan, which contemplates fifty miles of line on the face of the Ghauts, of which, according to his own anticipations, half a mile in every mile would consist of tunnels, or twenty-five miles of tunnelling altogether?

Indian Railways
 Governor General
 to E. I. Company.

Enclosure

43. Of the estimate framed by Major Kennedy of the expense of operations of this nature, I shall say little; either some great clerical error has occurred in putting together his memoranda on the subject, or in estimating the expense of tunnelling at 6*d.* per cubic yard, or 17*s.* 6*d.* per yard forward for a tunnel for a single line, he has left out of the calculation the cost of convict labour, the feeding and guarding the convicts, the value of the superintendence afforded him from the public service, and other items—to say nothing of the want of any information regarding the nature of the material in which his operations were carried on. All this I must be permitted to say renders his estimate of no practical value. It may be very well in an occasional public work, where all circumstances suit, for Government to employ convict labour upon it; but it must be evident that on any very extensive scale, such as a long line of railway, this could not be done either with safety or profit; and I speak from experience, having had charge for a long time of subsidiary jails employed on public works. To attempt to reject from the calculations of the cost of a work the expense in maintenance, &c. of the convicts employed is a fallacy and a species of self-deception. I will conclude this part of the subject, viz., the estimated expense of tunnelling, put down by Major Kennedy at 6*d.* per cubic yard, by mentioning that this is, as near as possible, the cost in Bombay of digging foundations in ordinary soil, whilst the cost of excavating rock in ordinary circumstances varies from 2*s.* 6*d.* to 3*s.* per yard.

44. But I have now to consider the actual nature of the scheme proposed. Major Kennedy writes: “The precipitous face of the Syhadree range will probably be found to average about one perpendicular to three horizontal, with an elevation of 1,500 to 1,800 feet at some of the Ghauts above the more level country at its base, its crest for the most part offering a serrated line, with alternate salient and re-entering segments of curves of varying radii, and chords which we may assume to average somewhat less than semicircles of about half a mile radius, and occasionally diversified with spurs of considerable projection. The principle upon which these data should be dealt with in order to procure at the lowest cost a road fitted for a locomotive followed by a remunerative load, will be to conform as much as possible to the natural contour line of the hills, where the width can be obtained by simple side cutting, intersecting where necessary such portions of the projecting segments by cuttings or tunnels, and of the re-entering segments by embankments or viaducts, as shall bring the general line within the limits of well-considered radii of curvature.” He then goes on to propose, that for the purpose of ascending the Bhor Ghaut, for instance, a point for commencing the ascent should be chosen about fifteen miles south of the Malsej Ghaut, and at the foot of the range, and an incline with a slope of 1 in 176 formed along the face of the mountains, partly by side cutting and tunnelling and partly by the construction of viaducts, until such slope would come out about the summit of the Bhor Ghaut.

45. It is a very difficult thing, requiring a peculiar talent—that of scenic description—to bring by simple writing an ordinary landscape clearly before the mind's eye; and not laying claim to such art, I despair in great measure of enabling a stranger to the Ghauts to realize fully the nature of the district. Nothing but plans and sections of the most detailed and accurate description would enable me to do this; but I assert, and that without fear of contradiction from any person acquainted with the Ghauts, that the project of Major Kennedy is but one step removed from the impossible.

Indian Railways.
 Governor General
 to E. I. Company.
 Enclosure.

46. His description in the before quoted paragraph of what the "Syhadree range will probably be found," I must be permitted to say, affords anything but a correct idea of the nature of that range. The Ghauts have been likened to a wall, and not untruly so; broken this wall is by huge chasms, and in places by projecting spurs. Whether the slope, where there is a slope, would be found as Major Kennedy anticipates, to average about one perpendicular to three horizontal, I cannot say with precision; but throughout the entire length of the Ghauts from north to south, there is one feature which he has overlooked, and that is, that there exists a sheer precipice in the strictest sense of the word, varying from 200 feet to, in some places, perhaps 500 feet perpendicular height. This precipice is not always the very crest of the range, but is found perhaps generally between the middle and the top; it is broken by huge fissures, and in many places runs out, apparently only to recommence a short distance further on. During the monsoon, cascades in all directions pour over the face of this bed of rock. A line of road taking up this after the fashion proposed by Major Kennedy would, setting aside all other difficulties, come out upon chasms the passage of which would require viaducts of a description, I may safely say, hitherto unprecedented for height or magnitude.

47. As to the commencement of such a work, I may observe, that to get even a footing for the workmen, it would be necessary throughout considerable length of it, to sling the men over precipices, there to commence operations in situations where yet the foot of man never trod. I have said before that the work is but one remove from the impossible, and in these days it is impossible. It is one of those works that might be attempted, and perhaps carried out by a ruler of irresponsible power and unlimited command of men and money; and when completed it would rank as one of the most, if not the most stupendous works of the sort—stupendous, not in the same sense as the Britannia Bridge, where it is the grandeur of the conception and the bold application of an entirely new theory of engineering that excites the wonder of the spectator, but only from the consideration of the vast amount of labour and money that must have been expended in its construction.

48. After what I have now said, it would seem superfluous to advance further objections to the project, but there is one which I would yet mention. It is proposed to construct a line of railway gradually creeping up the face of a precipitous range of hills for a length of fifty miles. The annual fall of rain varies from 180 to 200 inches at Khandallah, and this falls principally in three months of the year. Of the works necessary for the protection of a line crossing at right angles the whole drainage of such a locality, all must at present be surmise. I will, however, mention that in 1832, 1833, and 1834, I was employed at Khandallah and its vicinity. This was but shortly after the opening of the new Bhoze Ghaut road, which, only four miles in length, ascends a spur without any very extensive side cutting; nevertheless, wherever the natural soil has been disturbed by side cuttings, though all ordinary precautions had been taken, vast masses during the monsoons would frequently slide down on to the road from above, rendering it almost impassable for days, and requiring the constant labour of a body of men to keep it clear; and although of course the frequency of such accidents has diminished by time, and when they do occur they are not of the same extent, still even at this date, after the road has now been open for upwards of twenty-two years, partial slips do take place. The case of a railroad subject to such accidents for fifty miles of its length can be better imagined than described.

49. Major Kennedy estimates the cost of this work at 5,000*l.* per mile. I have already shown that one of the principal data upon which he founds this estimate, viz., the cost of tunnelling, is erroneous. I will not, however, undertake to correct his estimate by stating what I think the work would cost, as I could not presume to attempt such a thing without the most detailed plans and surveys; though, as far as my own credit goes, I feel that I might safely do so—for the sufficiency or otherwise of such estimate would, I am sure, never be practicably tested.

50. There is one more observation which I would be permitted to make. It is, I am aware, strictly speaking, no argument, but is still worthy of some consideration on an occasion like the present. The project for ascending the Ghaut laid down by Major Kennedy contains no new idea; everybody is aware that a better gradient is found by leading a railroad or an ordinary road along the

face of a hill and gradually surmounting it, than by facing the said hill in a more direct manner. I would ask, therefore, is it just to the numerous parties of all descriptions, well acquainted with the ground, who have given their attention to this subject, to say nothing of the talented and experienced civil engineers who have for the last two years been engaged in a laborious instrumental survey of the whole district, to suppose that the very obvious plan proposed by Major Kennedy, if feasible, should have been so utterly lost sight of by all, and remain to be discovered by one at a distance, and who evidently cannot ever have visited the locality.

Indian Railways
 ———
 Governor General
 to E. I. Company
 ———
 Enclosure.
 ———

51. Before closing, I would beg to apologise for the seeming prolixity of this letter, but I have been placed under the serious disadvantage of having to combat propositions, which I am bound to say are in many instances advanced on no better grounds than the writer's assumption. Propositions brought forward in this way can of course be stated with whatever brevity the writer pleases; whereas objections to them necessarily require that the subject be more fully discussed.

52. One more point I would request permission to mention. It has not anything directly to do with the matter in hand, and may possibly appear somewhat personal. Should the Right Honourable the Governor in Council deem what I have advanced of sufficient force to allow of his adhering to his former opinion, with respect to the project for the extension of the railway beyond Cullian, and see no reason to propose to the supreme Government and Honourable Court any modifications of it, consequent on the receipt of Major Kennedy's memoir—it may then happen that that memoir may be recorded without being sent for consideration to the railway company. In such case I feel it to be almost an injustice to gentlemen with whom I have now been associated for the last three years, that certain passages of the memoir should be placed on the Government records without notice, especially as those gentlemen will not have the opportunity of protesting against the spirit of them. I allude more particularly to paragraphs 24, 25, and 26 of the memoir. I shall not enter into a discussion as to what parties were most to blame at home, more especially during the period when what has been well designated as the railway mania prevailed. Possibly there was blame attachable to all sides, but there is nothing whatever to show that it all rested with the engineers. I will only ask permission to state, that from the habits of intimacy upon which I have been with the gentlemen now in the employ of the Great Indian Peninsula Railway Company, as well as what I know officially from my association with them on matters of duty for the last three years, I do believe that there are no grounds upon which useless extravagance on their part is to be anticipated, but on the contrary, I have every reason to know that they are one and all most anxious to economize as far as safety and sufficiency of the works will allow.

53. The capital raised for the line from Bombay to Cullian was 500,000*l.*; of this there are now good grounds for anticipating that there will be a clear saving of 100,000*l.* This is no ordinary circumstance, either in railway affairs or large public works in general, and when the work done comes to be compared with the amount expended upon it, the extremely economical views of even Major Kennedy may possibly be satisfied. From the sum of 400,000*l.* a deduction must first be made of 30,000*l.*, admitted by the Honourable Court under the head of previous expenses, and applicable to charges incurred in the examination, &c., of the Malsej Ghaut scheme some years ago. That the present scheme has benefited by the examinations and surveys then carried on, there can be no doubt, although no part of the said sum of 30,000*l.* was actually expended on the present project.

54. The sum then, actually expended, it is now pretty clearly seen, will amount to about 370,000*l.*, and we may now inquire what has been done for this money.

55. First then, including the Mahin' branch, the contracts now in hand (two of which are approaching completion) exhibit a total length of railway of somewhat upwards of thirty-three miles—this divided into 370,000*l.* will give an average rate of about 11,212*l.* per mile. But of this thirty-three miles no less than twenty miles or nearly two-thirds is completed as a double line. This twenty miles of double line through the islands of Bombay and Salsette, are from local circumstances of a much more expensive description than would be case further inland.

Indian Railways.
 Governor General
 to E. I. Company.
 Enclosure.

56. There are first of all two expensive road bridges carrying the ordinary road over the rail, for the two most frequented thoroughfares of Bombay; there are other two also, but in situations where, from the line being in a cutting, they are of a less expensive nature. Again, the level crossings and gates rendered necessary by the great number of public roads intersected by the line are very numerous, and throughout the vicinity of the town the fencing, either walling or palisade fence, is of a much more expensive character than is required elsewhere.

57. Again, although the country is generally favourable throughout, there is an extensive embankment across a deep marsh, a very large viaduct of twenty-two arches, and one large opening of eighty-four feet with box iron girders. This viaduct, crossing a large arm of the sea, has a headway of thirty feet above high water mark. Some distance beyond this there is another viaduct over a salt water creek, besides two tunnels, which although of no great length, add considerably to the cost of an otherwise ordinary line. Where the line is laid as a single line, the works, such as bridges, viaducts, tunnels, &c., have all been constructed for a double one.

58. In addition to the above there are on the islands of Bombay and Salsette alone, consequent on the anticipated requirements of the passenger traffic of a very populous district, no less than five stations, not including the terminal one at Bombay, sufficient for the line when extended to a much greater distance into the exterior.

59. There is much here then which takes the line out of the category of ordinary lines, but there is this yet further to be considered, that besides the works above alluded to, there has been provided a rolling stock with all requisites sufficient to work at least fifty miles of railway, and many preliminary expenses not to be expected in future have been included in the amount of 370,000*l*.

60. The above will, I think, be sufficient to show that economy has not been lost sight of.

61. In conclusion, I think it may be granted that the construction of a line of railway into Candeish, as proposed by the railway company, viâ the Thull Ghaut, is of direct and immediate consequence to Bombay, whatever great political value there may be in any of those suggested by Major Kennedy. One of our richest provinces on this side of India is approached by the most direct route. It is not sought to divert the traffic of the country, but only to occupy the route it has followed for a long series of years. The country onwards from Candeish appears to offer every facility for the extension of the line to the eastward, so that we may hope to fall in with the Calcutta line in its extension to the north westward, and thus complete the communication between Bombay and Calcutta by rail, a result looked forward to, I imagine, with much greater anxiety by the mercantile interest in Bombay, than a present communication with Agra.

62. If in what I have written I have succeeded in showing that, for a communication between Bombay and Candeish, the route by the Thull Ghaut is far preferable to that proposed by Major Kennedy, viâ Surat and the Taptee, and also that Major Kennedy's plan for ascending the Ghauts by an incline along their face for a length of at least fifty miles is not feasible, I trust Government will feel induced to continue the support already afforded to the designs of the Great Indian Peninsula Railway Company. If delay occurs, and the work is not pushed on beyond Callian at once, so as to meet the general traffic of the country, the portion now completed, or nearly so, will be next to useless. The delay will intimidate capitalists at home, and as far as natives of this country are concerned, must destroy any confidence they might otherwise have had in railways in general, when they see a project so energetically commenced, and carried through to a certain point, stopped, for reasons they can never appreciate. I feel confident that, if our railway is stopped pending the consideration of Major Kennedy's extensive projects, the delay which must necessarily ensue will paralyze railway progress for years to come.

I have, &c,

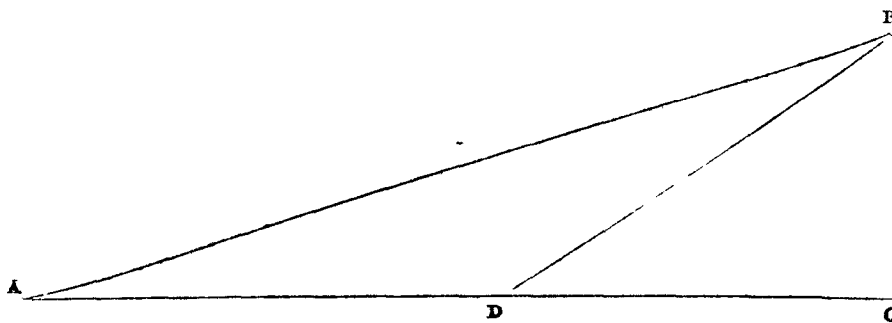
(Signed)

J. H. G. CRAWFORD, Captain,
 Superintending Engineer, Railway
 Department.

Bombay, 31st January 1853.

P.S.—In par. 11 of the above Report, I have alluded very shortly to the 4th proposition in par. 38 of the memoir, relative to what Major Kennedy terms impulsive planes. I merely said, “the plan may possibly be a good one,” and ventured no further in the discussion; seeing that, whatever might be its value in a country of a generally uniform slope, it was quite inapplicable to Western India, where the features of the country would obtrude questions of much too great importance relative to gradients and corresponding works, to allow of a line being laid out with anything like an approach to the minute uniformity which Major Kennedy apparently desires.

2. On reading over again, however, note (A.) to par. 52 of Major Kennedy’s Memoir, where he says, “A principle has occurred to me, as given in Appendix No. 4, by which the engine may be enabled to surmount considerable ascents with the *load due to a level road*,”—it has struck me that Major Kennedy may mean that he has discovered a plan by which he can move a weight a certain height without a corresponding exercise of power. The note either means this, or there appears to me a want of that precision with which a mathematical proposition requires to be enunciated.



If A B represent a given gradient, it appears to me that, in the end, just as much power must be exerted to move a given load, say 100 tons, from one point to the other by any other disposition of the rails—as, for instance, A D, D B—as if the load had been moved along the uniform slope A B.

3. This is not the place for the discussion of a mechanical problem. I merely mention what I have now said, that I may not seem, in par. 11, to concur in any mechanical fallacy.

31st January 1853.

(Signed) J. H. G. CRAWFORD,
Superintending Engineer.

True copy.

(Signed) H. E. GOLDSMID,
Secretary to Government.

ABSTRACT of Major Kennedy’s Memoir.

Enclosure.

The accompanying memoir, by Major Kennedy, on the subject of railways in India, has been forwarded by the Court of Directors for the consideration of the Governor General of India in Council. The following is an outline of its contents:—

1852. Home Corr.
22nd Dec No. 24

Considering that the Government, when it guarantees a return for capital invested in Indian railways, should not only be convinced of the incalculable benefit of railroads in India, or rest satisfied even with the almost certainty of the money so invested affording ultimately a remunerative return, but is bound and entitled to be assured of a direct and immediate equivalent and gain to itself from the establishment of railroads, by which, in the event of being called upon to pay the guarantee, it would be enabled to do so without any additional charge upon the revenues. Major Kennedy endeavours to show whence such an equivalent gain may be looked for, and what measures are necessary for securing it.

The increased efficiency of the army, which would result from a well-arranged system of railways, and the corresponding reduction in its cost, would, in Major Kennedy’s opinion, of itself repay the outlay of the whole of the payments guaranteed by Government.

“No one will deny,” he observes, “that the efficiency of an army is in some inverse ratio to the time required to concentrate such a preponderating

Indian Railways. " force of well-trained troops on any given point of its lines of defence as shall
 Governor General " secure victory over the largest hostile force that can be expected to
 to E. I. Company. " attack it.

Enclosure.

" What the exact ratio of increased efficiency may be, compared with the
 " increased power and rapidity of concentrating troops, and conveying artillery
 " and commissariat supplies to the first place of assembly for a campaign, as
 " well as in the subsequent supply of reinforcements and provisions, it is diffi-
 " cult to express in precise numbers; but it would probably not be straining
 " the argument to assume that two-thirds of any given army for the protection
 " of British India would be much more efficient where a field force of 50 000
 " or 60,000 men, with ample artillery, stores, and provisions, could be con-
 " gregated on any point of its vast lines of defence in twenty, forty, or sixty
 " hours, than the whole of such an army would be under the present system,
 " requiring a mean period of three or four months to bring such a force
 " together."

But although one-third of the numerical strength of the army might thus be dispensed with, Major Kennedy does not calculate on a reduction of the military expenditure in the same proportion. Certain charges are such as would not be diminished by the power of rapid movement and concentration, and for such charges he allows one-fourth of the whole. One-third of the remaining three-fourths, *i.e.*, one-fourth of the whole, he assumes as the probable amount of saving that would result from the introduction of railroads, and this amount therefore he considers may be fairly held to be available for investment in railways.

Quoting from the last Parliamentary Returns, Major Kennedy puts down the military expenditure of India as it was in 1848-49 at Rs.932,99,356, and in the annexed table he shows what might be done with the saving on this amount at different rates of guarantee on capital and of cost per mile of construction.

TABLE ABOVE REFERRED TO

PRESIDENCY.	Present Cost of Military Establishments as given in Parliamentary Return for 1848-9	Annual saving on Military Establishments which would accrue from the introduction of Railway Intercourse	Capital which may be raised for Construction of Railways upon annual saving in Col 2			Number of Miles of Railway which may be constructed by Capital in Col. 4, at per Mile.						Number of Miles which may be constructed by Capital in Col. 5, at £5,000 per Mile
			5 per Cent per Annum	4 per Cent per Annum.	3 per Cent. per Annum.	£ 5,000.	£ 6,000	£ 7,000	£ 8,000.	£ 9,000	£ 10,000.	
	1.	2	3	4	5.	6.	7.	8.	9.	10.	11.	12.
	£	£	£	£	£	Miles.	Miles.	Miles.	Miles.	Miles.	Miles	Miles.
Bengal - - - - -	4,933,538	1,248,384	24,967,680	31,209,600	41,612,800	6,241	5,210	4,438	3,901	3,467	3,120	8,322
Madras - - - - -	2,620,621	655,155	13,103,100	16,378,875	21,838,500	3,275	2,729	2,339	2,047	1,819	1,637	4,367
Bombay - - - - -	1,715,775	428,943	9,578,860	10,723,575	14,298,100	2,144	1,787	1,531	1,340	1,191	1,072	2,859
Total - - - - -	9,329,953	2,332,482	47,649,640	58,312,050	77,749,400	11,660	9,716	8,328	7,288	6,377	5,829	15,549

(326.)

Q 3

(125)

Indian Railways
 Governor General
 to E. I. Company
 Inclosure

Indian Railways.
 Governor General
 to E. I. Company
 Enclosure.

Major Kennedy is convinced that "5,000% per mile ought amply to suffice for single tracks," but, nevertheless, proceeds in his calculations on the suppositions the cost will be 10,000%, and asserts that even at this rate the mileage would be quite sufficient to open the main lines of trunk road throughout the several presidencies. It would give he says—

For Bengal	-	-	-	3,120 Miles.
For Madras	-	-	-	1,637 "
For Bombay	-	-	-	1,072 "
Total	-	-	-	<u>5,829 Miles.</u>

But in order to secure the utmost advantage from railways, it is necessary that every precaution should be observed for their judicious arrangement and management.

"It is," observes Major Kennedy, "imperative to adopt the most arduous and incessant scrutiny of all projects, as well as supervision in the subsequent execution, to eradicate the grave errors in the former and the extravagance in the latter which will otherwise assuredly emanate from those trained in the practice in England."

With a view "to direct, concentrate, and combine with useful effect the efforts of well intentioned active minds," Major Kennedy proposes for the adoption of the Government of India, the following rules:—

1. "That all railways constructed in India shall belong to one of two classes; the first or the second class.
2. "That the regulating gradient of the first class or trunk railway, shall not exceed 1 in 2000; (by regulating gradient is meant the gradient which shall regulate the load of the engine).
3. "That no regulating gradient of any second class or branch railway shall exceed 1 in 330.
4. "That short, alternate, impulsive planes may be introduced to assist the ascent, not to exceed a length of half a furlong each, and not to be nearer to each other than one furlong and a half.
5. "That no line shall be undertaken when the estimated cost shall exceed the average rate of 5000% per mile of a single track. But that this rate of cost is not expected to include the bridging of large rivers, as the Soane, Jumna, &c., exceeding half a mile wide at flood level; such rivers are to be considered as breaks or temporary termini, where goods and passengers are to be carried across on rafts.
6. "That no line shall be sanctioned, except for a single track of rails, with masonry, cuttings, and embankments to correspond. The ground, however, required for a double track to be in all cases secured.
7. "That no locomotive engine shall be introduced to India for ten years, except such as the ratio between the length of stroke of piston and the diameter of the driving wheels shall sanction, with reference to the maximum load, notwithstanding any sacrifice of velocity on the journey. Rule No. 11 contains an exemption from this restriction.
8. "That when piling for foundations be requisite, the foundations are to be laid to suit a double track, although the superstructure is only carried up for a single track.
9. "That no portion of any line shall be permitted to open for the transport of goods or passengers, until the capital account for the construction of such portion shall have been closed.
10. "That no more than one train daily shall run in each direction upon any line, until the traffic shall furnish more goods and passengers than one engine can carry, after which a second may start daily each way, and that when the traffic calls for three trains fully loaded per day, then arrangements shall be made for laying down a second track of rails.
11. "That, notwithstanding the tenor of Rule No. 6, if on any line it shall appear that the profits exceed a dividend of 6 per cent. per annum, it shall then be permitted, if thought advisable by the directors of the company interested, to introduce engines of higher powers of velocity, with a view of running passenger trains separate from goods trains.
12. "That the height above the sea of all obligatory points throughout India having reference to the construction of works, draining, irrigation, &c.

“ such as the highest points or necks of valleys, the low passes in mountain ranges, be obtained and recorded with all convenient despatch on the maps now in progress of construction by the surveyor general’s department, and that in addition to this, the height of numerous points of inundation level be taken upon the rivers of India, and recorded upon the maps at intervals of two or three miles, so as to admit of the projection of proximate sections of the slope of such rivers; and that any striking peculiarity in the lines of rivers or of the ground between adjacent rivers be reported upon to the surveyor general by his subordinate officers, such reports to be methodically arranged in his office as records.”

Indian Railways.
 Governor General
 to E I Company
 Enclosure

In addition to the principles laid down for observance in the above rules, Major Kennedy points out some of the leading features in the geographical formation of the peninsula of Hindostan, which should be borne in mind.

These are described as follows :—

1st. The Great Western range of hills, parallel to the coast, at a medium distance of about forty miles from it, and running south from the Taptee Valley for about 700 or 800 miles.

“ From the western range a formidable spur projects for about 400 miles to the eastward, reaching near to the centre of the peninsula from a point in the Ghaut a little to the north-east of Bombay.*

“ A feature of much general importance in our present consideration, is the great Omiauwtee table land. It sheds its waters in every direction; 1st, to the north-east, by the Soane valley, which falls into the Ganges, and passes Calcutta; 2d, to the south-west, by the Nerbudda and Taptee, which fall into the Gulf of Cambay, on the Bombay coast; and 3rd, to the south-eastward, by the Gunga, Godavery, Mahanuddy, &c., which flow towards the Madras coast.

“ Keeping these great geographical features in mind, and they cannot be overlooked in any general project without fatal error, they force upon us the knowledge of what the great arteries of commerce must necessarily be; and with those arteries our trunk roads must correspond. We must remember the valleys of the Ganges and Jumna, whose waters flow from the Himalaya to the south-eastward for about 1,300 miles, passing by Calcutta and many of the richest districts in India. If we keep these leading features always in mind, and seek to accomplish the object in view, without throwing away our great natural advantages, attempting to outrage scientific axioms, or fruitlessly striving to accomplish what is inadvisable, merely to gratify erroneous local influences, which are taken up in total ignorance or carelessness of first principles—there will be no doubt but singularly profitable trunk lines can be selected throughout India, which shall admit of judicious ramifications, to any extent that local interests can possibly demand hereafter.”

Major Kennedy then goes on to consider in detail the lines of railway which, in accordance with the principles thus laid down, “ would lead to the most perfect and comprehensive system of intercommunication that can at any future time be looked for in India.”

“ It will be observed,” he remarks, “ that the direction given to all the railways in this project is, as much as possible, in the course of the valleys; and that, as rarely as may be, it is proposed to cross any valleys or ranges of hills transversely.”

Supposing, in the first place, that capital was procurable on no lower guarantee than five per cent., the following railroads might, he supposes, be constructed by means of the saving on military expenditure above noticed, and they should be constructed, Major Kennedy thinks, in the following order :—

1. From Calcutta, viâ Rajmahal, to Agra.
- ✓ 2. From Bombay, viâ Surat, Baroda, and Ahmedabad and Neemuch, to Agra.
3. From Surat, through Candeish and Berar, viâ Rajamundry, Masulipatam, &c., to Madras.
- ✓ 4. From Madras to Trichinopoly, and thence to Poman, on the Malabar coast.
5. A branch from Bangalore to Madras.

* Since writing the above a principle has occurred to me as given in Appendix No. 4, by which the engine may be enabled to surmount considerable ascents with the load due to a level road.

Indian Railways.
 ———
 Governor General
 to E. I. Company.
 ———
 Enclosure.
 ———

6. A branch from Bombay to Sholapore.
7. An extension of the main line from Baroda to Tattah and Kurrachee.
8. A branch from Masulipatam to Hyderabad.
9. An extension of the main line from Agra, viâ Delhi, to Lahore.
10. An extension of the main line from Tattah, viâ Hyderabad, along the banks of the Indus, to Mitton.
11. An extension of the main line from Rajmahal to Saibgunge, through Dinapore, and thence a branch to the foot of the Darjeeling Hills.
12. A branch from Kurnal to Simla.

In a second fly sketch additional lines are marked, which might be constructed, should it be found possible (as Major Kennedy is sanguine that it would,) that capital could be raised with a guarantee of only 3 per cent. It seems scarcely worth while, however, at present, to pursue further a scheme of which the completion must, under any circumstances, be delayed to so distant a period. It is of more immediate importance to consider the remarks on the future direction of the Bombay line, to which the attention of the Government is especially directed by the Honourable Court in their despatch forwarding Major Kennedy's memoir.

The deed of contract between the East India Company and the Great Peninsula Railway Company, is "for the construction of an experimental line of railway from Bombay to or near to Callian, with a view to its extension to the Malsej Ghaut." The portion of this road up to Callian has all been given out to contract, and is in progress of construction; but the Government of Bombay concur with the railway engineer, the superintending engineer, and the committee of directors, in thinking that "the Malsej Ghaut extension ought to be finally abandoned, and the double Ghaut system, consisting of the north-eastern extension by the Thul Ghaut, and the south-eastern by the Bhore Ghaut, should be taken as the basis of operations."

Major Kennedy's remarks proceed on the supposition that the Malsej Ghaut route had been determined upon, but the principal of his objections extend equally to the lines now advocated by the Bombay authorities. Indeed, the possibility of some other similar route being adopted was evidently contemplated by him, and his views appear not to have been in any way changed by what he calls "the smaller question," as to "whether the Malsej, or the Bhore, or any other particular Ghaut might have been the preferable one through which to reach the table land." The following are his observations on the subject:—

"In this view, I apprehended that the project now in progress at Bombay calls for some very important modification of the original design. It is to be hoped, however, that this modification may be effected without the necessity of abandoning, for one object or another, any of the work done. It was an error to contemplate carrying the Great Northern traffic, including that of Candeish and Bejai, over the Syhadree Ghauts. At the same time, the portion of road made from Bombay as far as Tannah will probably be found suitable as the commencement of the great northern trunk road, whilst from Tannah, on by Callian, &c., the work done may come into use as a branch towards Sholapore, &c., from the trunk line.

"It would appear that the projectors of the works now in progress at Bombay, proposed to cross the Syhadree range by the Malsej Ghaut, 2,060 feet high. They propose to surmount the precipitous portion of the Ghaut, 1,770 feet high, by a fixed engine incline of about six miles, with a gradient of about 1 in 18 or by an alternative incline of thirteen miles long with a somewhat reduced gradient. They would then proceed through the table land due east for twenty miles and a half to Alleh, the maximum incline being so great as 1 in 113. At Alleh they would send off a branch to the south eastward in the direction of Sholapore; but the principle object appears to be the northern line from Alleh through Candeish, and crossing the Taptee and Nerbudda rivers they would take the direction of Agra after passing by Mhow, Indore, &c.; they would also throw off a branch from the Nerbudda, bearing on Allahabad. Here then we have, gravely proposed, a most erroneous project of a grand trunk road, by which the whole northern, north-western, and north-eastern traffic is to approach Bombay, the important mercantile capital of Western India. Between Bombay and Agra it appears to be the intention, that this great trunk line (second only to that of the Ganges, if even second to it,) should pass over no fewer than four

“ *unnecessary* and fierce ranges of mountains, of which I imagine the aggregate amount of rise and fall would not be less than from 8,000 to 9,000 feet, whilst on the natural route by Surat and the valleys of the Mhye and Chumbul there is but one summit to pass, at Neemuch, between Bombay and Agra. The height of this summit is 1,356 feet, which, added to the fall from Neemuch to Agra, say 850 feet, would make the total rise and fall by this line only 2,206 feet, whilst the distance would be about 120 miles less than that by the hilly route through the Ghauts.

“ The same reasoning which overthrows this project as a general trunk line between Bombay and Agra, holds equally against that portion of it intended to open an intercourse between Bombay and the districts of Candeish and Berar. On this portion of it, the aggregate amount of rise and fall would probably exceed considerably 4,000 feet, whilst by the coast we go level to Surat and branch off by the Taptee valley at the slight gradient of the river, without passing any range whatever; nor would the distance by this route exceed that over the Ghauts.

“ The best route harmonizes with every general and local interest of India in their widest extent, whether as regarding the north by the route I propose, with the power of throwing off branches, or as regarding the east by the valleys of the Taptee, Nerbudda, Soane, Godavery, lower Kistna, &c.; or as regarding the west, by Guzerat, Kurrachee, the Indus, &c.

“ Nothing can exceed the eligibility of this mode of opening the communication of all those districts with Bombay; nothing could be more preposterous than to think of carrying the traffic of any of them over the Ghauts.”

“ There is no doubt that the interests of the table land east and south-east from Bombay call for every exertion to open a passage through the Syhadiee range. But it is with this view, and this view only, that the work done to the eastward of Tannah can be made available.

“ I shall not *here* enter into the smaller question of whether the Malsej or the Bhoie, or any other particular Ghaut might have been the preferable one through which to reach that table land.

“ But what I most earnestly appeal against is the project which has for its object to approach the district of Candeish or Berar, or any other part of India to the north, the eastward, or the westward of those districts by any line whatever passing over the Ghauts. I trust that the East India Directors and the Board of Control will resist every suggestion made to them with this object, until they shall have heard from the Governor General of India upon the subject, and I feel firmly convinced that his Lordship’s experience will sustain the view which I take of this most important subject. The nature of the error is precisely similar to, though of much greater magnitude than that which I brought under his consideration in the project of the East Indian Railway Company in Bengal. He did not hesitate in adopting the remedy I recommended in the Bengal case, nor will he now for a moment hesitate in protecting those vast districts, which the Bombay project would affect, from the unnecessary tax on their transport of goods that would be the inevitable effect of carrying them over several fierce ranges of hills, when a much shorter line can be had, avoiding those hills and combining the broadest interest of Indian traffic generally.”

Major Kennedy admits the importance of throwing open communication with the districts of the table land above the Ghauts, and in an Appendix (No. 3.) describes how this might be effected by means of one or more branch roads. The system he advocates is what he designates one of impulsive inclines, and will be found described in the same Appendix.

A detailed description of the two proposed lines of railway, viâ the Bhoie and Thul Ghauts, will be found in paragraphs 79 to 194 of Mr. Berkeley’s report, which is among the papers forwarded by the Bombay Government.

Captain Crawford, the superintending engineer at Bombay has made two suggestions, which that Government have referred for the consideration of the home authorities; one of these is that in a case such as the proposed inclines at the Ghauts, the “principle of the atmospheric railway reversed,” might be usefully employed. The other is that in the event of railways in India proving hereafter a source of large and regular profit, the proprietors should be required to contribute to the general revenues of the country.

Possibly the Governor General in Council will wish to consult the consulting engineers at the several Presidencies on the subject discussed in the papers, and

Indian Railways.
 Governor General
 to E I Company
 Enclosure.

Indian Railways.
Governor General
to E. I. Company.
Enclosure.

especially to afford the railway authorities at Bombay an opportunity of considering Major Kennedy's project and remarks. With this view it might be desirable that these voluminous reports should be printed.

23d April.

(Signed) A. R. YOUNG.

Since the above was written, the report from Madras on the line proposed for that Presidency has been received. Major Pears's printed report, and the minutes of consultation which form enclosure No. 1 of the Madras letter, seem to contain all necessary particulars, and his Lordship in Council may wish to consider this subject in connexion with the above projects.

(Signed) A. R. YOUNG.

NOTE by the SECRETARY dated 3d November 1852.

Indian Railways.

No. 51 of 1852,
dated 22nd Sept

Dated 15th Oct
1852, No 450

Dated 9th Nov
1852, No. 66

These papers consist of a despatch from the Honourable Court sending out a memoir on Indian Railways by Major Kennedy, a despatch from Bombay referring for the orders of the Governor General of India in Council a proposed line of railway from Callian, (near Tannah in a north east direction up the Thul Ghaut, by Nassick, towards Candeish, and a despatch from Madras, referring for the same purpose a proposed line of railway from Madras up the Palamanair Ghaut to Bangalore. Mr. Young's memorandum gives an abstract of these papers.

No. 27 of 1851,
Dated 23rd July

No 51 of 1852,
dated 22nd Sept.

No 13 of 1852,
dated 18th August.

2. Until now the Bombay Railroad has been managed by the Bombay Government in direct communication with the Honourable Court; and the preliminary arrangements respecting a railroad in Madras have been managed by the Madras Government in the same manner. But in their despatch noted on the margin, the Honourable Court intimated to the Government of Bombay, that they would defer coming to a determination on the line to be adopted for the Bombay Railway extension beyond Callian, until they should receive the opinion of the Government of India as well as that of the Government of Bombay on that subject. And in their present despatch, they forward Major Kennedy's memoir with especial reference to his remarks on that line, which is a question on which they say they expect the decision of the Governor General of India in Council. In their despatch noted on the margin, the Honourable Court intimate to the Madras Government that they leave the precise route for the Madras Railway to the determination of his Lordship the Governor General in Council in communication with that Government.

Major Kennedy's Memoir.

3. The object of Major Kennedy's memoir is to impress upon the authorities in England and India, (1.) The great importance of the speedy completion of such extensive railways in India as will form a grand connected railway system. (2.) To show the safety with which the Government may construct, or give the necessary guarantee to private companies for the construction of such a grand connected system; trusting securely to reimbursement, if the speculation turns out commercially unprofitable, from the vast saving of military charges which a grand connected system of railways will enable it to effect. (3.) To enforce the absolute necessity in this view of guarding against the "incongruous errors of isolated action," by now taking, as from an elevated central point of view, a survey of the Indian empire; and before money is spent on local projects, forming a matured general design, and laying down correct principles of action, which in no railway to be made or guaranteed by Government shall ever be departed from in practice; and (4.) To explain the design generally and the principles in detail which, in his opinion, ought to be determined upon. In his memoir he sets forth at length his objections to the line now proposed at Bombay for the extension of the Bombay Railway beyond Callian, and to all the alternative lines that have ever been proposed for that railway, all of which according to his principles are so fundamentally objectionable as not to seem to him worthy of detailed examination; and the fact that a proposition to make such lines has been made and approved, he treats as a glaring instance of the terrible errors into which want of system and principle must lead. Major Kennedy also criticises the details of the line now in course of construction from Burdwan to the collieries.

4. The reference of the Bombay and Madras projects to the Governor General of India in Council, now made by the Honourable Court, seems to afford the Government of India the opportunity—or perhaps it should be said to impose upon it the necessity—of coming to a decision on the important principles involved in Major Kennedy's memoir.

Indian Railways
 —
 Governor General
 to E. I. Company
 —
 Enclosure
 —

5. On the two first of Major Kennedy's propositions as above abstracted, nothing that could be submitted for the consideration of the members of Government in this note, would facilitate their decision.

6. On the third, it may be mentioned that the Honourable Court, in writing lately to the Bombay Government, have repeated the instructions conveyed to the Government of India in their despatch, (No. 16,) of the 15th of May 1850, in the following words,—viz., that the objects of a survey of a proposed line of railway should have reference “to the ulterior destination of such a mode of conveyance, as forming a part of a general system, the object of which would be to facilitate communication for political as well as commercial purposes, and to effect more ready intercourse with other Presidencies.” The determination lately come to by the Honourable Court to refer the projected lines at all the Presidencies to the “decision” of the Most Noble the Governor General of India in Council, may seem to be nearly equivalent to the authoritative adoption of the principle of working everywhere on one imperial system under central control which Major Kennedy advocates.

No 4 of 7th Jan
 1852

7. How very much mistaken those are, who think that the magnificent design of giving to India the full benefit of railways is advanced by a hasty adoption of every local project for a few miles of railway which can obtain public support, and by the neglect in a railway case of that severe examination which all other projects, involving the expenditure of millions, are admitted to require, before they ought to be irrevocably determined upon—is demonstrated by the case of the Malsej Ghaut project at Bombay, which has now happened to come under the eyes of the Government of India. The line up the Malsej Ghaut was surveyed for two years, was proposed by the Railway Company, was approved by the local Government, and was so far sanctioned at home as to be made a part of a deed of contract between the East India Company and the railway company under which the original capital has been subscribed. It would be supposed that a locomotive railway which has to rise some 2,000 feet in a very few miles, is a work that would not have been blindly embarked in. But the fact is that it has now been discovered that there was an error of no less than 164 feet of vertical height in the survey on which the project was adopted; that is to say, the height to be surmounted was under-measured by three times the whole height which the railway, 200 miles long, from Calcutta to Rajmahal, will have to rise—that the expense in the one item of tunnelling alone was under-estimated by 384,754*l.*, being at the rate of 2,635*l.* a mile for the whole line of railway—that other items were similarly under-estimated—that one tunnel was required which could not be pierced in less than seventeen years, until which time no portion of the extension line beyond Tannah could be made useful, and that the line would be carried through a country in which it is now said there is very little traffic, to terminate, in railway parlance, nowhere.

8. On the fourth of the heads above described, a few remarks occur to the Secretary, as perhaps worthy of some consideration.

9. Major Kennedy's grand principle is to connect the several Presidencies by trunk lines which shall run, in every instance, along the great valleys, never crossing a ridge of hills, crossing a valley as seldom as possible, and rising over the summit lines (which of course must be surmounted somewhere,) at their lowest points. He shows how this can be done: from Bombay he runs a trunk line to Surat, whence proceeds one grand branch through Baroda to Agra; and another up the Taptee and down the Godavery valleys to the Coromandel coast, and thence by Masulipatam to Madras. Thus, the line he insists on, as the first line to be made from Bombay, goes nearly due north to Surat. He allows a second class line to go easterly up the Ghauts, for the local traffic of the high land of the Deccan; but for this, seemingly, he would take the Bhor Ghaut to the south-east and not the Thul Ghaut to the north-east, which last is the line recommended at Bombay as the first of the two Ghaut lines for adoption.—If Major Kennedy's views are sound, the extension from Tannah to

Indian Railways.
 Governor General
 to E. I. Company.

Enclosure.

Callian now in progress, which it is reported cannot become a paying line without much further extension, was over hastily adopted, for it may not be in the best line from Tannah to Surat.

10. Probably, as for grand connecting lines, no one will dispute the excellence in general of Major Kennedy's principle. Apart from the class of arguments which it is more especially in the engineer's province to weigh, the arguments for running in the great valleys are predominant. It may be questioned whether, viewed especially as an imperial object, a line running from one grand point to another by a great detour, alongside of and in competition with a *navigable* river such as the Ganges, is preferable to a direct line which would give a good means of communication to a country now destitute of any such means. But where the river is not navigable, as is the case with all the rivers bearing upon the Bombay system, there can be no question that a general preference is due to a river line, because the valleys of the great rivers constitute very generally the richest and most populous parts of the country, and in them are the grand marts of trade and most of the great military stations.

11. In discussing the Madras project, reasons will be assigned below for thinking Major Kennedy mistaken in his belief that his grand connecting lines can be carried out at gradients even approaching to the *quasi* level of one in two thousand.* It will be well to judge from what is now before Government, if his first class lines can be carried out universally on his second class gradient of one in 330.

12. It will be seen that Major Kennedy lays extreme stress on the importance of having Indian railroads on all but a dead level. By that means, and by that means only, he thinks they can be profitably worked. Now an extreme case of a very long, and in its first cost a very expensive line, with a small amount of traffic workable at a very cheap rate per mile on every ton of goods carried, can certainly be put, which would be demonstrably less eligible than a shorter and cheaper line, workable at a dearer mileage rate per ton. Therefore there must be some point in regard to distance and first cost, beyond which it is waste of money to go, in the desire to avoid a severe gradient. Without knowing, for every gradient that occurs, and for all probable amounts of traffic, where this point is, it is plain that no doubtful question as between distance and first cost on the one hand, and mileage working cost per ton on the other hand, can be solved to demonstration. Indeed, without this knowledge, all opinion as to what sacrifices in money and distance ought to be made for better gradients is merely fanciful. Now although Major Kennedy condemns wholesale all that has ever been done or projected regarding railroads in England and India, merely because the severe gradients adopted must reduce the engine load and increase the mileage cost of traction, he has made no attempt, either in this memoir or in his previous report therein referred to, to give a general formula for ascertaining the limiting point, or even to fix it in any one particular case, so as to prove that there will be actual loss by disregarding his principle, and to show what that loss will be. The suggestion which this consideration leads to, is, that a reasonably trustworthy table, showing what the extra working mileage cost per ton in India will be at each gradient, should be constructed before positively adopting any such universal rule as Major Kennedy proposes.

13. On the proposal to limit the number of trains to one each way daily, it is to be observed that if this were done upon the Benares line, either it would be necessary to carry goods at a wasteful rate of speed, or the railroad would not supersede the present mail cart *dâk* which travels ten miles an hour in a direct line.

14. Major Kennedy proposes that a most ingenious plan of "impulsive inclines" which he has invented should be introduced at once universally in India. But as the plan has not yet been tried anywhere, it is impossible to foresee that it will be free from all practical inconvenience. It would be however very easy to try it on one mile of some one railway now in course of construction.

Bombay Project.

15. The objections that occur as worthy of consideration in discussing the Thull Ghaut line now proposed at Bombay are these :—

* One in 2,000 is something above $2\frac{1}{2}$ feet of rise in a mile.

16. The line will form no part of any grand connecting line, unless Major Kennedy's principles are found to be altogether unsound. Indian Railways.

17. The Ghaut incline seven miles in length which shows, together with a steep gradient of one in thirty-seven, sharp reverse or winding curves, (the sharpest is of thirty chains radius,) must be admitted to be a bold work to begin with. It is a part of the scheme that there shall be a branch to ascend the Bhoie Ghaut, of about the same height, which shows at present one gradient so steep as one in twenty, requiring a stationary engine. The report of the Government engineer, who recommends the trial of an atmospheric retardation cylinder, by way of avoiding the danger of the descent, may seem hardly equivalent to a positive professional opinion in favour of the safety of the project as it stands.*

Governor General
to E I Company.

Enclosure

18. The traffic seems to be estimated upon fair grounds, and is taken as affording an income of 1,224*l.* a mile. This is said to be calculated upon a moderate scale of tolls. This scale appears to be two pence three farthings, or twenty-two pice a mile per ton generally, and double that upon the Ghaut incline upwards. This will not be admitted generally to be a moderate rate. The general opinion of the Madras authorities seems to be, that the rate there should not exceed six or eight pice, and the highest rate proposed there is twelve pice or one anna. The working expenses at Bombay are taken at 600*l.* a mile, which *at the estimated first cost of the railway*, with the above income, would afford a profit of five per cent. But the grounds on which the working expenses are assumed at 600*l.* a mile are not stated—no details are given. No precedent is known, from which to estimate the working expenses of such a precipitous and long incline as is projected at the Thull Ghaut; and as to the first cost, all who have any experience in great public works of an entirely novel character in India, know that the original estimates of cost are always from one cause or another in the end largely exceeded. It seems to the secretary, therefore, that it cannot be securely anticipated from the present papers that the line will pay unless a very large *new* traffic shall be created by it; and there would be a better chance for that, if the line were much longer than the present capital will make it. It does not appear what equivalent the Government will have in the possession of a detached line of railway from the sea coast at Bombay to some spot of no importance above the Ghauts, where it stops short, for any deficit in the profits which they will have to make good. For the mere purpose of bringing cotton to the sea coast, it would seem that lines running into the interior from Surat and Broach, should be the most likely and cheapest means.

19. To Major Kennedy's low country line the only apparent objection is, that such a portion of it as the present capital will make, which would barely reach Surat, probably would not pay. For from Surat and all intermediate places there would be the sea traffic to compete with, except during the south-west monsoon. But if Indian railways were carried on in the spirited manner and upon the grand principles Major Kennedy recommends, and the Bombay Railway were carried on at once beyond Surat, either (1.) up the Taptee to the Coromandel coast; or (2.) up the Nerbudda to the Ganges; or (3.) by Baroda to Agra—then it would have its fair chance of paying on the whole, and even if it did not pay, Government, in the possession of such a grand connecting line would have a full political equivalent for the deficit which under its guarantee it would have to make good to the shareholders.

20. The Bombay Government promise to send, as soon as they are prepared, copies of a great many maps and plans, as noted in the margin,* connected with the second lines of railway that have been considered at Bombay. These maps and plans have not yet been received. But no survey of the most cursory sort has been made of any one of Major Kennedy's three grand connecting lines above mentioned, nor has any survey of the most cursory sort been yet made in extension of the Thull Ghaut and Bhoie Ghaut lines, to show that these lines are capable of becoming good connecting lines between Bombay and the west

- * No. 2. A map of the Poonah Collectorate.
- „ 3. „ „ Ahmednuggur.
- „ 4. „ „ Sholapoor, with the various extension lines drawn upon them.
- „ 5. A general map of the country, showing all lines that have been laid out.
- „ 6. An enlarged section of the Malsej Ghaut deviation line of 1847
- „ 7. A section of the exten-

* See par. 27 of Captain Crawford's Report of 7th October, 1852.

Indian Railways,
 ———
 Governor General
 to E. I. Company.
 ———
 Enclosure
 ———

- sion line from Callian to the top of the Thul Ghaut at Egutpoora.
- No. 8. An enlarged plan and section of the Thul Ghaut incline.
- „ 9. A section from Egutpoora via Nussick and Munmar, a plan from Nussick to Munmar.
- „ 10. A plan and section from Callian to the top of the Bhoze Ghaut at Toongurlee.
- „ 11. An enlarged plan and section of the Bhoze Ghaut incline.
- „ 12. A plan and section of the line from Toongurlee to Poonah.

coast. It is for consideration whether it would be wise to determine finally in favour of any decisive line whatever, until Government is in a position to say that such line is preferable to every other, when viewed as the first stage of a grand connecting line to be completed between Bombay and one of the other Presidencies.

Madras.

21. The Madras Government refer several reports of Major Pears, their railway commissioner, with their own recommendation as to the lines to be eventually adopted, and the one line to be first commenced upon.

22. The general formation of the peninsula between Cape Comorin and the Vendya range, which is very simple, is well known: It consists of a triangular ridge of mountains, namely, the western Ghauts on the south-west, having a narrow belt of low rich land (Malabar, Canara and the Conkans,) between it and the sea; the eastern Ghauts on the south-east, having a wide belt of low land; in which rocks and hills are rather thickly scattered; the northern Sirkars, the Carnatic and southern districts between it and the sea; and the Vendya range on the north-west, having beyond it the plains and valleys of Hindostan. Between these is the undulating rocky table land of our own Deccan provinces of Nagpore and Hyderabad, of our own ceded districts, Bellary, &c., and of Mysore. This mountainous triangle is cut through, near its southern apex, by the very remarkable gap in the western Ghauts at Pulghatchery, south of which the eastern Ghauts do not extend, and where they round in and join the western ridge. This gap of low country gives an open passage between the eastern and western coast lands, and the richest districts of Madras are in it or in its parallel. Excepting at the northern verge of the table land, the drainage of the whole of this vast rocky triangle is from the ridge of the high western Ghauts, in view of the Indian ocean, right through the table land, and eastern Ghauts into the Bay of Bengal. But on its northern verge the summit level of the plateau is in the middle of the peninsula, whence the water runs in the Nerbuddah and Taptee to the Indian Ocean, in the Soane to the valley of the Ganges, and in the Godavery to the Bay of Bengal.

23. It is plain that to connect by railway the western and eastern coasts, one of three systems only must be adopted, either first to drive the line up the steep ascent of the ridges of both Ghauts, more than 2,000 feet; and down again, or, secondly, to ascend by the long and easy gradients offered on the one side by the Nerbudda or Taptee valleys in the northern part of the table land, and on the other side by the valley of the Godavery and one of its northern feeders; or, thirdly, to turn the whole triangle by running the line immediately through the great gap at Pulghatchery, and eventually continuing it to Bombay.

24. The second method is the one recommended by Major Kennedy for immediate adoption, whereby the two coasts and the two Presidencies of Madras and Bombay will be connected immediately towards the north, by a line ascending much, but very gradually. Major Kennedy's line goes up the Taptee, and down one of the northern feeders of the Godavery—and the lower part of the Godavery Mr. Turnbull has suggested as worthy of survey—a line up the Nerbudda, and down the Godavery, with another line from the summit level down the Soane. Either way the great table land is pierced through, and connected with both coasts, and the Bombay and Madras Presidencies are connected towards their northern parts by a good line of railway. By Mr. Turnbull's project, if feasible, the great table land would be also connected, with the centre of the Bengal provinces. Major Kennedy proposes to connect the two coasts by a line running from Madras through the gap in the Ghauts described as the third of the above three possible methods, and eventually he projects the extension of that line up the west coast to Bombay. By Major Kennedy's scheme, Bombay and

Agra would be connected by a separate line running through Baroda.) All these lines would be lines of Major Kennedy's first class, that is to say of low gradients. Indian Rail

25. It is probable, or rather it is now certain, that Major Kennedy is very much too sanguine in thinking that these grand connecting lines are possible with gradients never exceeding 1 in 2,000, or even anything like that *quasi* level. The first forty-eight miles of the trunk railroad in the Carnatic, now proposed, which does not go half way from the coast to the foot of the Ghauts, has a maximum gradient of 1 in 309, and if it rose unbroken at one angle all the way, its gradient could be no less than about 1 in 700. The ruling gradient ordered upon Major Kennedy's own line from Burdwan to Rajmahal, through the nearly dead flat of Bengal is 1 in 1,000.* That gradient is greatly exceeded on the line from Burdwan to the collieries, in which, long gradients of 1 in 823, 1 in 625, 1 in 500, and even 1 in 222 are to be found. This, however, is certain that so much of Major Kennedy's line as comes now into question, namely, the low country line through the gap in the Ghauts at Pulghatcherry, is practicable at what are generally considered favourable gradients, whilst the *competing* line, projected by the Madras Government, from Madras in a due westerly direction up the eastern Ghauts, and through the Mysore country to Bellary, is now seen to be impossible at any but what are generally considered the very extreme of bad gradients. Governor G
to L I Con
Enclosur

26. It is true, nevertheless, that Major Kennedy also proposes a line due westerly from Madras to Bangalore, which is the very line now proposed by the Madras Government to be commenced upon. But Major Kennedy proposes this as an isolated line, and as it ascends the Ghauts he permits it to be one of his second class of lines. Even his second class of lines, however, allows of no gradient above 1 in 330, which is better than the Madras engineer obtains in the country altogether below the Ghauts. Major Kennedy, no doubt, never saw either the Ghauts to be ascended, or the undulating country above and below them. Major Pears's report will probably put to flight all idea of lines of railway running up the Ghauts at inclines of 1 in 330. But the *comparative* difference between Major Pears's real low country and Ghaut lines is much more than that between Major Kennedy's imaginary low country and Ghaut lines, the gradient up the Ghaut being *hoped* by the Madras engineer to be 1 in 57. Therefore, all Major Kennedy's general arguments apply with their full force, whatever that is, against the present project of the Madras Government. For his argument, put generally, is, that the grand connecting or imperial lines should be the first made, and that no line with comparatively bad gradients should be part of any grand connecting line.

27. The Madras scheme is, to have two grand lines, one up the Ghauts to Bangalore, and thence to Bellary, and beyond it through the table land, *by which line it is proposed by them to connect Madras and Bombay*, the other through the Carnatic, in a south-west direction, hugging closely the foot of the eastern Ghauts, and eventually to be continued so as to pass through the gap in the western Ghauts, and to connect the eastern and western coasts. This last line in its final direction coincides with Major Kennedy's grand connecting line, but it adopts at its commencement the Bangalore line for forty-eight miles, as far as a place called Menil, whence it branches off to the south-west. There does not from the papers appear to be any object in this beyond the evident object of making one rail do for both lines for forty-eight miles. But as it is said of this trunk portion, that it will very soon require to be laid as a double line, † and as it prolongs the south-east line of traffic, unless it has other advantages (which, however, are not noticed), its adoption in preference to Major Kennedy's first-class line may be open perhaps to question. Major Kennedy's first-class line starts as a separate line from Madras, in a much more southerly direction, and runs to Trichinopoly at the apex of the delta of the Coleroon (Cemvery), the most fertile district under the Presidency, whence it turns westerly and runs straight west through the gap to the western coast at Poniany. But it occurs to the Secretary as an objection to terminating this important line even for the present at this obscure spot, that the grand military and political advantages of the line will not be obtained unless it runs to the northward up the Malabar coast, and passing

* The fall of the great highland rivers of Central India must be much more than that of the lowland portion of the Ganges.

† The rails are a large proportion of the whole estimated expense at Madras.

Indian Railways.
 Governor General
 to E I Company.

Enclosure

Calicut and Tellicherry reaches at least the great military station and commercial town of Cannanore, even if it do not proceed to the great commercial port of Mangalore. Half their troubles in Madras are in Canara.

28. It will be seen that whilst Major Kennedy's line takes a long detour to the south east of the direct course by Salim and Coimbatore to the west coast, the Madras line by Vaniembady at the foot of the Ghauts, takes a detour on the opposite side of the direct course whether starting from Madras or from Menil. There are doubtless local circumstances on account of which the longer line along the foot of the Ghauts is preferred, but what those circumstances are is not mentioned.

29. A line apparently very good, judging only by the map, is what may be called the direct line, starting from Madras and running near Conjeveram Arnee and Salim to Coimbatore, and thence rounding through the gap up Malabar and Canara to Cannanore. This would be the shortest line possible, and it only differs from the present Madras proposal in the portion between Madras and Salim. It would be satisfactory to know what are the advantages of the proposed line by Vaniembady, hugging the Ghauts over this or some other more direct line, for the distance in a straight line from Salim to Madras can be little less than that in the proposed line from Salim to Menil only.

30. Thus there are three directions to be considered which the grand line from coast to coast may take.

1st. Major Kennedy's, which makes a long detour to the south-east to pass Trichinopoly, and which would have to cross the Coleroon and several of its feeders.

2d. The direction now proposed at Madras by Menil, Vaniembady, and the foot of the Ghauts, which makes a long detour to the north-east, for what object is not stated, and which it is admitted goes (some twelve miles apparently) away from the existing main line of traffic, which is through Wallajah-nuggur.

3d. The direct line from Madras to Salim and Coimbatore, and so to the western coast, which is the line that a mere inspector of the map would first turn his attention to and ask to know about. There is nothing in the papers sent up from Madras to enable the Governor General in Council to determine between these lines, nor to show the grounds which induced the Madras Government to give the preference to their proposed (No. 2) direction over all other directions.

31. The Madras Government recommend that the line due west to Bangalore be first made. They think that the low country line to the south-west would be most remunerative to the shareholders, at least at first, but they think the other line entitled to precedence as being one of more political and general importance.

32. There is a general consideration in favour of beginning with the line most certainly and immediately remunerative, which the Madras Government has not discussed, namely—that as the capital for railroads is to be subscribed by private persons, it is a public object not to discourage subscriptions. If the line commenced with pays well, there will be plenty of money for the second line, but otherwise, a second line may never be commenced at all.

33. There are some considerations regarding the proposed line due west of Madras to Bangalore, which the Secretary ventures with great respect to submit, as he happens to know that country well. Major Pears's excellent reports will probably be accepted as proof that of the Ghauts available for quite a direct line to Bangalore, the Ghaut of Palamanair (up which there is now a good carriage road), which is the one he has selected, is the best. But it involves a gradient of extreme severity, 1 in 37, according to present expectations. The actual survey, plan, and estimates of no part of the line west of Menil, being three-fourths of the distance to Bangalore, and containing the whole of the difficulties, have yet been received. Those of the portion to Palmanair, containing the pass to the Mysore table land, are promised very soon, but the Government of India is asked finally to determine the question without them. The Ghaut may perhaps be found not quite the only expensive portion. It is suspected that Mysore may be found rather an expensive country to drive a railroad through. It is a rocky country, continuously highly and confusedly undulating, much intersected with ravines. The only part of the line, that of forty-eight miles to Menil, yet estimated for, is estimated at a very cheap rate,

materially less than Rs.40,000 a mile. There is nothing to show what the Madras Government expect to be the rate of cost for the other three-fourths of the way. Yet this is a material consideration, especially in a line expected to be remunerative only in the second degree. Mr. Turnbull, the engineer of the East Indian Railway Company, estimates the line from Burdwan to Rajmahal at three times the sum above stated;* and taking the Palmanan Ghaut as equivalent only to the passage of the Adjai and the Mor, they will do well at Madras, if, in fact, they do the remaining 141 miles to Bangalore at the same rate as that of the Rajmahal line, maintaining, exclusively of the Ghaut, good gradients.

Indian Railways
 Governor General
 to E I Company
 Enclosure

34. It is for consideration whether, in the absence of plans and estimates, any course should be finally determined upon which binds to the adoption of the direct west line to Bangalore, and whether the approval of a trunk line to Meni would not be tantamount to such adoption; inasmuch as it may be assumed in the absence of all reasons assigned to the contrary, that the grand low country connecting line would not be taken forty-eight miles due west to Meni except in order to make use of so much of the Bangalore line.

35. Further: a line running from Madras to Bangalore, and not going west of the meridian of that place, can be regarded only as a military and political line. Now Bangalore is the highest place on the Mysore table land, uninhabited rocks excepted, and being 3,000 feet above the sea, it is fully 1,000 feet above the mass of the province, which may be taken as being 2,000 feet above the sea. Palamanair, is 2,100 feet above the sea, and it would seem a preposterous project to take a railroad, having commercial objects between Palamanair and Bellary, eighty miles round by Bangalore, which is at right angles to the line forward, involving a rise and a subsequent fall of nearly 1,000 feet. Accordingly it will be perceived Major Pears proposed a distinct line from near Palamanair to Bellary, which shows plainly that nearly eighty miles, or two fifths of the line as now projected, is for no other object than to get to the great military station of Bangalore. If there is any foundation at all in Major Kennedy's argument, there must be something gravely objectionable in this project.

36. It will be seen that Major Pears anticipates confidently the possibility of running a railroad from Bangalore in a south-south-east direction down the Royacotta pass, or down his newly discovered pass near Vanimbady, to join the low country railroad, and that he has satisfied himself that in that direction Ghauts *at least* as good as that of Palamanair exist. Would not a line running from Bangalore southerly to join the low country railway, be even a better military line than that to Madras directly? It would be much shorter, and it would run directly towards the body of the Madras country, meeting in the middle a railway connecting the eastern and western coasts, Madras and Mangalore.

37. Accordingly it will be seen that it is a line proposed by Major Pears to be eventually made. But if it is to be made at all, and if when made it will be preferable to the east and west line now proposed, and in fact will supersede it, at least for all political objects, why should it not be made now, whereby all necessity of ever making the proposed line of double its length may very probably be done away with altogether.

38. It would be very easy to connect the foot of the Neilgherry hills by a short line with the low country railroad near Coimbatore. So happily placed are the Madras hills and healthy table lands, that with any reasonably good railroad system, it is hard to see why a single European soldier in the Madras Presidency out of Fort St. George itself, should be cantoned out of them.

39. It is respectfully submitted whether all the above considerations do not lead to the decision that the line first to be made is one or other of the three low country lines from coast to coast above described. The half million now engaged for will not be found to go too far, even if restricted to this one railroad.

* 12,000*l.* a mile, but Major Baker estimated it at much less. From Howrah to Pundooab the contract is Rs 53,706 a mile; and from Pundowab to Raneegunge Rs 36,179, exclusive of the permanent way which may be taken at Rs 20,000 a mile, stations which may be taken at Rs.4,000, and fencing which may be taken at Rs 4,000. Thus the cost to Pundowab will be about Rs.81,000 a mile, and from thence to Raneegunge, about Rs.64,000 a mile. To this must be added, for rolling stock to begin with, say Rs. 3,000 a mile.

Indian Railways.
 Governor General
 to E. I. Company.

Enclosure.

40. An is respectfully submitted whether, if this plan be adopted, the railroad should not be made at once as fast as possible all the way from Madras to the west coast, because Government will have but a small political equivalent for its financial guarantee until that is done.

(Signed)

J. P. GRANT,

Secretary to the Government
 of India.

3d November 1852.

MEMORANDUM by the CONSULTING ENGINEER to Government of India in the Railway Department.

Memor by Major J. P Kennedy on the subject of Railways in India.

MS. papers detailing projects for railways at Bombay

Printed papers chiefly by Major Peais, C.B., connected with railway project at Madras.

THE papers named in the margin have been communicated for my perusal and comment by the Secretary to the Government of India in the Home Department. They contain matter for much interesting discussion, but in the following observations I have deemed it proper to confine myself as much as possible to practical questions bearing on the present position of railway enterprise in India.

2. The objects contemplated by Major Kennedy in his memoir, are—

1st. To prove that it is alike the duty and the interest of the Government to bestow upon India a perfect system of Railway communication.

2d. To define the essential principles of such a system, and to embody them in a series of obligatory rules.

3. I admit the first proposition to its full extent, and am convinced that the more rapidly and energetically this duty is discharged, the more surely and effectually will the interests of the empire be served.

4. I cannot entirely accept Major Kennedy's calculation that the saving on military establishments would alone furnish funds for the extensive system of railway communication which he considers due to the country. For resistance to foreign aggression, or for any other object external to our recognized frontier, the power of concentrating troops by railway would virtually compensate for numerical strength of the army, in a ratio perhaps as high as that assumed by Major Kennedy; but I have no reason to believe that the internal condition of the country is or would be such as would justify a large reduction, considering that the railways would be in the hands of the people, and would continue efficient only by their sufferance. Without, however, reducing it to a pecuniary standard, it is easy to understand the magnitude of the indirect advantage which the Government of such vast territories will derive from the railway system in the enhanced efficiency of their military and civil establishments. There is no necessity to strain this or any other argument for railway enterprise. There is no reason to doubt that by means of well selected and economically constructed lines, the blessings of railway communication may be extended throughout the land, at a price within reach of the great mass of the people, with a sufficient margin of profit to the shareholders, and with eventual immunity to the Government who guarantee the dividends.

5. The guiding principle of Major Kennedy's proposed "Rules" is the necessity of reducing to a minimum the cost of railway service, and, as a necessary condition, the construction of such lines only as will admit of economical working. There is some room for diversity of opinion as to the means by which this desirable object is to be attained.

6. Major Kennedy's 1st, 2d, and 3d Rules limiting the gradients in his first or second class railways to 1 in 2,000 and 1 in 330 respectively, are probably those which will be least palatable, especially at Madras and Bombay.

7. The perfection of gradients is but one element, however important, in the calculation of the cost and value of railway service, the others being generally the interest on capital, the tariff of fares, the amount and nature of traffic, and the ratio of cost of locomotive power to the other items of annual charge. These conditions will constantly vary, and many of them are not susceptible of accurate previous estimate; in each case the projector solves the problem his own way, and the results are as discordant as under such circumstances might

be expected. They have, however, certain fixed relations to each other, and these will indicate the circumstances under which the "perfection of gradients" will attain the most prominent importance; viz.—

- 1st. A very low tariff of fares, and consequent necessity for a minimum rate of working charges.
- 2d. The cost of locomotive power (being the item most affected by gradients), bearing a high ratio to the other items of working charges.
- 3d. The greater part of the calculated traffic being in goods, and therefore admitting of more economy of locomotive power than would be possible in the conveyance of passengers.

8. If, as I believe,* these are precisely the conditions under which Indian railways are expected to work, it follows that the quality of gradients demands more attention from the Government of India than would be required in England, and still more than has usually been bestowed upon it in that country.

9. Agreeing so far with the spirit of Major Kennedy's "Rules," I cannot recommend the Government of India to adopt the strict limitation which he has proposed, and which would require considerable relaxation even on the favourable levels of the Gangetic valley. If it be desirable to fix a maximum ruling gradient for trunk lines, I would recommend that of 1 in 1,000 as more generally attainable and less likely to call for frequent exceptions; but if Government should object to fetter itself by the adoption of any absolute rule, it would still be very necessary to fix and make known the principles on which railway projects are to be framed and the standard by which Government will judge them.

10. I would ask permission to defer my remarks on the 4th Rule until I have leisure to examine Appendix No. 4, which I have just received.

11. The 5th Rule appears liable in some measure to the objection I have urged against the 2d. I believe that a single line not involving expensive river crossings or other special heavy works, ought to be constructed for 5,000l. per mile, but justifiable exceptions will occasionally arise and should not be entirely precluded; nor can I advise the unreserved adoption of the rule by which the bridging of large rivers is to be indefinitely postponed. In this respect also, each case must be judged on its own merits. The annual direct and indirect cost of the temporary arrangements for crossing the river must be weighed against the interest of capital required for the construction of the bridge and the period of time by which the completion of the line would be retarded. What is called "the convenience of the public" should not, in my opinion, materially affect the question. As regards the transit of goods, the delay of a few hours would be of little consequence, and it would not be justifiable to burden the capital account with a heavy expense merely to gratify the impatience of travellers, who would demur to paying commensurate fare.

12. The 6th, 8th, 9th, and 12th Rules have my entire concurrence.

13. The 7th, 10th, and 11th Rules have reference to the conveyance of goods and passengers together, and not by separate trains; such a plan would, in my opinion, be advisable in the infancy of the undertaking, and until the working expenses shall be covered by the returns; it has, however, been frustrated by anticipation for Bengal. The locomotive engines now under construction for the East Indian Railway, notwithstanding the injunctions of the Government of India, based on Major Kennedy's and my own recommendation, are of two classes, five being intended for goods traffic and five for the conveyance of passengers.

14. I proceed with great diffidence to offer a few remarks on the comprehensive scheme of railways for India proposed by Major Kennedy. Being

Indian Railways
 Governor General
 to E. I. Company
 Enclosure.

* On these grounds, viz —

1st It is almost self evident that a low tariff of fares is alone consistent with the low price of human and animal labour in India

2nd. The cost of locomotive power will bear a higher ratio than in England to the total working charges, because, the locomotives, the drivers for some time, and in Bengal much even of the fuel will be imported, and therefore dearer, the salaries of all subordinate establishments (who would be natives), and the maintenance of permanent way will be cheaper, and there will be no rates or taxes.

3rd. The reliance on goods traffic as the principal source of revenue appears to be general. I believe that passenger traffic will be very large, but chiefly perhaps in the lowest and cheapest class, which would be worked with the goods trains.

Indian Railways.
 Governor General
 to E. I. Company.

Enclosure

ignorant alike of the productive resources, and of the topographical features of many important districts, I am chiefly dependent on the information supplied by maps.

15. Major Kennedy's project follows naturally from his "Rules," the lines which stand highest in his estimation being those which promise the most favourable gradient. Most of his first class lines, and those especially which reach the interior of the country by a gradual ascent of the principal valleys, appear to deserve the first consideration; they would bring into communication with the coast and with each other the districts which are presumably the most fertile and populous, and that too by lines which promise the greatest facilities for economical construction and working.

16. The coast lines hold out the prospect of fewer advantages. They must necessarily cross many rivers at the most unfavourable points in or near their deltas, while throughout their length they have to compete with the best and cheapest description of water carriage.

17. However distant may be the complete execution of a scheme so comprehensive as is here proposed, there can be no doubt of the propriety of determining, as soon as sound data may be obtainable, precisely what that scheme is to be, and of encouraging no railway enterprise which would not form an essential part of it. I would respectfully urge the adoption of early and energetic measures for reconnoitring and levelling such of the principal lines as have not yet been examined; but as this must occupy some time, and as the machinery is already organized for the construction of one line in each Presidency, it is of primary importance at the present time to decide on the lines to be first adopted.

18. Happily, as regards Bengal, there is little room for hesitation in the choice of a first line. That from Calcutta through the Gangetic valley, by Agra and Delhi, to the Sutlej, combines with a singularly favourable profile the highest degree of political and commercial importance, and a fair basis for extension to the other Presidencies.

19. The numerous rivers and inundations which it must encounter, will, indeed, entail considerable expense; but to these it is indebted for the fertility of soil, the density of population, and the rich abundance of agricultural produce, which cannot fail of rendering it the most important and remunerating line in India.

20. I earnestly hope that the simultaneous construction of this line may be sanctioned at once, and that authority may be given to complete the preliminary survey, which already extends to Allahabad, and may without difficulty be pushed on to the Sutlej during the ensuing cold season. Some of the works involved (including the collection of materials) will probably occupy four or five years—the rest might be completed in two working seasons; but I will reserve the further discussion of this provincial portion of the imperial project for my report on the survey operations now in progress.

21. Without entering into the details of the Bombay projects, a task for which I am disqualified by the want of local knowledge, and in the absence of maps and drawings, I would still offer a reluctant though decided opinion against either of the lines so fully described by Mr. Berkeley. The least objectionable of the three lines discussed, that passing north-east by the Thull Ghaut, is not such as I could recommend for adoption by the Government of India as part of a general plan. The steepness of the gradients and sharpness of the curves approach the extremest limit of recorded practice, and in their combination would, in my opinion, be condemnatory of the project (as one which, under the circumstances of this country, could not be worked at a profit), even were the traffic calculated upon not accessible by another and less difficult route. But I find, from paragraphs 220 to 224 of Mr. Berkeley's Report, that the principal feeders of his north-east line would be those districts of Candeish and Berar which are watered by the Taptee and its affluents, and Captain Crawford states (paragraph 23), that "the principal portion of the traffic (on the proposed north-east line) appears to come from districts beyond Munmaur." These districts, however, would be tapped by Major Kennedy's No. 3 line, on which the distance would be very slightly increased; and the engineering difficulties being incomparably less, if it be considered by the Bombay Government, in concurrence with the engineers, that the traffic of these districts would justify the construction of a railway burdened

with such complicated imperfections as that proposed—still more encouraging would be the prospect of a line free from these objections, and capable of being economically worked.

Indian Railways.
 ———
 Governor General
 to E I Company
 ———
 Enclosure

22. I would therefore recommend, as the first for careful examination and eventual construction at Bombay, a portion of Major Kennedy's No. 2 line to Surat, and of his No. 3 line, (at least as far as Omrawuttee,) with a view to its eventual extension by the Godavery to Madras, and by the Soane to Patna, Calcutta, and Agra. By this plan the provincial objects of the Thull Ghaut line would be secured, while a railway communication would be established and an acceleration of mails attained between all the seats of Government.

23. The extension of Major Kennedy's No. 2 line through Baroda, Ahmedabad, and Neemuch to Agra, would be politically more important than the Taptee extension, and when completed would share the traffic of the Punjab and north-west provinces. Intermediately, however, it would chiefly benefit independent States, and would be interrupted near its outset by two important and, I suppose, unbridged rivers. Besides these considerations, it might seem unjust to the Bombay Presidency not to allow some weight to the local and provincial advantages which the Taptee line appears to possess over that of the Mhye.

24. The geographical features of the Madras Presidency would appear to limit its lines of easy gradients in a great measure to the coast, under the incidental disadvantages already adverted to; and, accordingly, under Major Kennedy's plan the high table lands would be the last to enjoy the benefits of railway communication.

25. It is evident that the lines advocated by Major Pears and the Madras Government, however advantageous to local interest, would not materially promote a general scheme of intercommunication (unless the Bombay lines were permitted to ascend the Ghauts); and it appears to me, *primâ facie*, that the general object would be best secured by a northerly line from Madras to the head of the Kistna's delta, and thence up the valley of the Godavery, to meet the Bombay line already described (paragraph 22).

26. A line by Arcot and Salem to Combatoor and the western coast, would be a sort of compromise between Major Kennedy's views and those of Major Pears. There is a strong presumption that it would be a valuable commercial line, but it would not possess first class gradients, nor would it apparently further the connexion of Madras with the other Presidencies. It would, in my opinion, be as much a provincial measure as the proposed line to Bangalore and Bellary.

27. It is my opinion, which, however, I submit with the greatest diffidence, that the northern line claims the first attention, and should that be found liable to insuperable objections, that the south-western line would be, on the whole, preferable to the ascent of the Ghauts.

28. Some of the Appendices to Major Kennedy's Report have not yet reached me, and others were received late. Having been unable to examine them properly, I would beg to defer my remarks to a future occasion.

(Signed) W. E. BAKER, Major,
 Consulting Engineer to the
 Government of India.

Calcutta,
 1st February 1853.

MINUTE by the Most Noble the Governor General.

Enclosure.

20th April 1853.

1. THE Honourable Court of Directors has recently made a series of references to the Government of India, regarding proposals for the construction of various railways in different parts of India. Railways in India.

They comprise a memorandum by Major Kennedy, lately the consulting engineer of this Government, specially directed to a consideration of the lines already proposed at Bombay, but entering largely, also, into the question of railways for India generally. A subsequent despatch calls for the opinion of the Government upon a specific proposal for constructing a line from Bombay to Agra, viâ Baroda.

Indian Railways.
Governor General
to E. I. Company.

Enclosure

The views of the Governor General in Council are also required, relative to the extension of the railway from Calcutta to the north-west frontier, the proper portions to be constructed, and the most eligible mode of carrying them on.

The opinion of the Government of India has, in like manner, been called for regarding the lines of railway that have been suggested for the Presidency of Madras.

Lastly, a proposal for the formation of a railway from Calcutta to Diamond Harbour has been transmitted for the consideration of the Governor General in Council.

Upon these the Honourable Court has required opinions with the least practicable delay.

2. The references embrace a variety of questions, whose magnitude and importance can hardly be overstated. The consideration of them involved the necessity of previous reference to the other Presidencies, with whose local projects the Supreme Government had no acquaintance. It demanded the most anxious and careful deliberation, and closeness of inquiry, which was hardly compatible either with the necessity for early reply, or with the due consideration of other questions occurring in the daily course of events, and imperatively demanding immediate decision.

The consulting engineer, who was absent examining the extension of the Bengal Railway, was immediately recalled to the Presidency. The consulting engineer at Madras was requested to repair to Calcutta. Distance did not admit of my requesting the presence of the engineer from Bombay; but full reference was made upon the several matters on which it was necessary that the views entertained in that Presidency should be known.

I have had the advantage of conferring personally with Major Baker and Major Pears, and the reply of Captain Crawford has been received from Bombay.

3. I have given my best and most earnest consideration to these great questions, sensible of the responsibility which attaches to the expression of an opinion upon measures that will affect so many and such vast interests; and I now submit respectfully the conclusions I have formed to the collective judgment of the Honourable Court.

4. It will be convenient to treat the several questions that have been raised in these documents in their natural order. I propose, therefore, to advert,—

1st, To the question of a general system of railways for India, on which Major Kennedy has dwelt in the memorandum transmitted by the Court.

2d, To the lines required in the Presidency of Bengal.

3d, To those proposed and required in the Presidency of Bombay.

4th, To those projected or desirable for the Presidency of Madras.

5th, To the agency by which the lines shall severally be constructed.

6th, To the general principle which ought to be observed in the construction of them.

7th, To the particular companies which seek permission to undertake them.

5. It cannot be necessary for me to insist upon the importance of a speedy and wide introduction of railway communication throughout the length and breadth of India—a single glance cast upon the map recalling to mind the vast extent of the empire we hold; the various classes and interests it includes; the wide distances which separate the several points at which hostile attack may at any time be expected; the perpetual risk of such hostility appearing in quarters where it is the least expected; the expenditure of time, of treasure, and of life, that are involved in even the ordinary routine of military movements over such a tract; and the comparative handful of men scattered over its surface, who have been the conquerors of the country, and now hold it in subjection—a single glance upon these things will suffice to show how immeasurable are the political advantages to be derived from a system of internal communication, which would admit of full intelligence of every event being transmitted to the Government, under all circumstances, at a speed exceeding fivefold its present rate, and would enable the Government to bring the main bulk of its military strength to bear upon any given point in as many days as it

would now require months, and to an extent which at present is physically im-

Indian Railways
Governor General
to E I Company
Enclosure

6. And if the political interests of the State would be promoted by the power which enlarged means of conveyance would confer upon it of increasing its military strength even while it diminished the numbers and cost of its army, the commercial and social advantages which India would derive from their establishment are, I truly believe, beyond all present calculation. Great tracts are teeming with produce they cannot dispose of; others are scantily bearing what they would carry in abundance if only it could be conveyed whither it is needed. England is calling aloud for the cotton which India does already produce in some degree, and would produce sufficient in quality and plentiful in quantity if only there were provided the fitting means of conveyance for it from distant plains to the several ports adapted for its shipment. Every increase of facilities for trade has been attended, as we have seen, with an increased demand for articles of European produce in the most distant markets of India; and we have yet to learn the extent and value of the interchange which may be established with people beyond our present frontier, and which is yearly and rapidly increasing.

Ships from every part of the world crowd our ports in search of produce which we have, or could obtain in the interior, but which at present we cannot profitably fetch to them; and new markets are opening to us on this side of the globe, under circumstances which defy the foresight of the wisest to estimate their probable value, or calculate their future extent.

7. It needs but little reflection on such facts to lead us to the conclusion that the establishment of a system of railways in India judiciously selected and formed, would surely and rapidly give rise within this empire to the same encouragement of enterprise, the same multiplication of produce, the same discovery of latent resources, to the same increase of national wealth, and the same similar progress in social improvement, that have marked the introduction of improved and extended communication in various kingdoms of the western world.

8. If further illustrations of these advantages be sought they will be found in the documents laid before the Honourable Court. The Court itself has recorded its desire that "India may, without unnecessary loss of time, possess the immense advantage of a regular and well devised system of railway communication."

(67, 1852) 21 t De.
pu 2

I trust, therefore, that it may be considered as a matter determined, that the limited sections of experimental line which have heretofore been sanctioned by the Honourable Court, are no longer to form the standard for railway works in India, but that these are to be undertaken upon a scale proportional to the extent of the British dominions in the east, and to the immediate benefits they are calculated to produce. I conceive that experimental lines of small extent are at this day no longer requisite.

9. The mechanical practicability of constructing railways in India, needs no further experiment for its establishment. If there are difficulties in India from which railway works in Europe and America are free, India is exempt on her part from many great impediments to which those countries are subject. If there are still doubts and difficulties here which the soil or season of India create, it may now be assumed with confidence that there are none which the skill and experience of those who are charged with the undertaking will not be able to master.

10. Again, the commercial success of railways in India, which the experimental lines were partly intended to test, is in my humble judgment not less certain than the practicability of them as material constructions.

Whatever might have been the result of the commercial experiment upon the short section of line which was commenced at Calcutta, if it had not been extended beyond its original dimensions; there seems to me to be no doubt of it proving remunerative, if it became as is now proposed, portion of a substantive line towards the north-west provinces. The amount of traffic which is passed and met by any one travelling upon the great trunk road; the inability of the limited number of steamers on the Ganges to meet the demand for freight; and the numerous river craft which everywhere cover the stream and crowd the canals near this city, through which they communicate with the port, all betoken an amount of goods requiring conveyance, which must be very great in extent.

Indian Railways.
 Governor General
 to E. I. Company.
 Enclosure.

There is no *primâ facie* reason to suppose that the parties interested in the conveyance of this mass of goods will not greatly prefer the rapid, safe, and easy carriage of a railway to the slow and riskful voyage of a country boat. And all the engineers have distinctly stated in their several reports up to the most recent which Major Baker has submitted, that their constant communications with the natives with whom they are brought in contact along the country which is to be traversed by the lines, have satisfied them, not only that the natives will gladly use the railways for the conveyance of their goods, but that they will have no scruple in availing themselves of them as passengers, if only the rate of fare paid shall render the carriages available to them.

If the lines shall be judiciously selected in the first instance, well and economically constructed, safely and thriftily worked, I entertain no doubt that upon the great lines of communication now in the contemplation of the company, the returns will be remunerative, and that the Honourable Court will be called upon after a line shall be in full operation, to pay the interest which it has been obliged to guarantee upon the capital, in order to induce the public to invest its money in railway works in India.

11. Were it otherwise, I should still consider it to be the plain duty of the Honourable Company to concede the assistance which is now required of it for the establishment of Indian railways.

Though the lines should not prove clearly remunerative, they will certainly pay in some degree. If the Honourable Company should thus be left liable for some payments to the railway proprietors, still additional means to meet this liability will be afforded by the reduction of public establishments which the introduction of railways will render feasible, though these may not be practicable to the extent anticipated by Major Kennedy in his memorandum. And even if, contrary to the expectation of those who are best qualified to form a judgment upon the subject, the railways should not prove a profitable investment, and the Honourable Company should be called upon to make good yearly a considerable portion of the interest it has guaranteed—the direct advantage it will derive from railways in the reduction of military force which they will render practicable, and the many other direct and indirect benefits which will accrue to it politically, commercially, and socially from their existence, will be so great and so palpable, as to render the payment of guaranteed interest a burden which the Honourable Company may cheerfully and contentedly bear; more especially when it calls to mind the peculiar relation in which it stands to the people, over whom it has been set to rule.

12. Having stated my opinion that the construction of an extensive system of railways in India ought at once to be commenced; and having further expressed my conviction that the lines when fully established will, if prudently and well constructed, be remunerative to those by whom they may have been constructed, and will be productive of infinite advantage to the Government as well as to the community—I have now to suggest the lines which it appears desirable to establish in the first instance.

13. In the memorandum to which the Honourable Court has directed our attention, Major Kennedy has observed, after stating various general principles:—

“The first object must be to lay down the great trunk lines, with a view to the broadest future ramification, and on a principle that shall ensure the most profitable permanent working of the lines generally, bearing at once upon the internal intercourse of India itself, as well as upon the intercourse of India with Europe.”

In fulfilment of this object, he proceeds to consider the lines of railway which would lead to the most perfect and comprehensive system of intercommunication that can at any future time be looked to for India. These he has marked in successive maps, in the order in which he considers they should be undertaken, according to the funds that may be available under circumstances which he supposes.

I apprehend that any attempt to lay down at this time a perfect and comprehensive system of railways covering the surface of India, is premature, and can lead to no practical result. I conceive that my present business is to advise the Honourable Court as to those great trunk lines which are of primary importance, not only as being most immediately required, but as forming the main channels

which future lines shall be able to take advantage of, as the best and readiest means of communication with other portions of the Indian Empire.

14. That some such general outline of a system should be described at the commencement, is of essential importance, in order that whatever capital may now be made available for the construction of railways in India may not be frittered away upon local and inconsiderable schemes, but may, as far as possible, be made to conduce to the establishment of those great lines by which the general interests of India would be best served.

15. The main considerations which should determine the selection of a great trunk line of railway in India must be—1st, the extent of political and commercial advantages which it is calculated to afford; 2nd, the engineering facilities which it presents; and 3d, its adaptation to serve as a main channel for the reception of such subordinate lines as may hereafter be found necessary for special public purposes, or for affording the means of conveyance to particular districts.

16. Tried by these tests, I apprehend that the line from Calcutta by the valley of the Ganges to the north-west provinces, which is referred to by the Honourable Court (in the despatch, 67, 1852,) will stand the first in order of importance and value, and ought to command the earliest and best attention of the Government of India.

The first portion of the line from Calcutta to Burdwan and Raneegunge was sanctioned some time ago. Its extension from Burdwan to Rajmahal has already been approved.

The engineer of the railway company and the consulting engineer have been engaged during the past season in closely examining the line proposed from Rajmahal to Allahabad.

Their report, which has lately been submitted, is fully satisfactory. Beyond Allahabad the country is known in its general character to be eminently favourable for the formation of a railway, although it has not been minutely surveyed.

With the exception of the rivers which intervene, there is nothing to prevent the prolongation of this line to Lahore and to the river Jhelum, whenever it may be thought desirable so to do; and although the country between the river Jhelum and Attock, in whichever direction it may be approached, will present greater engineering difficulties than the other portions of the line, there is in my opinion nothing whatever to prevent the railway being carried to the banks of the Indus at Attock, within forty miles of our extreme western frontier, whenever it shall seem good to the Honourable Court to order its construction.

17. The line I have sketched, even though it should not be carried at present beyond the river Jhelum, will constitute a very noble work, replete with the highest advantages to the Government and to the public.

18. Viewing it, first, with especial reference to the interests of the state, I have to observe, that it would infinitely diminish the risks, if risks there be, which are involved in the extension of our frontier to a distance of 1,500 miles from the capital of the country. The points on which hostile attacks are the most probable are the Cabul frontier and the borders of Nepal.

19. The hostility of Maharajah Gholab Singh, which has sometimes been anticipated, will most assuredly never be exhibited, so long as he has life in himself and strength to prevent its exhibition by others. The interest of future rulers of Cashmere will hardly be less urgent than his to induce them to cultivate friendly relations with the Government of India. If they should not be friendly, neither the wealth and power they hold nor the character of the people they rule are sufficient to make them formidable to us.

I regard, therefore, the states of Cabul and of Nepal as the only powers from which hostilities are likely to proceed.

20. The probability of an European invasion by way of Cabul, and by an European force, is so remote as to be hardly more than a bare possibility.

But the probability of an attack from Cabul under European instigation, if circumstances should arise elsewhere to recommend it, especially if either foreign war or internal disorder should, concurrently with such circumstances, compel us to weaken our force in the western provinces—is by no means to be disregarded.

21. The state of Nepal is, I believe, at the present time sincerely friendly, but its prince is a nonentity; its minister, Jung Bahadur, whose personal knowledge of the real power and resources of the British Government forms our

Indian Railways
Governor General
to E I Company
Enclosure.

Indian Railways.
 Governor General
 to E. I. Company.
 Enclosure.

best guarantee for the friendliness of Nepal, is, I fear, too far in advance of the public feeling of his countrymen to admit of our regarding his tenure of power or of life as at all secure. Events have already shown that he stands in a perilous position; and if the attempts to destroy him should succeed, trouble upon the frontier of Nepal is not altogether improbable.

22. The distance between the frontier which I have indicated as the point of risk, is very great. The European force in the eastern portion of this Presidency has been for many years past weaker, perhaps, than prudence would altogether warrant.

The recent addition of Pegu, however unwelcome, must be provided for; and while we have only our present force, must proportionally increase the risks of the Nepaulese frontier, whatever those may be held to be.

23. Whether, then, hostility shall come from Cabul or from Nepal, the line of railway to which I have referred would be of incalculable value.

Touching every important military station from Calcutta to the Sutlej, connecting every depôt, Allahabad, Agra, Delhi, Ferozepore, with the arsenal in Fort William, it would enable the Government of India to assemble upon either threatened frontier, or if it were necessary upon both, an amount of men and materials of war amply sufficient to deal with any such emergency, and within a period which would be measured by days; whereas months must elapse with our present means before we could provide the same extent of military defence.

24. Inasmuch as the consciousness of our power thus to concentrate our means wherever we might desire would deter native states from resorting to combined attacks, which they have hitherto happily neglected to attempt, it is probable that the army we now maintain might be numerically reduced without unduly diminishing our military strength.

The weary reliefs of corps periodically traversing long distances, at heavy expense to the state, with grievous loss of time and occasionally with loss of life, would in a great measure be obviated. The heavy tax upon the people of districts, which is often unavoidably inflicted by reason of the necessity of carriage for the troops, would be removed.

European stores, tending to benefit the health and affect the conduct of our troops, would be easily obtained quickly and cheaply. And in many various ways, which it is unnecessary to follow in detail, the power of the state would be increased, and its interests materially promoted.

25. The course which the railway would follow for these political purposes is, at the same time, the very best which it would be possible to select for the interests of trade, and for the local advantage of the whole of this portion of India. The sections that have been already sanctioned open the only coalfield which has yet been brought into extensive operation in Bengal, and afford means of conveyance for the great mass of traffic, which, excluded from direct communication with the port of Calcutta by the imperfect navigation of the Nuddia rivers, is compelled, during a great portion of the year, to find its way by the circuitous and inconvenient channel of the Soonderbunds.

The construction of the line to Rajmahal will, at the same time, afford new and great facilities of carriage for the rich produce of districts that lie upon the left bank of the river Ganges.

Proceeding onwards to Allahabad the line will skirt the hilly tracks that are now under examination with reference to the mineral wealth they are said to contain. It will open out the opium districts, and will meet the trade of the Nerbudda valley at Mirzapore, its chief emporium.

Beyond Allahabad it will run along the entire Doab, skirting the frontiers of Oude, whose great fertility and natural resources will one day contribute largely to the traffic of the line. It will traverse the country beyond Cawnpore, which, fruitful already, will shortly become more so under the influences of the Ganges canal, whose opening is looked for in 1854. It may receive, whenever it is desired, a branch by Furrackabad, for the conveyance of the produce of Rohilcund; and it will be equally accessible to such other branches as either the Honourable Company or native princes may desire to lead from it into their districts on the other side.

And although the country beyond Delhi is at the present time less productive and less populous than the districts below—no man who has noted the effect which even four years of peace have had upon the face of the country beyond the Sutlej, or who is aware of the vast results which the providing of the means of

irrigation produces upon the cultivation and peopling of similar districts in India will entertain a doubt of the certain success of those great irrigation works which are already commenced in the Barce Doab, and are contemplated in the cis-Sutlej province, or of their rendering the districts beyond the Doab, at no distant date, as populous and as productive as those within it.

Indian Railways
 Governor General
 to E. I. Company.
 Enclosure.

26. With the prospect of so many and such various benefits to be derived from its construction, I have to recommend that the line of railway by way of the Ganges valley to the north-west should be completed as far as Delhi with all practicable speed, and that it should thereafter be carried across the Punjab as soon as may be found feasible and expedient.

27. The only local line which is at present contemplated within the Presidency of Bengal is the line from Calcutta to Diamond Harbour.

The object which it is intended to secure by the construction of this line is indicated in the first paragraph of the despatch from the Honourable Court.

The despatch observes: "Adverting to the difficulties and dangers which attend the navigation of the river between Calcutta and its mouths, it appears to us that these evils would in a great measure, if not altogether, be avoided by means of railway communication, and that such a work would, in other respects, be productive of much public benefit, and would materially promote the shipping and mercantile interests connected with your Presidency."

In order to enable this Government to give an opinion as to the dangers incurred by trade and shipping in the navigation of the Hooghly, and as to the sufficiency of a railway to Diamond Harbour, as a remedy for the evils adverted to, I caused a reference to be made to the Superintendent of Marine. That officer has submitted a return showing all the vessels that have been lost in the navigation of the Hooghly during the last twenty years.

They amount to fifty-one in number. Of these only nine were lost above Diamond Harbour, all of which were weak and inferior ships.

It further appears that among such ships as have taken the now common precaution of being towed by a tug-steamer, only one has ever been lost below Diamond Harbour, and not a single one above it.

These facts, briefly stated, afford the means of effectually testing the value of the present project.

They show that a railway to Diamond Harbour, far from averting "in a great measure, if not altogether" the dangers of the navigation of the Hooghly, would exercise a very small influence over them, for they lie chiefly below Diamond Harbour. They further show that whenever ships have recourse to the usual easy and accessible precaution of steam towage, the dangers of the navigation are reduced to nothing above Diamond Harbour, and as nearly as possible to nothing below it.

Apprehensions have been entertained that the navigation of the river might be closed altogether by the silting up of the channels near the James and May sand.

No information has ever been before me to show that this is a probable event or that it has of late years become more probable. Until it does actually occur or until the probability thereof becomes imminent, or until those huge arks which have been spoken of, and to which Captain Rogers alludes, shall really be the vehicles for the commerce of India, I am unable to advise the construction of a railway from Calcutta to Diamond Harbour.

Fleets of magnificent merchant ships annually come and go, uninjured and even unimpeded. The fine steam ships of the Peninsular and Oriental Company habitually run up and down the river safely, and at a very high rate of speed. The large mail steamers of the Screw Company, and the heavily-armed steam frigates of the Indian Navy, perpetually traverse the channel without difficulty or danger.

I do not believe that the formation of a railway to Diamond Harbour would be of the slightest benefit to any one of these; or that, if it were opened for traffic to-morrow, it would induce any one of them to anchor there, or to depart from their usual plan of proceeding direct to this city, with the advantages of proximity to their cargo and agents, of accessibility to their passengers, and manifold other conveniences, both for those who belong to the ships and for those who are on shore.

Indian Railways.
 Governor General
 to E. I. Company.

Enclosure.

I am aware of no benefit whatever which would be derived by the Government from the existence of such a line of railway. Nor is it apparent to me in what other respects it would be productive of benefits to the shipping and mercantile interests of this Presidency.

If, however, those interests are of opinion that a railway to Diamond Harbour would be advantageous to them, I respectfully submit that the proper course is, that their own enterprize should provide the line for their own advantage. It would be a line of limited extent—of very easy construction; for there does not appear to be any formidable engineering difficulty in its course—and cheap, excepting where it would be necessary to purchase land in the immediate vicinity of Calcutta. The project, therefore, would be easily accomplished by a very small exertion of enterprize, and a comparatively small amount of capital.

As the dangers of the navigation do not loudly call for this line, as the interests of the Government would in no respect be promoted by it, and as it is quite within the ordinary compass of joint stock undertakings, I beg leave to express very strongly my opinion that it should not be taken in hand by the Government of India; and that, if private parties should engage in it, the Honourable Court should not come under the obligation of guaranteeing interest upon the capital raised for it in any amount whatever.

With reference to the observations of the Superintendent of Marine upon Chilka Lake, I have only to remark, that it is so little of a practical question at the present moment, that I do not think it necessary to occupy the time of the Honourable Court by entering upon a consideration of it.

28. The next important point for consideration is the desirableness of connecting the several Presidencies by means of railways, and the best mode of effecting the communication. I attach no great value to the connexion by railway of the several capitals and seats of Government, considered merely as such. But it appears to be of the first importance to connect the several Presidencies by a line of rail, each with the other, and to unite Hindostan and the districts to the north-west with the western ports in the peninsula.

29. The memorial of the directors of a proposed company for constructing a line from Bombay, viâ Baroda, to Agra, which has been transmitted for the opinion of this Government by the Honourable Court, communicates very fully the several political and commercial purposes which would be served by their project. Although their case seems to be somewhat overstated, and although I do not concur with them in thinking that Simla must ere long become “the permanent residence of the general government of India,” or recommend that it should be so, I am strongly of opinion that the formation of some line uniting Hindostan with Bombay is immediately desirable.

30. Whatever strength there may be in the arguments by which a general line through Hindostan has been urged on political grounds, they bear as strongly in favour of a junction line with the Presidency of Bombay. The military power of the Government of India would be incalculably advanced thereby.

The Presidency of Bombay may be said to have no foreign frontier, except in Scinde.

The Nizam is a foreign potentate, but wholly helpless in our hands.

Of the Rajpoot states, none are hostile, or in the least likely to become so. Most of them furnish a contingent force in some form, officered and controlled by the British Government, which is stationed within their bounds, and forms an effectual check upon them. Even if they should become hostile, the experience of a century has shown us that the danger of combination need not be anticipated; while, if it should unexpectedly take place, the force in the Presidency would be amply sufficient to meet it, even though a considerable portion of the army should be detached elsewhere. In taking this view, I assume, of course, that all risk of simultaneous foreign invasion upon the coast will be fully provided against by our fleets upon the sea.

Such being the political situation of the Presidency of Bombay, it would be able to afford, with safety to itself, extensive and valuable aid to the Government of India, in the event of the Bengal army being suddenly and heavily threatened by any of those very possible events to which I have pointed in previous paragraphs, if only the means of movement for its troops were afforded to it, and a railway were in existence, annihilating the vast distance

which separates the two armies, and which deprives them, in a great measure, of all the advantages of mutual co-operation.

31. Nor is it in time of war alone that such a communication would be valuable. Heretofore, and until very recently, every recruit that joined his corps from England, every invalid that was sent back shattered to his home, was obliged to travel the long, slow, weary track to Calcutta, however distant the station at which he was placed. Within the last two years, the establishment of steam communication regularly on the Indus has enabled the Government greatly to lessen this evil. The despatch of recruits by Bombay to Kurrachee, for that large portion of the Bengal army that is stationed to the westward of the Jumna, and the conveyance of the invalids of the same portion of the army from Ferozepore to the sea, have been a vast improvement. But a railway to Bombay would afford infinitely greater relief to the class returning home, and far greater facilities in favour of those for the first time arriving in a tropical climate.

32. Its advantages might be still further extended with great economy of time and money, and probably with great benefit to the health of the troops, and consequently increase to the efficiency of the Bengal army. If a line were in full operation, regiments in relief, instead of landing at Calcutta and having their first introduction to an Indian climate in those districts where its character is the worst—or instead of landing at Kurrachee, which can only be done at certain seasons of the year—might be shipped for the shorter voyage to Bombay, and being landed there, might at once be transported by rail to such station in the upper provinces as might be thought best adapted for ensuring the health of the corps.

33. Furthermore, I hope before long to see the cost of the conveyance of troops to India reduced by still another step, and the time occupied upon the voyage equally curtailed, by obtaining permission to convey them across the Isthmus of Suez.

At the present time nothing would be gained by such a change; but when the railway in Egypt shall be completed from Alexandria to Suez, as it undoubtedly will—and if a railway shall be formed from Bombay to Upper India, as I trust it may—a regiment may be carried in steam transports from England to Alexandria, conveyed in twenty-four hours from thence to Suez, thence landed by the ships of the Honourable Company at Bombay, and moved up to their station in Hindostan by rail, in less time, and with infinitely less trouble than they now could march from Calcutta to Benares.

The conveyance by rail across Egypt will, I venture to hope, remove any objection which might be felt to the passage of foreign troops; while, if the permission should be granted, a corps might leave England after the heat of summer was over, and might be quartered before Christmas upon the banks of the Sutlej, without any exposure in its way, and with four months before it of the finest climate under the sun, so that the men would enter upon the first heats of India with constitutions vigorous and unimpaired by the accidents of voyage or march.

34. There can be little doubt that, viewed commercially, this line would supersede all present modes of communication for passengers between Hindostan and the sea. Large numbers of persons already take advantage of the steamers upon the Indus, but the port of Kurrachee is closed during the monsoon. A railway would be available at all times. The Indus passage, though better than the state of things that preceded it, is at best a tedious one, occupying some weeks. The railway would place travellers at Bombay in as many days. These steamers on the Indus bring up European stores and goods far faster and safer than the native boats that preceded them; the bullock train in the upper provinces, now extended to Calcutta, is a great advance on the hackeries before it; but in either case, months elapse before either traders or individuals can obtain the articles on which they are dependent for their business or their comfort. Here again, the time in which they would be supplied by railway would be measured only by days; and although, of course, the construction of a line from Calcutta would, in like manner, afford the conveyance for goods which they require—the line from Bombay, communicating through Egypt with England, would be shorter and speedier, and, by virtue of competition, probably as cheap as that through Bengal; while European goods conveyed direct to

Indian Railways
 Governor General
 to E. I. Company
 Enclosure

Indian Railways.
 Governor General
 to E. I. Company.
 Enclosure.

Bombay by sea would, I apprehend, be able to enter the markets in Hindostán at an advantage, as compared with similar goods by way of Calcutta.

35. On these grounds I consider that a line of railway connecting Upper India with the western ports and with the Presidency of Bombay, would be of great political and commercial value, and I beg leave strongly to advocate its construction.

36. The specific course which such a line should follow, it is hardly possible as yet to decide.

The company whose memorial has been addressed to the Honourable Court, projects a line, by way of Baroda and Neemuch, to Agra, commencing for the present at Surat, and leaving the link between that city and Bombay to be constructed the last in order.

There can be no doubt, I think, that, on political grounds, such a line would be the best, as it would be also the most direct. But it would, doubtless, be contended by many that the commercial advantages of a line which, commencing at a point near to that contemplated by the memorialists, should be carried up the valley of the Nerbudda, and joining the Bengal railway somewhere near Mizapore, should thus follow the natural course of the present trade, while it opened up the coal fields known to exist, and the productive resources of that extensive and fertile valley—would be so superior to the line by Neemuch as to recommend it as the first to which capital should be applied.

I entertain little doubt that one day both of these lines will be formed. If one only can be obtained, then, although the line by the Nerbudda would open a communication with Hindostan circuitously, I am of opinion that the line by Baroda and Neemuch would be preferable so far as we are at present able to judge, and should be selected for construction if it should be found, on examination, a practicable and eligible line.

37. This condition is necessarily attached to my recommendation, because at this moment the Government of India has no knowledge of the character of the line, excepting that which it can obtain by looking at the map. The memorial of the company which proposes to undertake it, gives no information whatever. It proposes indeed that the maximum cost per mile shall not exceed 5,000*l.*, exclusive of the crossing of great rivers; but it quotes no survey, adduces no facts, and, in short, supplies no evidence whatever to show that the line can be constructed for that or for any other sum.

I repeat, therefore, that I advise the construction of a line from Surat by Baroda and Neemuch to Agra, as being calculated to afford the greatest amount of general advantage; if, on survey, it should be found that the work can be executed upon any such terms as those contemplated in the memorial of the directors of the Baroda and Central India Railway Company.

38. I would further observe that the omission or the postponement of the link between Surat and Tannah (or Bombay) appears to me to be a great imperfection in the proposed scheme. No doubt the connexion of the line at Agra with Surat on the coast, would of itself be a great gain. But the work would be very incomplete, until it were extended so as to communicate uninterruptedly with the harbour of Bombay.

39. The memorial does not state whether the company has taken, or intends to take any measures for the survey of this line during the ensuing season. A knowledge of the engineering character of the different channels by which Bombay might be approached from Hindostan, is very urgently required; and I would propose that arrangements should be made during the summer to commence a general survey of these two lines in the autumn, if the railway company should not have taken measures for that purpose, or unless the Honourable Court should instruct us otherwise.

40. I have now to enter upon the consideration of those lines in the Bombay Presidency upon which the Honourable Court has required the opinion of the Government of India, with especial reference to the remarks contained in the memorandum by Major Kennedy.

A line has already been constructed from Bombay to Tannah, twenty-four miles in length, this point must be common to all lines entering the Island of Bombay—whatever may be their direction. An extension of this line to Callian, to the eastward of Tannah has been sanctioned. From Callian three lines of railway have been submitted for consideration.

1st. The Thull Ghaut line carried in a north-easterly direction by Nassick into Candeish, with a view to future prolongation onward.

2nd. The Bhoie Ghaut line carried in a south-easterly direction to Poona, with anticipated extension to Ahmednuggur &c., and as the probable course of a junction line with Madras.

3d. The Malsej line carried in an easterly direction between the two others to the table land.

All of these, as their names imply, mount the Ghauts of the Syhadree range. 1846—1847.

The Thull Ghaut and Bhoie Ghaut lines were proposed a few months ago.

Upon closer examination of it, all parties concerned, the Great Indian Peninsula Railway Company, the Government engineer, and the Government of Bombay concur in recommending the total abandonment of the Malsej Ghaut line.

When I observe, that, at the lowest calculation, it could not be opened for through traffic for seventeen years to come, it will be thought that I have stated sufficient ground for concurring in its abandonment, without entering further into the many good reasons which are given for that course in the very full reports of the railway and the superintending engineers.

The question then for consideration relates only to the Thull Ghaut and Bhoie Ghaut lines.

41. The superintending engineer in his observations upon the memorandum of Major Kennedy, writes thus:—

“20. It will be seen from paragraph 30, and also from the opening of Appendix No. 3, that Major Kennedy is not aware that the whole project for reaching the table land of Candeish by the Malsej Ghaut route has, after a most careful reconsideration and survey of the other routes, been rejected for that by the Thull Ghaut, and there is no intention now of attempting the ascent by a fixed engine incline of about six miles, with a gradient of about one in eighteen, or by an alternative incline of thirteen miles long, with a somewhat reduced gradient.” All exceptions therefore taken by Major Kennedy to these points, or to the branches north from Alleh to Candeish, and south eastward to Sholapore are now of no force.

Neither is it the intention that the grand trunk line between Bombay and Agra “should pass over no fewer than four unnecessary and fierce ranges of mountains;” indeed, it is no object, at any rate at present, with those in Bombay interested in railways, to look towards Agra at all. Our object is to reach the table land of the Deccan and Candeish as speedily as possible, and this I am fully persuaded is provided for in the project now before Government in the report forwarded by the railway company.*

42. In these remarks it does not appear to me that the superintending engineer has fairly met the main objections to the Bombay lines, set forth by Major Kennedy.

That objection broadly stated is, that it was a grave error to propose that the grand trunk road by which the whole northern, north-western, and north-eastern traffic is to approach Bombay, the important mercantile capital of Western India, should be carried over the Syhadree Ghauts.

The remarks of Capt. Crawford which I have quoted, would appear to imply that the lines now projected have no other object than “to reach the table land of the Deccan and Candeish, as speedily as possible.” It appears, however, from other passages in the documents communicated from Bombay, that their views regarding the Thull Ghaut line are not limited to this local object.

Later in the same letter Capt. Crawford remarks “The country onwards from Candeish appears to offer every facility for the extension of the line to the eastward; so that we may hope to fall in with the Calcutta line in its extension to the north-westward, and thus complete the communication between Bombay and Calcutta by rail—a result looked forward to, I imagine, with much greater anxiety by the mercantile interests in Bombay, than a present communication with Agra.”

Again in his report to the Government of Bombay, the superintending engineer gives it as his opinion, that “looking at the subject in every point of

Indian Railways
Governor General
to E. I. Company
Enclosure
Report of Engineer
of G. I P Railway
Company, p 226

Letter, par. 20.
31st January 1853

Par. 61.

Report 7th Oct.
1852. par. 23.

* With Letter No. 548 (D.) 27th Sept. 1852. Copy sent to Government of India, with Letter No. 450, October 15, 1852.

Indian Railways.

Governor General
to E. I. Company.

Enclosure.

Mr. Berkley's Re-
port, 14th Septem-
ber 1852, par. 223.

view there can be no doubt, that, as a grand trunk line for India, the route by the Thull Ghaut is to be preferred to all others."

This view is advocated also by the engineer of the railway company. He says :—

"It would be a part of the most practicable and convenient line for Oujein, and the province of Malwa with its opium trade, and for the north-western provinces of Bengal." It would be the "shortest route for the produce of the Nerbudda valley, with its coalfields of Baitool and Bewas, and lie, in my opinion in the proper direction for the trunk line to cross the peninsula."

These passages demonstrate, that in laying out the Thull Ghaut line both the railway company and the Government engineer at Bombay contemplate it as the great trunk line for India, which shall open Malwa, the Nerbudda valley, and the north-western provinces of Bengal, cross the peninsula, and connect Bombay with Calcutta.

Whether, then, the lines now proposed at Bombay are or are not directed precisely to the point mentioned by Major Kennedy, namely, Agra, they are recommended as great trunk lines to traverse India and convey the "northern, north-western, and north-eastern traffic" to Bombay.

Whether they do or do not literally "pass over no fewer than four unnecessary and fierce ranges of mountains" they cross the Syhadree range and other ranges and valleys in the route anticipated for them—wherefore the lines now proposed are substantially liable to the main objection advanced against them in the memorandum in like manner as the Malsey Ghaut line to which it appears that Major Kennedy referred.

43. The practical question for determination is this—is the Thull Ghaut line, so strongly urged by the Great Peninsula Railway Company and the Government of Bombay, well fitted to be a great trunk line, connecting that city with Hindostan and Bengal, and serving as the channel for conveying the trade of northern and central India to the western port?

I have no hesitation in expressing a decided opinion that the Thull Ghaut line, as at present before this Government, is in many respects highly objectionable, and ought by no means to be adopted by the Honourable Court as a great trunk line for communication with the rest of India, unless it should appear that nature has denied us the possibility of finding a better, which I do not believe to be the case.

44. In support of this opinion it is necessary to advert shortly to the character of the line as shown in the engineer's report, and in the tables of gradients and curves appended.

Leaving Callian it runs straight at the Ghaut in the Syhadree range, which it is intended to surmount by a steep incline.

For eighteen miles out of twenty-eight, before it reaches the foot of the incline, it rises at a gradient of one in 100.

It mounts the incline at a continuous gradient of one in thirty-seven for nearly seven miles. This, however, is not its most objectionable feature, which is to be found, as the engineer points out, in the concurrence with this steep gradient of "sharp reverse curves" of thirty-two and even thirty chains radius.

The railway engineer admits this feature to be objectionable, but he affirms "from the experience upon inclined planes of a similar character in England, that this one may be worked efficiently by locomotive power."

The superintending engineer, quoting the opinion of the engineer as to working a train up this plane by locomotive power, observes :—"I must confess, however, that the working the down line on such an incline appears to me almost as difficult a problem as getting the traffic up it."

The railway engineer proposes to effect this solely by the use of ordinary breaks, and he refers largely to the Lickey incline, in proof that it can be safely done. Both planes are at one in thirty-seven, but the Lickey incline is two miles and a quarter in length, the Thull Ghaut incline nearly seven miles; and moreover, as the superintending engineer justly observes, the Lickey incline "has not curves of thirty chains radius upon it."

The superintending engineer proposes to meet this difficulty by "the principle of the atmospheric railway reversed." I am not sure whether I understand this proposal correctly when I assume it to mean, that the speed of the descending train is to be checked by the repelling pressure in the atmospheric

Report, par. 168.

Report, p. 27.

P. 27.

tube, in the same manner, as the pressure has usually been employed for propulsion. If so, with complete deference to opinions better than mine, I must needs say, that according to existing experience of atmospheric railways, this seems to me to be a desperate nostrum.

It is now a good many years since an opinion unfavourable to the atmospheric lines was expressed by the Railway Department of the Board of Trade. Like many other opinions which proceeded from the department, this one was overruled by Parliament. Atmospheric lines were constructed, one to Croydon, one I think in Devonshire. The result of the Croydon line (and I believe of both) was total failure. Those who used to travel on the South-eastern Railway will remember the very common spectacle of the carriages standing on the atmospheric line motionless, for want of power to move them. And all who do so, will feel as I do, some consternation at the thought of what would be the consequence of a similar failure of power in the Bombay atmospheric line, when a train should be descending the Thull Ghaut, in a gradient of one in thirty-seven, with curves of thirty chains radius for seven miles together. On the Croydon line, in such a case, the train simply stood still; on the Thull Ghaut, it would be, I apprehend, in a vastly less secure position.

45. Such is the character of the line over which all the goods and passenger traffic from Calcutta and the north-western provinces of Bengal, the corn and coal of the Nerbudda valley, the opium of Malwa, and the cotton of Candeish are to pass, and which the superintending engineer at Bombay considers "there is no doubt, in every point of view is, as a grand trunk line for India, to be preferred to all other routes." I am unable to concur in this view.

It may be that full and searching examination of the country may prove that its nature will not admit of any better approach to Bombay being found, than this which is recommended by the Thull Ghaut. It may turn out that a trunk line to Hindostan and Bengal, by Baroda, or by the Nerbudda valley, can only be constructed at such great additional cost, or with such great increase of extent, as to render it less profitable than the Thull Ghaut line would be, notwithstanding the objections that may be stated to the latter. In such case it would doubtless be advisable to sanction a "grand trunk for India" by the Thull Ghaut. But unless this should be shown, which I do not believe to be probable, I respectfully advise the Honourable Court not to give their sanction to the Thull Ghaut line in the character of a main trunk line between the western coast of Bombay and Hindostan or Bengal.

46. It does not necessarily follow from the rejection of the Thull Ghaut as a great trunk line, that its construction as a local line should be prohibited.

Even the memorandum by Major Kennedy (whose doctrine regarding gradients goes beyond the opinion I hold, and will be considered in another part of this minute,) fully admits that "there is no doubt the interests of the table land, east and south-east from Bombay, call for every exertion to open a passage through the Syhadree range."

Memo p 33

The report of the railway engineer, confirmed by that of the superintending engineer, appears to me to establish the great commercial importance of opening as soon as possible a channel for trade into the table land above the Ghauts. The practicability of it is established. Its remunerativeness seems at least to be highly probable.

Of the two lines proposed, that in the direction of Candeish appears to be of the greater commercial value. That in the direction of Poonah has considerable political value, and it is not without commercial value, but in this latter respect it appears to be inferior to the Thull Ghaut line.

The value of both, however, upon political and commercial considerations, seems to me to be so satisfactorily established, that I venture to submit to the Honourable Court a recommendation that both should be undertaken on such favourable terms as it is probable may be obtained.

An extension in one direction or the other is clearly necessary, if the portion already sanctioned as far as Callian is expected to pay. If only one project meets with favour from the Honourable Court, I am bound to say, notwithstanding the advantage politically of connecting Poonah with Bombay, that I think the Candeish line is, upon the whole, entitled to the preference.

47. Although I conceive that the Candeish line is the more valuable of the

Indian Railways.
 Governor General
 E. I. Company.
 Enclosure.

two and have recommended it for preference, I cannot recommend that it should at once be sanctioned by the Honourable Court as it now stands.

Concurring with Major Kennedy in the general principles which he lays down (as I shall elsewhere more fully explain), I cannot go with him through the whole extent to which he has carried them. Guided by the information I have obtained from the able and experienced officers who have been appointed to advise the Government on railway questions in each of the three Presidencies, I must express my conviction that such gradients as 1 in 2,000 for first class, 1 in 330 for second class lines, on which he inflexibly insists, are physically unattainable in the Presidency of Bombay, as well as of Madras.

Neither can I give my assent to the whole views he has expressed regarding the Bombay lines. The superintending engineer has shown, I think, very clearly, that in the general rules which he has thought capable of observance upon Bombay lines, and in his scheme for surmounting the Ghauts by lines free from the objections that are applicable to those proposed, Major Kennedy has written without sufficient practical and personal knowledge of the facts, and has fallen into error. The discussion is a professional one, and I venture only, with great distrust of myself, to give an opinion at all upon the question at issue. So far, however, as I may venture to do so, I must say that I think Captain Crawford has shown that the Ghauts of the Syhadree range cannot be ascended in the manner, or at the cost, asserted by Major Kennedy.

Again, I conceive that Captain Crawford has built up a very strong presumptive case against the practical correctness of Major Kennedy's opinion that Candeish ought to be opened up by a railway taking the line of the Taptee river. The length of such a river line is shown to be very much greater, the difficulties of construction would apparently be very serious, and the sources of traffic along it few and scanty.

But although I consider that the Ghauts, if ascended at all, must be ascended at gradients far less favourable than those which Major Kennedy's views regard as the worst admissible; and although I think that as the case stands at present, the Thull Ghaut line, faulty as it is, may perhaps prove to be a more profitable line whereby to connect Candeish with Bombay than the line of the Taptee river—still I am of opinion that the Honourable Court ought not to jump to a conclusion, and to sanction the Thull Ghaut even as a local line, until farther examination shall have been made, and an authoritative comparison instituted between the Ghaut line and the river line.

Both parties are at present proceeding on assumption. Neither have examined the line which they respectively commend and condemn.

I recommend, therefore, that before the Honourable Court shall sanction the Thull Ghaut line at all, they should require an accurate survey of the Taptee line; with a view to determine which of the two will be the more profitable and the more generally valuable to the interests of India.

48. Though the decision were already given in favour of the Ghaut line, as against the river line, I should further recommend the Honourable Court not to sanction the Thull Ghaut railway, over which it is probable that a very large commercial and passenger traffic will be conveyed, until further examination of the Syhadree range shall have shown that the Ghaut actually selected is the most favourable one, in an engineering point of view, by which a railway could reach the table land towards Candeish. I apprehend that it is in no way essential that the railway in mounting the Ghauts should closely follow the road over which the traffic now travels. If the line shall penetrate anywhere by the Ghauts the country from which the produce comes, I conceive it will readily draw the traffic to itself.

These observations apply equally to the Thull Ghaut and Bhore Ghaut lines. The engineering character of the former has already been adverted to; the latter presents also some startling characteristics. Nearly six miles of its length are upon a gradient of 1 in 37, of which nearly two miles are at no more than 1 foot in 200; and curves of 30 chains radius occur in this incline, as upon the other.

49. I repeat again, nature may have decreed that we must scale this gradient or be excluded from the table land. If so, doubtless such obstructions to ascent must be submitted to. But they ought not to be submitted to until submission shall have been proved to be inevitable. A gradient of 1 in 20 for two miles should not be sanctioned, unless the engineers are in a condition to affirm that

the Syhadree range nowhere affords a Ghaut more easy of access in the direction required. That the engineers are not in a condition to say this, we know upon their own authority, with respect to both of the lines they now recommend.

Mr. Berkeley says regarding the Bhore Ghaut: "It would be unreasonable to conclude that in one short season of four months, and with very limited assistance, I have been able to select a line up this Ghaut which would not admit of considerable alterations and improvements. On the contrary, the minute study of the country which Mr. Sandum has made in obtaining the present section, led us to discover the means of improving the objectionable parts of that section, as soon as its completion made us aware of them."

With reference to the Thull Ghaut line, he in like manner remarks: "In the case of this as well as of the Bhore Ghaut, it cannot be expected that in the course of the last short season we should have been able to select the best line, in all its details, that the ground admits of."

A reference to the context will show that in both cases the engineer feels confident that better inclines will be found on these passages; the superintending engineer commenting expresses an expectation that a further examination will get rid of many of the heaviest works, and especially of the incline of 1 in 20

There is no reason to doubt that the engineers did the utmost that men could do within the time allowed, but I submit to the Honourable Court that when the engineers themselves plead insufficiency of time for examination, and when they express confident belief that better access to the table land can be found, the immediate sanction that is asked for schemes which are thus avowedly crude ought not to be given. I submit that the sanction should be withheld, not only till a more perfect examination shall have been made of the particular Ghauts selected, but until that full examination of the general range which is not shown to have been made shall have been completed, and until the engineers are in a condition to certify that the Ghauts selected are the best available for the object in view.

50. I advise this course the more, that on the other side of India, where approaches are being sought for railways to the same table land, Major Pears, the consulting engineer to the Government, has found both the Ghauts that are best fitted for the purpose in view, after separate examination, and away from the immediate course of traffic as it flows at present.

51. The record before me shows, I think, the necessity of these precautions.

The Malsej Ghaut line was examined in 1846-47 by Mr. Chapman, surveyed, recommended, and adopted by the Court. It is now very properly rejected a few years after, as it has been found on further examination that it would take at least seventeen years to complete it, and that it is as Captain Crawford succinctly describes it—"not only ineligible but economically impossible."

52. I beg leave to represent the expediency, with respect to the Thull Ghaut and Bhore Ghaut lines, of that complete examination of the lines, and of the rest of the range which does not appear as yet to have been given to them; and which if it had been afforded to the Malsej Ghaut line formerly, would have prevented such facts appearing upon record regarding railway schemes as are contained in the papers before me.

53. I am aware that the course I respectfully recommend involves delay; and I am aware that the superintending engineer and the Government of Bombay strongly deprecate delay. Captain Crawford urges that "the work should be pushed on beyond Callian at once," lest capitalists at home should be intimidated, and natives should lose confidence in railways in general; and the Government of Bombay endorses the sentiment.

I humbly conceive that in dealing with so large a matter as railways for India, it is our duty to look beyond the interests and the impressions of the moment. I apprehend that capitalists at home are more likely to be intimidated, and natives to be discouraged, by discovering some years hence that we have adopted, as was done in the Malsej Ghaut railway, a costly and a bad line, when a more deliberate inquiry would have improved the actual line, or would have guided us to one altogether better—than they are likely to be alarmed by a prudent delay, incurred for the purpose of testing the soundness of the undertaking we are engaging in; and of taking reasonable care to ensure

Indian Railways.
 Governor General
 to E. I. Company.
 Enclosure.

that it shall ultimately prove a profitable one. Such a delay need not be a prolonged one, and most certainly is not a superfluous precaution.

54. The sum therefore of the recommendations which I have the honour to submit regarding the lines projected in the Presidency of Bombay, and on which the opinion of the Supreme Government was required by the Honourable Court, with a special reference to the remarks of Major Kennedy upon them, is—

1st. That the Malsej Ghaut line shall be wholly and finally abandoned.

2d. That the Thull Ghaut line should not be adopted as one of the great trunk lines for India, unless the examination I have already advised shall show that a better and more profitable line is unattainable.

3d. That lines opening a way from Bombay to Candeish and to Poonah respectively shall be sanctioned.

4th. That the Thull Ghaut line to Candeish shall not be sanctioned, until a survey shall have been made of the line recommended by the Taptee, and the Honourable Court shall have decided between the Ghaut and river lines.

5th. That neither the Bhore Ghaut line to Poonah, nor the Thull Ghaut line (if it should ultimately be decided that Candeish should be reached by a Ghaut line) shall be finally sanctioned until it shall have been ascertained, by full survey, that no better entrance to the table land north-east and south-east of Bombay can be found than those two Ghauts respectively; and until further survey of the Thull Ghaut and Bhore Ghaut lines shall have been made, with a view to determining specifically those modifications of the objectionable features of both lines which the engineers appear to be confident of effecting.

55. It is now to be considered whether the Presidency of Madras can be included in any general system of continuous railways in India, and what lines should be constructed therein.

The connexion of the capital of the Madras Presidency with the seat of the Supreme Government is of even less importance than a direct connexion between Bombay and Calcutta.

Madras does not, like Bombay, receive earlier intelligence from Europe, and it is considerable only so far as regards the Presidency itself. Any intelligence of moment will be communicable from Madras by the general line of electric telegraph, now about to be formed, and will be conveyed to the Supreme Government within a very short space of time, even though the wires should not be carried direct between the two cities.

56. The line of railway which is laid down in sketch No. 3 of the scheme transmitted to us, and which runs along the coast during its whole course, would, I apprehend, be very inexpedient at present, or until the circumstances of the country through which it would pass shall have become very different from what they now are.

This line would be of great length and costly in construction. It passes through a country having little produce and little trade, bordered in many parts by jungles which are even now unexplored. Along its whole course from Madras to Calcutta it would be worked in competition with the sea; a highway which in this case would be so comparatively easy, speedy, and cheap, as to be sufficient for all public purposes, and to render it preferable for all present commercial ends.

I therefore do not recommend that a line from Calcutta to Madras should be taken into consideration.

57. The junction of Madras, however, with the main line already recommended for Bombay, and thereby with the main line in Hindostan, would be of value.

The Presidency of Madras is even more unembarrassed with foreign frontier than the Presidency of Bombay. It contains seven regiments of European troops, and a numerous native army. At present this large force is in a great measure isolated, so far as the other portions of the continent of India are concerned. If however, Madras were brought into direct communication with Bombay by means of a line of railway, the military power of the British Government throughout India would be thereby still further enhanced, and its means of prompt and concentrated action most materially increased.

I apprehend also that the formation of this line direct to the great port on the western coast would be of much value to Madras in its communication with Europe, and probably in its general commerce.

58. The junction of Madras and Bombay is contemplated in the scheme to

which I have referred. Major Kennedy proposes to effect it by a line carried along the coast as far Rajahmundry, and thence, following the course of the Godavery through the territories of the Nizam, and through Candeish to Surat.

Indian Railways.
Governor General
to E. I. Company
Enclosure

With reference to this line, it is observed, "a feature of much general importance in our present consideration is the great central Omiawuttee table land. It sheds its waters in every direction to the south-eastward by the Gunga, Godavery, Mahanuddy, &c., which flow to the Madras coast.

"Keeping these great geographical features in mind—and they cannot be overlooked in any general project without fatal error—they force upon us the knowledge of what the great arteries of commerce must necessarily be, and with those great arteries our trunk roads must correspond."

Para 53, 54

59. Upon these questions I have endeavoured to aid my judgment by conference with the consulting engineer of the Presidency of Madras. Upon the principle above enunciated in the memorandum, and upon the junction line between Madras and Bombay proposed in accordance with it, Major Pears has observed as follows:—

"Now the rivers in the south are not, and never have been, the great arteries of commerce. All those rivers upon which Major Kennedy has marked lines, the Godavery, the Kistnah, the Penaur, the Palaar, and the Cavery, exhibit in different degrees the same characteristic features, they rise on the table land (some at the crest of the Western Ghats); they pass over it by a course more or less circuitous, till they reach the eastern limit of that table, and they then plunge on to the Coromandel plains, either falling over abrupt Ghats, or by a hurried and very tortuous course among an uninhabited or very thinly peopled range of rugged hills covered with forests. Some of these rivers are dry during a great portion of the year, and all are subject to very great variations in their volume of water.

Para 22, 23, 24,
and 27

"23. It is manifest that such streams as these cannot affect the condition of the people or the country, as do the Ganges, the Indus, and the Nile. In the Ganges we see a large volume of water all the year round, serving as a great highway for the people—a broad and fertile valley, subject annually to the fertilising influence of this noble stream—and the people clustering in large numbers on its banks, exhibiting in every possible way their appreciation of the benefits they receive from it. Here then we have a great artery of commerce, and we must recollect it has become so, not merely because the country drains down the valley, but because that valley, and the stream which flows down it, are favourable to the ordinary commercial manufacturing and agricultural pursuits of mankind. The traffic to which the railway company look for their dividend is greatly due to the river in its operations as a highway. We may take encouragement from this in other parts of the country, where the traffic is now less, and trust, that denied as they have hitherto been the great advantages of cheap transport, the railways may do for them what the Ganges has done for Bengal.

"24. The Mahanuddy, the Godavery, the Kistnah, are rivers, as I have above shown, of a different character. Instead of being the great arteries of commerce, no populous or busy towns are found on their banks during their whole length. Instead of passing through a dense and industrious population, their course, for several hundred miles, lies through a region of mountain and forest where the sound of man's voice is never heard."

"27. One more observation may be made upon this point, viz., that these streams do not necessarily give us good gradients, unless by a sacrifice in length and straightness. If we take any plain, such as that of Coromandel, inclined generally to the sea, at such an angle that a direct line drawn across it perpendicularly to the coast, would fall ten feet in a mile, the general course of a river will have precisely the same fall, and it is only by following the numerous sharp sinuosities of the river, and so proportionately increasing our distance, that we could reduce the fall to that of the river's bed."

60. Having regard to the information thus afforded, regarding the physical character and present condition of the country through which this line would pass; considering that it would extend to not less than 1,200 or 1,300 miles; and that in a great portion of its course it must traverse the territories of his Highness the Nizam, who not improbably might object to it altogether, or if he did not, would certainly be a great impediment to the undertaking; I am of opinion

Major Pears,
par. 19.

Indian Railways.
 Governor General
 to E. I. Company.
 Enclosure.

that as at present advised, the Honourable Court should not entertain any project for a railway between Madras and Bombay, by the line of the river Godavery. I have the less hesitation in offering this opinion, because there seems every reason to believe that a junction line may be found free from the objections to which the Godavery line appears subject, of much less extent, and well calculated to promote the political and commercial purposes which, in deciding upon general lines, are to be steadily kept in view.

61. The several reports of Major Pears to the Government of Madras give a full, clear, and well weighed statement of the subject as connected with that Presidency, whose peculiar physical character introduces important elements into the consideration of the question of railways in India.

Having studied it with the advantage of personal communication with that officer, and to the best of my ability, I venture to express an opinion that the main lines immediately required in Madras may be indicated in general terms with safety.

62. It appears to be established with certainty, that there are two great lines of commerce towards the city and port of Madras. The one approaches from the northward, bringing down the rich produce of the ceded districts and of the country of Cuddapah and beyond it. The other comes in from the westward and southward, by way of Aicot, Vellore, Vaniembady, Salim, and so on towards Coimbatore, &c.

✓ The Government of Madras have already selected the first portion of the second of these as their experimental line. On a reference directed by the Honourable Court, the Government of India has seen cause to concur with the Government of Madras in their selection of the portion, and it is already in progress.

I have the honour to advise that this line should be one of those selected for construction in the Presidency of Madras, and that it should be prolonged by Salim to Coimbatore, and, through the gap in the Ghauts at Paulgautcherry, to the opposite coast. A branch should be thrown off to Bangalore, which Major Pears entertained a hope of being able to effect satisfactorily by way of a Ghaut beyond Vaniembady. A branch might be carried with advantage to the foot of the Neilgherries, near to Ootacamund; and ultimately perhaps Cannanore might be included by means of a short extension.

The reports of Major Pears afford the means of forming a judgment upon this as a commercial line, so fully, that I should waste time in repeating his facts in this paper. ✓ In a political point of view its advantages are obvious. A large military force is habitually stationed at Bangalore, to which it is proposed to run a branch. Another European regiment is stationed at Cannanore, and one is likely to be placed at the sanitarium on the hills. The proposed line of rail would touch all of these points, and would enable the Government of Madras to collect its main force rapidly at the capital, either for its own purposes or for the assistance of the Supreme Government, by embarking and dispatching troops to Calcutta, or to the eastern provinces across the bay, as occasion might require.

63. Since his return to Madras, Major Pears, at my suggestion, has made a rapid survey of the line by Cuddapah towards Bellary, upon which it has already been stated that the main stream of traffic flows to Madras from the northward, and on which cotton especially is largely grown. It is satisfactory to learn that he has found much less engineering difficulty upon this line than his general local knowledge had previously led him to anticipate, and that he now sees reason to believe that a good line may be found by Cuddapah onwards.

Further examination is being made. If it should confirm Major Pears's present view, I advise that this line also should be undertaken.

Its commercial properties have already been pointed out, and it will bring the military station of Bellary into direct communication with the capital, still further strengthening the political considerations that have been urged in par. 62 on behalf of railways in Madras.

64. It still remains to determine whether a junction line with Bombay can be found, that by the Godavery having been rejected.

It has been suggested that the line by Vellore and Coimbatore to Calicut, might be carried thence along the coast of Malabar and Canara to Bombay, and would be eligible as a main line, by reason of its escaping the necessity of

rising up the eastern Ghauts and again descending upon the west, by passing through the gap at Paulgautcherry.

I have been able to obtain no accurate knowledge of the character of this line along the whole western coast. But it will be circuitous; foreign territory must apparently be crossed or avoided at Goa, and the general nature of the country upon that side of India, and a consideration of its features, as they appear even upon an ordinary map, induce me to think that this course ought not to be selected for a junction line with Bombay.

If Major Pears's examination of the Cuddapah country should lead to the discovery of an admissible line as far as Bellary, it will be seen that he contemplates its prolongation from thence up the valley of the Beema to Poonah, where it would join any line which may have been brought to this very important station up the western Ghauts from Bombay. No survey has been made as yet of this line, and it is so far objectionable, that it crosses a portion of the Nizam's territory. It does not do so, however, to any great extent, and so far as it is possible to form an opinion, with the very general knowledge of the country which alone has been obtained at present, it appears to be admissible.

I advise that means should immediately be taken in connexion with, and in continuation of, the survey of the line from Madras by Cuddapah to Bellary, for the purpose of surveying the country beyond, towards Poonah and Bombay. If present anticipations should be at all fulfilled, I conceive that this line would form the best trunk line that can be found for uniting Madras with Bombay, and with the general system of railway communication throughout the British territories in India.

65. It is very true, that this or any other direct line of junction across the peninsula must scale the Ghauts in order to cross the table-land which lies between; and consequently must be inadmissible, if the primary principle for trunk lines in India which has been laid down in Major Kennedy's memorandum, and has been referred for the opinion of this Government, shall be adopted and insisted upon. This general principle shall be presently considered. In the meantime it must be observed, that it is very doubtful whether any junction line between Madras and Bombay could be found, which does not wholly violate not merely the principle laid down for trunk lines, but also that laid down for second class or branch lines in the memorandum above-mentioned.

If such a line can be found and formed, it certainly will only be done at the expense of greatly increased distances, and in all probability of very heavy additional cost.

66. In the preceding paragraphs a general system of railways for India, together with the particular lines immediately required in the several Presidencies has been discussed.

The agency by which the several lines should be constructed is now to be considered.

I have bestowed upon this portion of the subject my best and closest attention, and have given to it most earnest and anxious thought, for it is a question of the very deepest importance to the Honourable Company, and one upon which differing views are entertained by many whose knowledge and judgment are entitled to great respect.

67. It is contended by some that railways in India should be constructed on behalf of the Government by its own officers, who, it is alleged, would execute the works with greater economy, efficiency, and speed than can be done by the agents of a railway company formed in and directed from England.

Others argue that the plan which has already been adopted, of entrusting the execution of railways to incorporated bodies, under the control of the Court and of the local Governments, should be adhered to in future railway undertakings.

68. With deference to those from whose views I dissent, I have to express a decided opinion that the construction of the works by a railway company under the supervision and control of the Government, is the best system which is open for the adoption of the Honourable Court.

69. Railway works in India will probably consist, for the most part, of embankments and bridges of various descriptions. These are works with which the engineers in the several armies of the Honourable Company are thoroughly conversant. There can be no doubt, therefore, that railways could

Indian Railways.

 Governor General
 to E. I. Company.

 Enclosure.

be executed by the local Governments with as full efficiency as by the engineers of private companies. Again; the engineers of the Government have had long practice in the construction of such works as form the component parts of a railway, though not in the formation of continuous railway lines. They are familiar with the people and their ways, acquainted with their language, inured to the climate, versed in the machinery of agency, and on their guard against its abuses. Great works exist to testify to their professional ability, and I am not aware of any well-founded allegations of reckless or unthrifty expenditure in the execution of them.

Officers so highly qualified, undoubtedly are likely to carry on the works of an extensive undertaking upon the plains of India, with greater economy and greater speed than can be possible now, or for some time to come, in the case of men freshly arrived from England, ignorant of everything connected with this country, and sometimes not altogether inclined to learn. And although I have some hesitation in believing that the Government of India is any exception to the general rule which holds good elsewhere, that a Government always works at greater expense than anybody else; and although I am not prepared to say that, during the five years I have passed in India, the execution of the grand trunk road, or even of the Ganges canal (noble work though it be), has in any respect been characterized by speed, as compared with the execution of corresponding works in other countries; still, I do not wish to dispute that railway works may be executed here with greater economy and speed by the Government than by railway companies.

70. But admitting unreservedly that engineer officers would make a railway as well, and admitting, for the sake of argument, that they would make it as cheaply and as quickly, as private companies, I am still of opinion that the Government ought not to undertake the making of railways.

71. The Government in these Presidencies is at present deficient in the agency they would require for the purpose. The number of engineer officers is so wholly inadequate for the duties they have to perform, that other officers have been numerously employed in the department of works. The Honourable Court has declared its readiness to augment the corps of engineers; but that measure would not for many years to come diminish the difficulty to which I have referred. Even if the duty of the Government engineer on a railway were solely that of superintendence, a few would not suffice for the work. Many must be withdrawn from the duties on which they are now employed; and it is my opinion that this could not be done without detriment to the general interests of the State. I think it far better that railway works should be entrusted to parties ready to execute them by professional engineers of undoubted competency, under the control of the Government, than that public works in other parts of the country should be starved through the withdrawal of the engineers for whom no adequate substitute can be furnished, merely in order that the railway works may be executed at something less cost and in something less time than European agency would spend upon them.

71. This consideration, however, does not form the strongest objection in my mind to the execution of railway works by the Government of India.

I hold that the creation of great public works, which, although they serve important purposes of State, are mainly intended to be used in those multifarious operations which the enterprise, the trade, and the interests of the community for ever keep in motion, is no part of the proper business of a Government.

It is very proper that the Government of India should undertake the formation of the Ganges canal, of irrigation channels, and of tanks in various parts of India. These are works which affect the general well-being of the community, or that of particular districts, and which, producing no immediate return, must be executed by the Government if they are to be formed at all.

It is very right that the Government of India should have constructed the great trunk road, and would be very right that it should greatly extend the principle on which it has charged itself with that work, because there is nobody else to do such things, and because the Government of India stands in various relations to local interests in India, beyond what it fills as the executive Government, and beyond what is filled by the executive Government in our own land.

But the conduct of an enterprise which is undertaken mainly for commercial

purposes, and which private parties are willing to engage for, does not fall within the proper functions of any government.

73. Least of all should it be taken as any part of the business of the Government of India. One of the greatest drawbacks to the advance of this country in material prosperity has been the total dependence upon the Government in which the community has placed itself, and its apparent utter helplessness to do anything for itself.

Until very recently, the only regular carrier in the country has been the Government, and no man could make a journey but with Government establishments, and by the agency of a Government officer.

It was but the other day that the agent for Lloyds in the port of Moulmein, where there is a considerable community of European merchants, formally complained that the Government of India did not keep a steam tug to tow their ships to sea for them.

Even in those instances in which something like enterprise has been attempted by means of joint stock companies, the effect has been feeble and the result insignificant.

For years the steam company on the Ganges have complained of the competition of Government steamers. During the last year fully one half of the Government steamers has been withdrawn; nevertheless, one of the two steam companies has ceased to run. It is so in everything else. No one seems to have activity enough in connection with a company even to look after his own interests; and of the few enterprising movements that have been made, fewer still can be quoted as having obtained even a moderate success.

Those cases in which the scheme has been connected with English management, and has been founded on English capital, have made their way and are prospering. The Peninsula and Oriental Steam Company is an instance of this kind; and its great past prosperity, and the spirit and success with which it is pushing its undertakings with India, and all over the east, are a conspicuous proof of the efficacy of private enterprise, directed by parties holding an interest in England.

74. When the spirit of enterprise still shows so feebly in India—when the employment of English capital on a great scale within the interior of this country is so rare—and when there is such good reason to anticipate the best effects from its profitable investment in any one branch of Indian undertakings, by the encouragement that would thereby be given to its introduction through many other and various channels—I submit that it would be impolitic for the Honourable Court to put aside the several associations that are now presenting themselves to compete for the advantage of supplying India with that which she so much needs, in order that it may itself undertake these vast works—on the no stronger grounds than the assumption (which, after all, is only an assumption) that some little time and money would be saved. I submit, on the contrary, that all the money and time which the Honourable Court may contemplate being able to save thereby would be well expended in securing the introduction at this time of a large amount of English capital and English energy, so as to encourage, by the successful issue which I anticipate for these railway undertakings, a more extensive employment of similar capital and similar efforts hereafter, in connexion with the products and the trade of India.

75. Having explained the grounds on which I formed my opinion that the construction of railways in India should be entrusted to private companies incorporated for that purpose, a few remarks are necessary respecting the union of private enterprise with Government control, which I have ventured to recommend as the best system which it is open to the Court to adopt.

76. The enlistment of private enterprise for the formation of these great works, directly but not vexatiously controlled by the Government of the country, acting for the interests of the public, was a principle for which I contended several years ago, when closely connected with that branch of public works. I may venture, without arrogance, to say, that if that principle had been then more fully recognized, the proprietors of railway property in England, and the suffering public, would have been in a better condition now than they appear to be.

The principle is a sound one, and I therefore propose to uphold it in the formation of the several lines of railway in India, in the same form in which it has been introduced and acted upon in the operations of the East Indian Railway Company in the Presidency of Bengal.

Indian Railways.

 Governor General
 to E. I. Company.

Enclosure

77. It has been objected to the system actually in existence, that by guaranteeing the payment of a fixed interest upon the capital expended, all inducement to economy and exertion upon the part of the railway company is destroyed, and that by admitting the direct interference of Government, the railway company is obstructed and delayed.

These objections do not appear to be well founded.

It is to be presumed that interest will not be guaranteed by the Honourable Court upon any sum to be expended, until it has satisfied itself that this sum, which it is proposed to raise for the construction of any fixed extent of railway, is not more than is sufficient for the work *well and economically carried on*, or without some secure provision for the completion of the line within a period to be named. If these conditions be observed, I apprehend it cannot be correctly said that all inducement to economy and exertion is lost. These will be requisite to enable the railway company to construct the line within the sum and the time allotted for it. Nor will inducements to the utmost economy and exertion ever be wanting, unless it be supposed that the company would be wholly indifferent to any prospect of gaining a higher return upon their capital than the rate of interest guaranteed, which an economical construction and working of the line might probably enable them to realise.

78. On the other hand, it does not necessarily follow, that because the Government has become a party to the undertaking by guaranteeing, a certain interest upon the capital expended, and has thus gained a right to closer interference with the operations of the railway company than usually or properly is allowed to a Government, that it will therefore interfere vexatiously or obstructively. It is not difficult to conceive that the Government by its officers may exercise a close and vigilant check upon the proceedings of the company without giving any just cause of complaint.

Experience of the working of this system in the Presidency of Bengal justifies the opinion I have expressed. The consulting engineer is placed in direct communication with the railway company, and has authority to settle all matters of detail or professional questions, unless they should be of great magnitude, without previous reference to the Government. Every precaution is taken to obviate delay in those cases in which the action of the Governor General in Council is needed. I have every reason to believe that these measures have been successful, and that while the consulting engineer directly and indirectly exercises upon behalf of the Government a very wholesome control indeed over the proceedings of the railway company, neither obstruction, nor vexation, nor delay can be justly attributed to the existence of a power of control in the hands of the Government.

79. Having advised the Honourable Court to entrust to private companies, under the control of Government, the construction of the lines of railway at present required for India, I have to submit the opinion that has been called for on the general principles of action regarding railways, proposed in the memorandum before me, for the adoption of the Government of India.

They are as follows:—

- “ 1st. That all railways constructed in India shall belong to one of two classes—the first or the second class.
- “ 2d. That the regulating gradient of the first class or trunk railway shall not exceed 1 in 2,000. (By regulating gradient is meant the gradient which regulates the load of the engine.)
- “ 3d. That no regulating gradient of any second class or branch railway shall exceed 1 in 330.
- “ 4th. That short alternate impulsive planes may be introduced to assist the ascent, not to exceed a length of half a furlong each, and not to be nearer to each other than one furlong and a half.
- “ 5th. That no line shall be undertaken when the estimated cost shall exceed the average rate of 5,000*l.* per mile of single road. But that this rate of cost is not to include the bridging of large rivers as the Soane, Jumna, &c., exceeding half a mile wide at flood level. Such rivers are to be considered as breaks, or temporary termini, where goods and passengers are to be carried across on rafts.
- “ 6th. That no line shall be sanctioned, except for a single track of rails with masonry, cuttings, and embankments to correspond. The ground, however, required for a double track, to be in all cases secured.
- “ 7th. That no locomotive engine shall be introduced to India for ten years,

“ except such as the ratio between the length of stroke of piston and the diameter of the driving wheels shall sanction with reference to the maximum load, notwithstanding any sacrifice of velocity on the journey. (Rule No. 11 contains an exception from this restriction.)

“ 8th. That when piling for foundations be requisite, the foundations are to be laid to suit a double track, although the superstructure is only carried up for a single track.

“ 9th. That no portion of any line shall be permitted to open for the transport of goods or passengers, until the capital account for the construction of such portion shall have been closed.

“ 10th. That no more than one train daily shall run in each direction upon any line until the traffic shall furnish more goods and passengers than one engine can convey, after which a second may start daily each way; and that when the traffic calls for three trains fully loaded daily, then arrangements shall be made for laying down a second track of rails.

“ 11th. That notwithstanding the tenor of rule No. 6, if on any line it shall appear that the profits exceed a dividend of 6 per cent. per annum, it shall then be permitted, if thought advisable by the directors of the company interested, to introduce engines of higher powers of velocity, with a view of running passenger trains separate from goods trains.”

80. In the first, second, and third rules, it is proposed that all railways in India shall belong to one of two classes; that the gradient of trunk railways shall not exceed 1 in 2,000; and that the gradient of branch lines, or second class lines, shall not exceed 1 in 330.

Upon a professional question of this nature, I naturally feel some diffidence in giving an opinion contrary to that of an engineer officer of ability and practical experience. Nevertheless, having carefully examined this point, and informed myself, through others very capable of informing me upon facts, I have come to the conclusion that I cannot advise the Honourable Court to adopt these three rules in the broad terms in which they stand.

81. In the general principle they are intended to assert, I entirely concur. That the engineer, by whom a railway may be constructed in India, should give his first attention to obtaining such favourable gradients, as will leave the greatest possible amount of tractive power in the engine available for moving its load of traffic along the line, and thus secure the utmost profit on its working, no one will deny; and it may as readily be admitted that the engineer in many parts of India will be able to obtain such favourable gradients much more cheaply and easily than could be done in England.

That it is expedient in India to submit lines of easy gradients, though somewhat less direct, in preference to direct lines where the gradients are adverse, may be fully conceded. Major Kennedy correctly states that I have already publicly recognized this principle in regard to Indian railways, by condemning the hull line to Mirzapore, and adopting the alternative line which he suggested to the Government. In so doing, I gave effect to opinions formed and expressed by me in 1848, within a few months after my arrival, and while the railway was still at a stand-still. I think the decision was a sound and good one, upon the ground on which it is put, though it was recommended by other considerations also; and I am quite of opinion that a similar attention to gradients ought to enter largely into the direction of the lines that are hereafter to be constructed.

82. But I am not prepared to assent to the rules while they require an inflexible adherence to this principle, carried to an extreme degree. A line constructed at 1 in 2,000 will, of course, be more cheaply worked than a line with unfavourable gradients; and if the former can be obtained without great increase of extent of line, or vast expenditure of money, every effort should be made to obtain it. But I humbly conceive that it would not be difficult to show that there are but very few cases in India in which such a gradient as 1 in 2,000 could be obtained, without such an excessive increase of length of line or such heavy outlay of capital as would make it more profitable to work the line with comparatively adverse gradient, however undesirable that course may be in theory.

83. I have further to observe that the gradient here laid down as indispensable for trunk lines is practically unattainable as a *general* gradient for India. The Honourable Court will perceive the opinions of the consulting engineers of Bengal and Madras, to whom I referred this point. Major Peas distinctly states—“The word trunk is in common language generally applied to those

Indian Railways.
 Governor General
 to E. I. Company.
 Enclosure.

“ roads or lines of railway which lie in the direction of greatest traffic and importance. No trunk line so understood could be constructed within the Madras Presidency with such a ruling gradient as this, unless by increasing the line to an extravagant extent. In many cases even this would fail to obtain it.”

I believe that the same statement would be correct if applied to the Presidency of Bombay. It will be seen also that in this Presidency, and even in the valley of the Ganges, the surveys that have now been made hold out no prospect of a gradient of 1 in 2000 being attainable in practice. The consulting engineer names a gradient less favourable by half, namely, 1 in 1000, as being the best that is practically available upon that line. If a better gradient should be sought, it can be got only by following closely the course of the stream through all its sinuosities—a measure which could not be adopted, without exposing the line to the objection that it would be immediately increased in extent, and would be brought moreover within the influence of the river to a degree which would be dangerous to its existence. In the face of these facts and opinions, I cannot recommend to the Honourable Court to adopt entirely the rules, that no trunk line should have a worse ruling gradient than 1 in 2000, and no branch line worse than 1 in 330. The principle of easy gradients is, I think, sound, and ought to be enforced in Indian railways. Its observance should be circulated by the Honourable Court, whose officers should be enjoined to pay vigilant attention to it, in connexion with the plans of railway companies. But I think it will be better that the Honourable Court should restrict itself to laying down the principle, that in every railway the closest attention should be paid to obtain the gradient which will admit of the most profitable working (in fact that the best should be made of each case), than that it should attempt vainly to insist upon the particular gradients that have been suggested for its adoption.

84. The rules numbered 4, 7, and 11, which relate to the introduction of alternate impulsive planes, and to the size of the engines to be employed, are purely engineering questions, on which I cannot undertake to give an opinion, and on which the Honourable Court has the means of obtaining authoritative judgment in England.

85. Rule No. 5, which lays down that no line shall be undertaken in India, of which the estimated cost shall exceed the average rate of 5,000*l.* per mile of single road, will be governed, I think, by the same considerations as those which were applied to the rules regarding gradients.

The importance of a cheap construction of the works to the success of an undertaking is obvious. There is every reason to believe, that in India the cost of railway per mile will probably, on the average, be less than the cheapest of the lines constructed in England; and it is very expedient to lay down such principles as are involved in Rule 5, and explicitly stated in Rules 6 and 8, in order to ensure that railway engineers shall consult the utmost economy in their works consistent with security and efficiency, and shall swell the cost neither by useless ornament nor by superfluous solidity.

I entirely concur, therefore, in the recommendation that all lines shall be formed for a single track of rails, with masonry, cuttings, and embankments to correspond, excepting only in the case of piling or difficult foundations, which shall be formed at once to suit a double track; land in all cases being taken for a double line.

In like manner, all buildings, stations, and appliances of every kind should be built only for use, and all heavy expenditure upon architectural decoration should be rigidly proscribed.

86. But I am not prepared to advise that 5,000*l.* should be fixed as the highest average rate of cost per mile that shall be admissible. The Honourable Court and this Government, and the railway engineers themselves, have not yet acquired sufficient experience in the formation of railways in India, to enable them to specify with exactness what ought to be the average cost of construction.

In Madras, the consulting engineer estimates the short line in preparation there at less than 5,000*l.* per mile; but experience has not yet tested the accuracy of his estimate in any respect.

In Bengal, some experience has been obtained.

The first section of 120 miles, it may now be calculated, will not exceed 7,500*l.* per mile; and this section includes the main terminus and works at Calcutta.

The next section of 120 miles, from Rundoak to Rajmahal, is estimated to cost about 8,500*l.* per mile.

The section of 440 miles, from Rajmahal to Allahabad, which has just been surveyed, is estimated at about 8,700*l.* per mile.

Although the plain of Bengal is flat, and so far favourable to railway works, it is crossed by numerous rivers, and liable annually to heavy inundations, which tend greatly to increase the cost of construction; and the estimates I have quoted above, include the expense of bridging all the rivers (except the Soane and the Jumna), many of which are of great size during the rainy season. Still, after making allowance for these considerations, and having regard to the statement of Mr. Stephenson, that his estimates are avowedly made high in order to be on the safe side, it does not appear probable, according to our present experience, that we can rely with certainty on constructing an ordinary mile of road for 5,000*l.*

Upon this point, Major Baker has stated it as his opinion that this sum cannot as yet be safely fixed as the average rate. He says, "I believe that a single line, not involving expensive river crossings or other special heavy works, ought to be constructed for 5,000*l.* per mile; but justifiable exceptions will occasionally arise, and should not be entirely precluded."

Under these circumstances, I would advise that, while the principle of economical construction should be jealously insisted upon, and an approximation to the sum of 5,000*l.* per mile of ordinary way should be aimed at, no specific sum should be fixed by the Honourable Court as the highest average rate of cost per mile for railways throughout India.

87. The 9th Rule, which declares that no portion of any line shall be permitted to open until the capital account for the construction of such portion has been closed, may advantageously be adopted on principle, but modified in its stringency, so as to bring it into accordance with the practice sanctioned by the Honourable Court in 1849.

88. The Rule No. 10, which limits the running of trains to one and two on each day, under certain specified circumstances, appears to me to be a matter of detail, which had better not be introduced as universally applicable to every future line.

89. It only now remains that I should submit to the Honourable Court, in obedience to its instructions, my opinion, whether railway works in India should be carried on simultaneously, and by what companies they should be undertaken.

I have no hesitation in recommending, in the strongest terms, that the several trunk lines throughout India which have now been suggested, and especially the great line from Calcutta to the north-west frontier, should be completed as speedily as may be practicable; and to that end that the several portions of the works should be commenced and carried on simultaneously.

90. In reply to the question, whether it will be advisable that the Honourable Court should enter into several distinct contracts with different companies of British capitalists, I would submit that it is not advisable that too large an extent of railway should be placed in the hands of any one company, while at the same time economy and public convenience are undoubtedly promoted by as close an approach to uniformity of management as may be consistent with the exercise of a vigilant and effective control over the entire line.

91. The Honourable Court has already sanctioned the establishment of the East Indian Railway Company in the Presidency of Bengal. It is constructing 120 miles of line,—has obtained a concession of the extension of 120 miles further to Rajmahal,—and now applies, by its managing director, Mr. Stephenson, for permission to execute the line, which it has surveyed onwards to Allahabad, and ultimately to construct a line to Delhi, with, if it is wished, an extension to Lahore, and a junction with Bombay by way of the Soane valley. It undertakes to execute completely these lines within seven years, or before the close of the year 1860.

A memorial has been addressed to the Governor General in Council, by Mr. H. Borradaile, on the part of a company styled the Upper India Company, and subsequently letters have been received from the chairman of the company, and from its solicitors, in which they state that the company has proposed to the Honourable Court to construct a line from Allahabad to Agra and Delhi.

92. The East Indian Railway Company has had a difficult task to perform. It entered on an entirely novel undertaking, and, as might have been expected,

Indian Railways.

Governor General
to E. I. Company

Enclosure

Part 11.

Indian Railways.
 Governor General
 to E. I. Company.
 Enclosure.

has had much to contend with. It is, therefore, entitled to some consideration in the judgment that may be formed on its first operations.

Although I am inclined to believe that more rapid progress might have been made in the execution of the works that have been in hand during the last two years, I am not disposed to condemn the proceedings of the company.

Mr. Stephenson, in his recent report, has stated that "the first section will be completed by the latter part of next year (1854), portions of it being opened, and locomotives with carrying stock provided and placed upon the line within the next few months."

This section of 120 miles, equal in extent to the Great Western, and exceeding the London and Birmingham, will be opened, if Mr. Stephenson's anticipations be fulfilled, in about four years from its commencement. People in this country accustomed to deal with great distances, are disposed to think lightly of four years being required for what seems to them so small a length of line. For my own part, adverting to the fact that this has been a first attempt, and that the works upon the line are considerable, though the country over which it is carried is level, I am not prepared to say that further confidence should be withheld from this company.

It has already received the sanction of the Honourable Court to extend its line to Rajmahal. It declares itself ready and anxious to continue the line to Allahabad. No other company has appeared to compete with it for this portion of the trunk line. If there had been any, I should still have recommended, as I have now the honour to do, that the East Indian Railway Company should be permitted to undertake the construction of the line from Calcutta to Allahabad, carrying it on in different portions simultaneously, and with all practicable speed.

93. It would not be expedient to admit a second management within so manageable a length of line as that between Calcutta and Allahabad.

Moreover, it is for the interest of the Honourable Court to concede the whole of this distance to the same company. The Honourable Court has guaranteed to the East Indian Railway Company five per cent. on the first section to the collieries, and four and a half per cent. on the second section to Rajmahal. It will greatly diminish the risk and liability of the Honourable Court, if its concession to the East Indian Railway Company include the upper and profitable portion of the line, as well as the lower, which appears likely to be less profitable.

For this purpose, and in order to avoid the inconvenience which certainly will result from different rates of interest being guaranteed upon the capital employed in the construction of different portions of the same line, I would suggest that the agreement to be formed with the East Indian Railway Company shall guarantee one rate of interest upon the whole capital employed.

94. The Honourable Court has quoted an opinion I expressed two years ago, that future bargains with railway companies in India might be made on easier terms than they had hitherto been. Everything that has since occurred goes to confirm the opinion which I took the liberty of expressing, and still hold. The East Indian Railway Company has itself undertaken the extension to Rajmahal, at the lower guarantee of four and a half per cent. The Baroda and Central India Company ask only for three and a half per cent., and the Upper India Company offer to make their proposed line "on terms more moderate than those hitherto granted."

These offers actually made, taken in connexion with the present abundance of money, justify me in expressing a confident expectation that the East Indian Railway Company will be glad to undertake the line to Allahabad on more favourable terms than those they have previously accepted, and as favourable as any that will be offered by any other company.

It would be expedient that, if possible, the company should be bound to complete the line to Allahabad within a period of time to be named, under the penalty of reduction of the guaranteed interest, by a certain proportion for every half year by which the railway company delays the completion of its work beyond the period named.

95. In recommending these conditions, I beg leave to advise that the terms to be granted should be liberal, both in respect of money and time.

96. It is more difficult to advise the Honourable Court upon the course which it will be best for the public interests to pursue above Allahabad.

I am not at all disposed to undervalue the benefit of competition, and I would therefore by no means exclude the Upper India Company from making

specific proposals for the line, which the papers before me do not show them to have done. Indian Railways.

If that company should be allowed to form their line, Allahabad will probably not prove an inconvenient break, while Delhi would be an equally eligible point for all companies. And I assume, as a matter of course, that the Upper India Company would be subjected to the same control in the hands of the Government as the existing company. Governor General
to E. I. Company.

Enclosure

On the other hand, I do not conceive that the substantive line from Calcutta to Delhi would be more than a single management could safely and effectively control; and that being so, there would undoubtedly be great convenience and advantage both to the Honourable Court and to the public, as well as considerable economy, in one uniform management extending over the whole of this great trunk line.

The East Indian Railway Company has already acquired some experience; its managing director, Mr. Stephenson, has knowledge and practice in Indian railway affairs—and these circumstances would entitle us to expect from them a speedier execution of the work than from parties entirely new to the country and the people.

97. The Honourable Court too may possibly feel that those who have been the pioneers of railway enterprise in India are entitled to be received with some favour, when competing for the privilege to extend the works they have commenced over other districts directly connected with that on which they first began under the directions of the Honourable Court.

These considerations would not induce me to recommend that the East Indian Railway Company should be permitted to make the entire line from Calcutta to Delhi on a monopoly footing, or without giving other parties, already in the field, a right of bidding for the preference.

But if the East Indian Railway Company should offer to construct the line onwards from Allahabad to Delhi on terms as favourable, or even nearly as favourable, as its competitor, the Upper India Company, I conceive that the public interest would be served by the line being allotted to the East Indian Railway Company, and I would advise the Honourable Court to grant it accordingly.

98. The capital which it would be necessary for the company to raise, in order to the execution of these works, would be very large. The great companies existing in England, however, have raised capitals as large, and I am not aware of any reason why one formed for similar purposes in India should not be invested with the same power, or be able to use it successfully.

In these remarks, I assume, of course, the sufficiency and stability of the railway company; a matter of which we can have no knowledge here, but of which the Honourable Court of Directors has the ready means of satisfying itself.

99. Before concluding this minute, it may be convenient to recapitulate the recommendations regarding railways in India, which I beg to offer to the Honourable Court.

1st. That a general system of railways connecting the several Presidencies, and constituting the great trunk lines within them, should be sanctioned and executed without further delay.

2nd. That the trunk line in the Presidency of Bengal should be carried up the valley of the Ganges to Allahabad, and thence up the Doab to Agra and Delhi, with a view to its being extended through the Punjab westward, as soon as its construction may be found practicable; and that the line to Diamond Harbour should be rejected.

3rd. That a junction line should be formed between the above-mentioned trunk line and the Presidency of Bombay, either by the valley of the Nerbudda, or by way of Baroda and Neemuch; but preferably by the latter in the first instance, if further examination should recommend it.

4th. That in Bombay the Malsej Ghaut lines should be abandoned.

That the Thull Ghaut line should not be sanctioned as a great trunk line of communication between Bombay and other parts of India.

That a line to Candeish and a line to Poonah should both be undertaken.

That if one only can be chosen, the line to Candeish should be preferred.

That it should not be resolved to carry such line to Candeish up the Ghauts, unless a survey of a line by the Taptee river should show the Ghaut line to be less objectionable than the river line.

That if the Ghaut line should prove the better, it should not be sanctioned as

Indian Railways.
 Governor-General
 to E. I. Company.

Enclosure.

now proposed, by the Thull Ghaut, unless further survey shall establish that no better access to the table land can be found on the Syhadree range, and that the present objectionable features in the Thull Ghaut line cannot be avoided.

Lastly. That the same rule should be applied to the line by the Bhore Ghaut.

5th. That a line should be formed in the Presidency of Madras, by Menil, (to which point it has already been sanctioned,) by Vellore, Vaniembady, Coimbatore, and thence to the western coast; with a branch to Bangalore, and a branch also to the foot of the hills towards Ootacamund.

That another line should be constructed in the Presidency of Madras, from that city by Cuddapah to Bellary; and that surveys, &c., should be made, with a view to its extension across the table land to Poonah, in the Presidency of Bombay, in order thereby to form a junction with the western coast.

6th. That the construction of these lines should be committed to incorporated railway companies under the control of the Government, in the manner in which it has been agreed upon with the East Indian Railway Company, and on such terms as may be fixed.

7th. That if it be necessary to guarantee a certain interest on the capital of the company, means should be taken to ascertain approximately the probable amount required for the construction of the line, and that the amount of requisite capital on which interest is to be guaranteed, should be strictly defined, and that the completion of the line should be required within a certain fixed period, under the penalty of a diminution of a certain proportion of the guaranteed interest for every half year in which the line shall remain incomplete after the expiry of the period fixed.

8th. That all lines for the present shall be formed with a single track, with bridges, embankments, &c., for the same; land being in all cases taken, and the foundations of extensive works laid, to suit a double track.

9th. That the officers of the Honourable Company should be required to exact the utmost economy, consistent with perfect security and efficiency, in the original construction of the line, and in all buildings and works of every description connected with it.

10th. That no portion of a line should be opened for traffic until the capital account for that portion of the line shall have been closed, in such manner as shall be to the satisfaction of the Government of India.

11th. That the line, when opened for the conveyance of passengers and goods, shall in like manner be managed with the closest attention to economy in the working expenses, rather than with a regard to the high rate of speed and frequency of despatch, which are the practice on the English lines.

12th. That the construction of lines to be managed upon the foregoing principles should be conceded to the East Indian Railway Company from Calcutta to Allahabad, one uniform rate of interest being guaranteed upon the capital required for the whole line, if a guarantee be indispensable.

13th. That the construction of the line from Allahabad to Delhi should be granted to the East Indian Railway Company, or to the Upper India Company, but preferably to the former, if it will undertake the works, on terms as favourable, or nearly as favourable, as those offered by the latter company.

100. I have the honour respectfully to submit these several recommendations to the Honourable Court of Directors, and to express my earnest hope that it will resolve at once to engage in the introduction of a system of railways into this Indian empire, upon a scale commensurate with the magnitude of the interests that are involved, and with the vast and various benefits, political, commercial, and social, which that great measure of public improvement would unquestionably produce.

20th April 1853.

(Signed) DALHOUSIE.

RETURN

(To an Order of the HOUSE OF LORDS, dated 14th July 1853.)

FOR

COPIES of any CORRESPONDENCE between the GOVERNMENT of INDIA and the COURT of DIRECTORS, and of any DOCUMENTS received from INDIA, relative to the LINES to be selected for the SYSTEM of RAILWAY COMMUNICATIONS in that Country.

Ordered to be printed 21st July 1853.

RAILWAYS (INDIA),

RETURN to an Order of the Honourable The House of Commons,
dated 12 July 1853;—for,

COPIES or EXTRACTS “ of any CORRESPONDENCE received by the last Mail
from the Governor-General in Council in *India*, relative to RAILWAY
UNDERTAKINGS in that Country.”

East India House, }
18 July 1853 }

JAMES C. MELVILL

(*Sir Herbert Maddock*)

Ordered, by The House of Commons, to be Printed,
19 July 1853.

COPIES OF EXTRACTS of any CORRESPONDENCE received by the last Mail from the Governor-General in Council in India, relative to RAILWAY UNDERTAKINGS in that Country.

LETTER from the Governor-General of India in Council.

Home Department Railway, No. 4 of 1853.

To the Honourable the Court of Directors of the East India Company.

Honourable Sirs,

Fort William, 4 May 1853.

WE have the honour to acknowledge the receipt of your Honourable Court's several despatches as per margin,* and to transmit herewith our proceedings on the very important questions which your Honourable Court have referred for our opinion.

2. The consideration of these questions involved the necessity of previous reference to the several Presidencies, and the Governor-general having conferred personally with Major Baker, the consulting engineer to Government at this Presidency, and Major Pears, the consulting engineer to the Madras Government, who was summoned to Calcutta for the purpose; and having also, through the Government of Bombay, communicated with Captain Crawford, the consulting engineer at Bombay, who could not, owing to distance, be called to Calcutta, has embodied his views, and the conclusions to which he has arrived in the accompanying Minute, dated the 20th April, which we have now the honour to transmit, and with which the other members of Government have expressed their full concurrence.

3. The several questions treated in the Governor-general's Minute are as follows :

1st. The question of a general system of Railways for India, on which Major Kennedy has dwelt in the memorandum transmitted by your Honourable Court.

2d. The lines required in the Presidency of Bengal.

3d. The lines proposed and required in the Presidency of Bombay.

4th. The lines projected or desirable for the Presidency of Madras.

5th. The agency by which the lines shall severally be constructed.

6th. The general principles which ought to be observed in the construction of them; and,

7th. The particular companies which seek permission to undertake them.

4. The recommendations which we beg to offer to your Honourable Court, are as follows :

1st. That a general system of railways connecting the several Presidencies, and constituting the great trunk lines within them, should be sanctioned and executed without further delay.

2d. That the trunk line in the Presidency of Bengal should be carried up the valley of the Ganges to Allahabad, and thence up the Doab to Agra and Delhi, with a view to its being extended through the Punjab westward, as soon as its construction

* Financial, No. 51 of 1852, dated 22d September, with a memorandum by Major Kennedy, on the lines of Railway proposed at Bombay, and on the subject of Railways for India generally.

Financial (Railway), No. 1 of 1853, dated 19th January, with a Memorial from the Directors of a proposed Company for the construction of a Railway from Bombay to Agra, *vid* Baroda.

Financial, No. 67 of 1852, dated 21st December, relative to the extension of the Railway from Calcutta to the North West Frontier, the proper portions to be constructed, and the most eligible mode of carrying them on.

Financial (Railway), No. 4 of 1853, dated 2d March, referring to Court's Despatch to Madras, No. 13 of 1852, dated 18th August, regarding the lines of Railway for that Presidency.

Financial (Railway), No. 3 of 1853, dated 16th February, suggesting construction of a Railway to connect Diamond Harbour, with Calcutta, and the establishment of Docks at Diamond Harbour in connexion with the Railway.

construction may be found practicable, and that the line to Diamond Harbour should be rejected.

3d. That a junction line should be formed between the above-mentioned trunk line and the Presidency of Bombay, either by the valley of the Nerbudda, or by way of Baroda and Neemuch; but preferably by the latter in the first instance, if further examination should recommend it.

4th. That in Bombay the Malsej Ghaut line should be abandoned; that the Thull Ghat line should not be sanctioned as a great trunk line of communication between Bombay and other parts of India.

That a line to Candeish, and a line to Poonah, should both be undertaken.

That if one only can be chosen, the line to Candeish should be preferred.

That it should not be resolved to carry such line to Candeish up the Ghats, unless a survey of a line by the Taptee River should show the Ghat line to be less objectionable than the river line.

That if the Ghat line should prove the better, it should not be sanctioned as now proposed, by the Thull Ghat, unless further survey shall establish that no better access to the table-land can be found on the Syhadree range, and that the present objectionable features in the Thull Ghat line cannot be avoided.

Lastly. That the same rule should be applied to the line by the Bhore Ghaut.

5th. That a line should be formed in the Presidency of Madras by Menil (to which point it has been already sanctioned), Vellore, Vaniembaddy and Coimbatore, and thence to the western coast; with a branch to Bangalore, and a branch also to the foot of the hills towards Ootacamund.

That another line should be constructed in the Presidency of Madras from that city by Cuddapah to Bellary; and that surveys, &c. should be made with a view to its extension across the table-land to Poona, in the Presidency of Bombay, in order thereby to form a junction with the western coast.

6th. That the construction of these lines should be committed to incorporated railway companies under the control of the Government in the manner which has been agreed upon in the case of the East Indian Railway Company, and on such terms as may be fixed.

7th. That, if it be necessary to guarantee a certain interest on the capital of a company, means should be taken to ascertain approximately the probable amount required for the construction of the line, and the amount of requisite capital on which interest is to be guaranteed should be strictly defined; and that the completion of the line should be required within a certain fixed period, under the penalty of a diminution of a certain proportion of the guaranteed interest for every half-year in which the line shall remain incomplete after the expiry of the period fixed.

8th. That all lines for the present should be formed with a single track, with bridges, embankments, &c. for the same; land being in all cases taken, and the foundations of extensive work laid, to suit a double track.

9th. That the officers of the Honourable Company should be required to exact the utmost economy consistent with perfect security and efficiency in the original construction of the line, and in all buildings and works of every description connected with it.

10th. That no portion of a line should be opened for traffic until the capital account for that portion of the line shall have been closed in such manner as shall be to the satisfaction of the Government of India.

11th. That the line, when opened for the conveyance of passengers and goods, shall in like manner be managed with the closest attention to economy, in the working expenses rather than with a regard to the high rate of speed and frequency of despatch which are the practice on English lines.

12th. That the construction of lines to be managed upon the foregoing principles should be conceded to the East Indian Railway Company, from Calcutta to Allahabad, one uniform rate of interest being guaranteed upon the capital required for the whole line if a guarantee be indispensable.

13th. That the construction of the line from Allahabad to Delhi should be granted to the East Indian Railway Company on to the Upper India Company, but preferably to the former, if it will undertake the works on terms as favourable, or nearly as favourable, as those offered by the latter Company.

5. We submit these several recommendations to your Honourable Court, with the expression, in the words of the Governor-general, of our earnest hope that your Honourable Court "will resolve at once to engage in the introduction of a system of railways into this Indian Empire upon a scale commensurate with the magnitude of the interests that are involved, and with the vast and various benefits, political, commercial and social, which that great measure of public improvement would unquestionably produce."

We have, &c.
(signed *Dalhousie.*
F. Currie.
J. Lewis.

REPORT by the Consulting Engineer to Government Railway Department, on the Result of his Examination of certain Lines for the Extension of Railways in the Bengal Presidency, during the cold Season of 1852-53.

INDEX to this REPORT.

- Para. 1 to 3. Plan of tour and reconnoissance.
- Para. 4 to 13. Description of the more direct line proposed by Professor Oldham.
- Para. 14 to 15. Application of the argument to other more or less direct lines.
- Para. 16 to 25. Description of the Ganges Valley line, from Soorujghura to the Soan crossing.
- Para. 26 to 42. Description of the Ganges Valley line, from the Soan crossing to Allahabad.
- Para. 43 to 44. Further extension to Delhi and Ferozepore.
- Para. 45 to 48. Anticipations of returns from goods and passenger traffic respectively.
- Para. 49 & 50. Advantages of carrying on the entire work simultaneously.
- Para. 51 - - Arguement for immediate commencement in the Doab.
- Para. 52 & 53. Suggested plan of operations.
- Para. 54 to 56. Description of subordinate agency to be employed.

Calcutta, 15 March 1853.

IN prosecution of the plan proposed in my memorandum, dated 25th October 1852, and approved by the Government, I proceeded to the examination of a direct line through the hills from Ranigunge to Patna, which had been proposed in a report addressed to Government by Professor Oldham. After following this line to the foot of Bhattia Ghat, and satisfying myself that it was not likely to answer, I proceeded due north to the nearest point on the Ganges (Soorajghurra), and thence in a westerly direction, examining the country on the right bank of that river to the termination of the hills between Mirzapoor and Allahabad. From this point I was returning, with the intention of completing my survey of the Ganges Valley Line from Soorujghurra, *via* Monghyr and Banghulpoor to Colong, when I received instructions to proceed with all expedition to Calcutta.

2. Throughout the greater part of this tour, I was accompanied by the chief engineer of the East Indian Railway, Mr. Turnbull, by whom instructions (the result of our joint examination of the country) were forwarded from time to time to the engineers employed on the trial sections between Rajmahal and Allahabad. I considered it important that Mr. Turnbull and I should reconnoitre the ground together, even at some sacrifice of mutual convenience: we were thus enabled to consider suggestions, and reconcile conflicting opinions on the spot, and within reach of the facts which alone could guide to a right decision, and I believe that we are, in fact, agreed upon all important points connected with the portion of the line which we examined together.

3. The surveys from Rajmahal to Allahabad have been completed, and the engineers are engaged in preparing maps and sections, and forming estimates, which will be forwarded with Mr. Turnbull's report, and will be accompanied by such further remarks from myself as they may appear to require.

4. In the meantime I beg to report the result of my personal observations, and first on the line recommended by Professor Oldham, who proposed to adopt
; the

the Ranigunge Colliery branch, as part of a trunk line to the North Western Provinces, and to extend it direct to Patna. The undulating character of the ground traversed by this branch, continues more or less through the hilly tract to the plains of Behar, and for 12 miles west of Ranigunge would involve ascending and descending gradient of about 1 in 300; from this point to Chukurdahar, about 60 miles, the country rises gradually, and would admit of a regularly ascending gradient, varying from 1 in 250 to 1 in 600. In this length the line would cross 11 nullas and streams, none of which are of much importance, and seven or eight hollows terraced for rice cultivation. These would provide for nearly all the drainage, as, with these exceptions, the line might be led, with very little deviation, from a straight course, along well-drained ridges, of which the drainage falls right and left into the Adjar and Burakur. Thus far a railway might be constructed with facility and economy, and would be liable to objection only on the score of gradients. From Chukurdahar, however, which is 1,150 feet above the sea, and the highest point on the line, the difficulties would commence; first, there is a descent of 330 feet into the valley of the Puttunjore, over seven miles of very rough country, intersected by ravines and covered with jungle, followed by a rise of 280 feet, and another fall of 200 feet to the Valley of the Adjai, from which there is a rise of 130 feet to the Chukai ridge.

5. The greater undulation above described might possibly be avoided by a line keeping closer to the Adjai: I believe that the valley of that river from near Elam Bazar would admit of the best line for a railway in this direction, should such ever be required; but the really obligatory point on the line is the lowest part of the Chukai Ridge, 1,030 feet above the sea, and 600 feet above the plain at the foot of the Bhattia Ghat.

6. Supposing, therefore, as I believe we may, that Chukai might be reached on an uninterruptedly ascending gradient, nowhere exceeding 1 in 250, it would still remain to get over a descent of about 600 feet through a rugged belt of rocks, seven or eight miles broad. The line by which the trial section was taken through the ghat was generally that of the cart-road, and appears to be the easiest passage that could be made without very expensive works; but even this would involve a gradient of 1 in 75 for six miles, with cuttings and fillings of 50 to 60 feet.

7. Of the three passages (the Bhattia, the Kuchwa and the Beernur), examined by Mr. Turnbull and myself, the one which would admit of the best line without reference to cost, would be that of the Beerwar, a torrent which rises south-west from Chukai, and breaks through the hills in a broad winding channel. The fall is very rapid, especially at two points where the river forces its way through and over barriers of granite rock. A tolerably straight line might be obtained by tunnelling under some of the projecting rocks, and by crossing and recrossing the torrent five or six times on oblique viaducts. By these means, the gradient might be slightly improved, but only in proportion to the increase of distance.

8. The prospect of success on either of these lines did not appear to Mr. Turnbull or myself sufficient to warrant the detention of the engineers to take the sections of more than one of them, and for the same reason it was not considered necessary to level the line indicated by Professor Oldham from the Bhattia Ghat through Behar to Patna.

9. It appears to me, that the arguments adduced by Major Kennedy, and on which Government adopted the Ganges Valley line in preference to the direct one originally proposed by the East Indian Railway Company, are equally condemnatory of Mr. Oldham's route, which possesses all the advantages and disadvantages of the more direct line, but in a less degree.

10. For my own part, I should consider that neither the diminution of the direct distance between Calcutta and the North Western Provinces, nor the superior facilities and economy of construction claimed for this line by Mr. Oldham, would justify the adoption for the trunk line of railway of such gradient as are now shown to be inevitable on the Ranigunge and Patna direct route; but I believe that even these advantages have been greatly overrated by the supporters of the project. They may be resolved into two: 1st. Saving of

time and money in construction; 2d., saving of distance between the North Western Provinces and Calcutta.

11. The small number of river crossings between Ranigunge and Chuckee would be counterbalanced, partly at least, by the heavy embankments and rock cuttings; there would be a difficulty in organizing and maintaining working parties, which the country itself could neither supply nor feed. The long land-carriage of permanent way materials would be very expensive, and that of heavy iron-work or long balks of timber would be out of the question; whereas on the river line water-carriage would be everywhere available to within two or three miles of the works.

The descent through the Bhattia or Burnur Ghat, involving long tunnels through rock and lofty viaducts over valleys (the only possible material being stone, which must be quarried and shaped on the spot), would require an immense amount of labour and skilled supervision, and, even with these at command to an indefinite extent, would inevitably occupy many years; while the maintenance of large working parties in a country producing scarcely grain enough to support its scanty population, exceedingly unhealthy during several months in the year, and swarming with wild beasts, would of itself be no easy task. I will not attempt to estimate the cost of heavy works under the circumstances I have described, but it is evident that it would materially raise the average mileage rate of the whole line.

12. The admitted excess in length by 70 miles of the Ganges line has the countervailing advantage of tapping the fertile district north of the Ganges, and bringing into communication with each other and with the Presidency a greater number of populous towns and civil stations. For military objects, the directest route is, *cæteris paribus*, the best; but the amount of advantage is directly measured by the time lost in the deviation. A detour of 70 miles to troops marching 12 miles a day might not be justifiable; but where the distance can be got over in four hours, the objection nearly disappears.

13. Mr. Oldham describes the country traversed by his proposed line as one of rich produce and of great undeveloped mineral resources, for which the railway would provide an outlet; but to me the agricultural produce at least appeared limited to the supply of a scanty population. I doubt not that the improvement of this, as of any other country, would be stimulated by the introduction of a railway; but there are many provinces where this great engine of civilization would be better appreciated, while there are other and less costly means which would more immediately act on the prosperity of this. The construction of wells, where water is sufficiently near the surface, for purposes of irrigation, the formation of tanks, and the maintenance of a good cart-road (for both of which there are great natural facilities), might soon bring the country into a condition to invite railway enterprise.

14. I would hope that the results brought out by the examination of this route will obviate further discussion of direct lines through the hills to the North Western Provinces. The general features of this section resemble those of the line first proposed for the East Indian Railway, and are such as would characterize any other line with a similar object, viz., a gradual rise to the north-west, terminating in an abrupt descent into the Ganges valley. The crest, though undulating, has been described to me by Captain Sherwill, as continuous, and appears to be nowhere lower than at Chuckai, though it is probable that a descent more gradual than that of the Bhattia Ghat may be met with elsewhere.

15. A minor deviation from the proposed line by Rajmahal has been suggested by Mr. Turnbull, and has lately been examined; it would go nearly direct from Sooree (Beerbkoom) to Baughulpore, and would admit, I believe, of a ruling gradient of 1 in 300. My opinion is decidedly averse to the adoption of this line, which, on a small scale, has the same recommendations and objections, which apply to the other more or less direct lines; and it may be said that the smaller the scale, the less excuse is there for introducing an exceptional gradient into the otherwise admirable profile of the line, which, I trust, will soon stretch from Calcutta to Lahore. The saving in distance would be about 30 miles, costing the sacrifice of Rajmahal, and of proximity to the river for 65 miles, within which the produce of Purnea, Rajeshye and Dinajpore would get access to the railway; the greater part of the More Valley line would lie through an unproductive

ductive and incapable country, and though the districts traversed by the other may not at present be better cultivated, they are, at least, susceptible of improvement.

16. I now proceed to describe the line most suitable for a railway from Soorujghurra, westward, passing over for the present the length between Soorujghurra and Colong, my personal inspection of which was prevented by the circumstances already adverted to. I would, in the first instance, call attention to the very remarkable disposition of the drainage, which enters the Ganges from the south, between Soorujghurra and Dinapoor, a disposition which resembles in character that described in a former report as obtaining in the Beerbhoom district, a mountainous tract of land, extending from Chuckai to Jupla (opposite Rotasghur on the Sone), through a length of 160 miles, and breadth varying from 60 to 100 miles, pours down its drainage in six principal streams (the Keeul, Sukree, Punchuna, Fulgoo, Moorhur and Poon-poon), and innumerable minor watercourses. These all follow a general southerly direction, till they meet the raised margin of the Ganges, when they unite into a vast inundation, which has only two outlets into the Ganges, at Soorujghurra, through the Halahur, and at Patna, through the Poon-poon.

17. It is evident that the railway must pass on one side or other of this inundation; if to the southward, it must cross the drainage in detail, either close to the hills, where the ground is rough and undulating, and unfavourable to the maintenance of uniform gradients, or on the alluvial plain, where the rivers are capricious in their course, and their channels wide and sandy. In either case there would be no communication with the large towns studding the river bank, nor with the productive districts, or its northern border. If, on the other hand, it be possible to pass between the inundation and the Ganges, there need be but three considerable works in a distance of 60 miles, and the freest access will be obtained to the principal marts on the river.

18. I believe that this course is both possible and expedient, and that its advantages would far outweigh the objections which may be raised against it on account, first, of the difficulty and expense of dealing with such accumulated masses of water; and, secondly, of the risk to which the railway would be exposed from the encroachments of the river in close proximity to it for so many miles.

19. I would not underrate the difficulty of the works which, especially near Soorujghurra, would, indeed, be of great magnitude in proportion to the accumulated drainage which they have to pass, and to the varying height of water, which ranges to 30 feet between the rainy and dry seasons. It may further be assumed, that the soil at the site of these works will be found to consist of river silt to a great depth; but it must be considered, on the other hand, that the aggregate quantity of work on the three large bridges will be greatly less than would be required for numerous smaller, but still extensive works; and its concentration on a few spots would admit of the economical use of all the best modern appliances, and the closest supervision of selected engineers. The proximity of the river would be the best security against a strong current, or scour through the railway bridges, for the freshes invariably occur during the same season as the land inundations, which, in fact, they frequently dam back: it would also afford cheap water carriage for the heavy iron-work (which appears to me to be the material best suited to the purpose), and will thus obviate what would otherwise be the most serious difficulty, the provision of the requisite quantity of bricks in a locality where fuel of any kind is scarce and dear.

20. I believe that it would be quite possible to found a stable bridge of brick-work on the river silt at a proper depth; we have an example in the old native bridge at Fatwa, which carries the united waters of the Moorhur and Poon-poon through seven arches, having an aggregate waterway of 132 feet; but, for the reasons above stated, and in order to obstruct the channel as little as possible, I would prefer an iron structure for this purpose.

21. At first sight it appeared advisable to cross the Hurlahur at Soorujghurra, below the junction of the Keeul Nuddee, and with this view Mr. Turnbull and myself carefully examined the locality. The high bank on which stands the village of Soorujghurra would be a good starting point; but the opposite or left bank

of the Hulahur, and, indeed, the strip of land lying between that river and the Ganges, as far as Burgoozur, is deeply inundated, and, consisting only of recent alluvium, is by no means safe from the encroachment of the Great River. There is, in fact, no good crossing of the Hulahur below its junction with the Keeul, and it will, therefore, be necessary to pass these streams separately, returning to the proximity of the Ganges near Barbeea, and following closely its right bank as far as the crossing of the Poon-poon at Futwa.

22. This line, for about 50 miles, would follow the northern edge of the land inundation, forming a border and barrier to the dry strip of ground above described, which is studded thickly with villages and mangoe groves, strongly contrasting with the treeless and houseless plain, stretching southward as far as the eye can reach—an inland sea in the rainy months, but green with wheat cultivation in the winter.

23. It may be objected, as suggested in paragraph 18, that a line following the river so closely, would not be safe from being undermined and carried away by its encroachment, and this objection, if well founded, would doubtless be fatal to the project: accordingly my most anxious attention was directed to this point, and I was enabled to satisfy myself, by personal inquiry, by the appearance of the bank, and by comparison of the ground with the revenue survey maps constructed in 1841-42, that the river is not generally encroaching on its right bank, and that that bank is protected by a stratum of strong red clay, mixed with kunker (a little above the cold-weather level of the river), which, not only has checked encroachments,* but would afford a firm basis for protective works, which at any particular point might possibly hereafter appear necessary. The railway would nowhere be nearer to the river than half a mile, which, under the circumstances I have described, appears to me a sufficient margin for security.

24. The crossing of the Poon-poon near Futwa would require a work similar to that over the Hulahur, and nearly as large. The native bridge already adverted to does not furnish a safe gauge of the waterway required. The great depth of the channel below the bridge seems to show a scour caused by insufficient vent; while for two or three miles westward of Futwa, on the Patna road, there are unmistakeable marks of inundation crossing the country, and falling directly into the Ganges. These would require a separate provision of land arches.

25. The city of Patna occupies a narrow strip of high land, extending along the river bank, and bounded on the south by swamps and inundations. In approaching and passing this important emporium, the line must necessarily occupy much valuable land now covered with houses, gardens and religious buildings. The course proposed for the railway will take advantage of one of the ramparts of the Old Fort, running east and west about 3,000 yards in length, by which it will be brought into contact with the heart of the city, in the position which will least interfere with the principal thoroughfares. This rampart is the property of Government; but it is let on long leases, and is covered with huts and inferior houses. One or both of the other ramparts which run north and south might afford communication with the river bank by means of tramways; and at the junction of these with the railway, there would be sidings and wharf walls for the reception of goods. The principal passenger station and offices would be at Bankipoor (the civil station of Patna), from whence the line would proceed direct *viâ* Phoolvaree to the point fixed for the Sone crossing, or else by a more circuitous course *viâ* Dinapoor, should it be considered advisable to touch that cantonment. Both lines have been surveyed, and on both the intermediate ground is low, and liable to inundation from the Poon-poon and the Sone, to within a quarter of a mile of the latter river.

26. In compliance with the wishes of the Honourable Court of Directors, expressed in their despatch No. 45, of 1851, dated 20th August 1851, notifying their approval of the Ganges valley route as recommended by Major Kennedy,
I proceed

* There is a slight exception at the town of Bar, where there is an appearance of one or two walls having fallen in at this place; however, the inhabitants have a custom of excavating and carrying away the red clay for the purpose of daubing their houses.

I proceed to describe more minutely the portion of the line between the Sone crossing and Mirzapoor.

27. The site which I believe was preferred by Major Kennedy for the passage of the Sone, near the village of Parewa, is that which to me also, on the whole, appears the most eligible. The river here flows in a well-defined channel, 4,000 feet in width. The banks on each side are above the highest flood-level, and consist of firm clay, calculated to afford a good foundation for works intended to resist the further encroachments of the river. I have not yet received a report on the borings made to ascertain the nature of the soil in the river bed, and on this will depend the description and cost of a structure suitable to the locality, and the expediency of constructing a bridge at once, or deferring it, as proposed by Major Kennedy, until the success of the line has been established. The former alternative would be obviously preferable, should it appear that the interest of the money to be spent on the bridge would not exceed the annual cost of the provisional arrangements, which must be made for the transit of goods and passengers.

28. It may be disputed whether a river like the Sone, which is in many places three miles broad, can safely be crossed at a point where its width is about one-fourth of that distance. I believe that it may, and that the narrow and deep channel, even with a less sectional area, may be dealt with more advantageously than the broad and shallow one. The Sone in its upper course has a strong fall, and is constantly cutting into one or other of its banks. It thus enlarges its apparent channel, without proportionately increasing its effective waterway; for much of the intermediate space is choked with sand-drifts; and though in extraordinary floods the whole channel may be superficially filled, it will be found that in many places the water is shallow, and in another it is nearly still. Again, in the upper part of the Sone, where the bed is wide, the river is liable to sudden freshes, which reach their height in a few hours, and after a short continuance rapidly decrease; but on its lower course the freshes rise more gradually, and continue longer. In the latter case the average discharge may be greater, and yet the channel may never be called upon to pass so much water at one time; still, however, it must be admitted as an objection of some weight, that the channel does not here carry the whole efflux of the Sone, part of which occasionally escapes over the left-bank many miles higher up, and overflows the country.

29. The high ground on the left bank of the river opposite Parewa continues for about four miles, and is exempt from inundation as far as Kaimnuggur, from whence, for about 16 miles, we find the drainage of the country indefinitely augmented by the overflow of the Sone.

30. The Nugree Nuddee, which passes under Kaimnuggur, has been frequently bridged by the ferry-fund committee, whose labours have been as frequently overthrown by the floods. Its valley shows evident traces of the violent action of floods, and will require a great extent of arching.

31. The town of Arra is situated on a spot of high ground, intersected by a nulla, which is at present spanned by a bridge of 10 arches, seven of them having been added since the first construction of the bridge. The local drainage is inconsiderable; but during the Sone floods the water is said to fill the channel, and to rise occasionally to the level of the roadway. The line of railway will pass south of Arra, and sufficiently near the town to pick up the passenger traffic, which I expect will be considerable.

32. Westward of Arra, within a distance of 12 miles, the line will cross 10 watercourses of greater or less width, and all said to be within the influence of the Sone floods. Over all of these, bridges have been constructed by the ferry-fund committee, in many instances more than once, the broken structures being replaced by others of greater width. The aggregate waterway at present provided is 450 feet; but I suppose that double or three times that width would not be more than sufficient to provide against possible floods.

33. The soil in all the inundated lands consists chiefly of the black earth known by the local name of kurrial, which is said to be utterly unfit for the construction of embankments; I therefore examined with much interest, both

in dry and wet weather, the raised road between Arra and Buxar, which is in places formed of this soil; I found it, indeed, very soft after rain, and the road being unmetalled, was at that time very heavy for wheeled carriages; but I see no reason to fear that, with the aid of a good coat of ballast, it would not be sufficiently firm for railway purposes.

34. From the Gunga Nuddee, which is the last connected with the Sone to Buxar, a distance of 33 miles, the line would cross the Bhynswalee, the Kooa, the Bhynsa, and three other smaller channels, whose existing bridges appear to provide sufficiently for the waterway by an aggregate width of 287 feet.

35. Passing close behind the town and fort of Buxar, the railway will cross the Thora Nuddee, about 200 feet wide; and at a distance of seven miles from the fort will encounter the Kurrumnassa, a considerable river, flowing between high banks, with a width of 600 feet, and a difference of 35 feet between the flood level and that of the dry weather.

36. From the Kurrumnassa to the crossing of the great trunk road opposite Benares, a distance of 50 miles, the country is most favourable for the construction of a railway. The only appearance of flooding is caused by the local drainage, which runs off slowly, owing to the excessive flatness of the country: an embankment raised two or three feet above the natural surface, with a few culverts at long intervals, will constitute all the work required. Kunkur for ballast is found in abundance throughout the whole line.

37. It appears to me not advisable that the railway should pass nearer to the town of Benares than Mogulserai, which is about seven miles from Rajghaut. By following the river more closely, it would encounter nullas, ravines and broken ground, besides a considerable increase of length. The traffic from the station to Rajghat would pass along the trunk road, unless it were found expedient to make a tramway.

38. Between Mogulserai and Chunar, a distance of 19 miles, the country becomes undulating, especially near the river bank, and is occasionally intersected by ravines; the railway would partly avoid these, by keeping well south of the river, but must cross several minor watercourses, besides the Jhungo, a considerable stream, which passes under Chunar.

39. The sand-stone hills which skirt the Ganges at Chunar are broken up in the vicinity of that place into detached hills, between which the railway will pass without any serious cuttings or awkward detour; but the country on which it will enter, after passing Chunar, is exceedingly rough, being, in fact, a network of nullas, gullies and ravines. Between Chunar and Mirzapoor, in a distance of 21 miles there are 14 channels of more or less importance, which will demand masonry bridges, besides a great extent of broken ground, requiring numerous culverts. The material, however, of these works, and for ballast, may be quarried on the spot, and rock foundations will be everywhere attainable.

40. At Mirzapoor, as at Patna, the railway could not be brought up to the river-bank, unless by a sweeping destruction of houses and religious buildings, attended by a great interruption of thoroughfares in the city. It appears, however, that, for Mirzapoor at least, a station on the river bank is not a matter of importance; much of the merchandize is brought by land; and I am informed that even the goods conveyed by the river generally change hands at Mirzapoor. As regards the land-carried goods, and for passenger traffic, a river-station would not be convenient, as being difficult of access, owing to the narrowness of the streets; nor would it be well placed for continuing the line towards the north-west; the most eligible site for a station would probably be near the great gaol on the Jubbulpore trunk road.

41. Passing Mirzapoor, the railway would cross the Aojla Nulla, about 150 feet wide, and the head of the Bindachul Jhul, and would then skirt the sand-stone hills for five miles to the crossing of the Kurnowtee, between which and the Tonse (about 26 miles) there are no natural difficulties or impediment of any kind.

42. I was unable to extend my personal examination further than to about 22 miles west of Mirzapoor, and have not yet seen the sections taken by the railway

railway engineers between the Tonse and the Jumna; they will be forwarded hereafter with Mr. Turnbull's report.

43. The profile of the Doab, from Allahabad to Agra and Delhi, is known, from the levels taken in connexion with the Ganges canal work, to be so favourable for the construction of railways as to leave the selection of the line to be guided chiefly by political and commercial considerations. Whatever route be selected, there would be, in 400 miles, but one important river crossing, that of the Jumna, at or near Agra, and but few bridges would be required to dispose of the local drainage.

44 From Delhi to Ferozepoor, a further distance of 220 miles, the railway would traverse a country, which I could state, from personal knowledge, to be remarkably free from engineering difficulties. The Delhi and Hurriana canals and the River Cuggur are the only streams; and I believe that the only other natural obstacles would be a few belts of drifting sand, which may occasion some little trouble in keeping the line open during the prevalence of the hot winds.

45. While examining the country, with reference to the engineering operations of a railway, my attention was also turned to the prospects of its use by the natives to such an extent as to ensure a remunerative return. The goods traffic has been chiefly relied on by Mr. Stephenson, Major Kennedy and others, and I have seen no reason to doubt the realization of their hopes. the quantity of merchandize passing up and down the Ganges Valley even now is enormous, and that the merchants, both native and European, are willing to pay for a safer and more expeditious conveyance than is afforded by the native boats, is abundantly proved by the growing demand for freight on the river steamers, and by the constant use of the great trunk road for the transport of goods between Calcutta and the provinces as far as Delhi.

46. My recent observations, however, have encouraged me to hope that the passenger traffic will be an equally, if not more fruitful source of profit. The population of the Ganges Valley is remarkably dense, especially along the banks of the river, to which it is attracted by commerce, fertility of soil, and every association connected with the religion and ancient superstitions of the country. This population is very locomotive; wherever roads exist they are crowded with travellers, and the inhabitants of the principal towns freely avail themselves of facilities for increased rapidity of transport, afforded by metalled or other well constructed roads.

47. The great trunk road affords the best example of the native appreciation of rapid transit, but on other thoroughfares, and especially between Mirzapore and Benares, I witnessed a constant stream of horsed conveyances, most of them hired vehicles, but not worked by relays of horses. On the trunk road, and, as I am informed, on other roads in the North Western Provinces, the use of staging carriages, drawn by relays of horses or bullocks, is spreading very rapidly among the natives, where horses are employed, and a rate of five to seven miles an hour attained: the charge is 1 anna per mile for each individual, while in the bullock carts, whose pace may be assumed at from two to three miles an hour, the fare is half an anna per mile for each person.

48. In the course of my tour, I noticed that the better class of natives whom I met with evinced considerable interest in the object of the inquiries on which I was understood to be engaged. I have taken every opportunity of conversing with all classes on the subject, explaining to them the nature of a railway, and of the accommodation it would afford to travellers, and the probable fares. In some instances I have suspected incredulity; but I have never heard a doubt expressed that all classes would avail themselves of this means of transit whenever they might have occasion to travel on legal or commercial business, to visit their families, or for religious objects.

49. Supposing it to be the purpose of Government ultimately to connect Calcutta by railway with the North Western Provinces and the Punjaub, I would take this opportunity of respectfully urging the expediency of entering at once and simultaneously on the prosecution of the entire undertaking. It need scarcely be observed, that the present plan of constructing the railway, by

successive sections, while it would indefinitely postpone the establishment of an efficient railway system, would also curtail the pecuniary returns for which each section is dependent on the distant as well as the local traffic, or, in other words, that a complete railway, or system of railways, would be more efficient for military, political and commercial objects, and more remunerative to those who pay for it, than any number of its parts, and that the cost and labour expended on such fractional portions are not bearing their full fruit, but lie comparatively unproductive, until the scheme be perfected.

50. Supposing that the requisite funds might be raised (a point on which I am not in a position to offer an opinion), the possibility of simultaneously carrying on so large an undertaking would depend on that of obtaining competent supervision in the engineering department. This may be a source of some difficulty; but I should anticipate none in commanding an adequate force of labour of all kinds within a short range of the districts through which the railway would pass. Consideration would at once be given to the provision of permanent way materials, and thus ample time would be afforded for the best and most economical arrangement for this important item of expenditure.

51. The advantages of carrying a railway through the Doab from Allahabad to Delhi having been already insisted upon by the highest authority in this country, need not be repeated here; but I would take the liberty of mentioning some circumstances which appear to me to strengthen the arguments for an immediate commencement of the work. The main line of the Ganges Canal is approaching completion, and measures will now be taken immediately for the formation of the branch canals (or rajbuhees), and their dependent systems of watercourses, by which the water will be distributed over the whole surface of the country. The railway must necessarily cross many of these watercourses, and I believe that economy of arrangement may be greatly promoted, and mutual interference obviated, if the railway and the irrigation system be laid out simultaneously and with reference to each other; I would further anticipate, that by the completion of the principal works on the Ganges Canal, much of the trained labour now absorbed by it, will be set free, and will be available for the railway, if the latter be commenced at once.

52. I defer the remarks I shall have to offer on the probable cost of the railway in its several parts until receipt of the sections and calculations of work, which will be forwarded by the chief engineer of the East Indian Railway; but it may not be out of place to suggest the plan of operations which to me appears best suited to the circumstances of the case, and to consider the description of subordinate agency to be employed.

53. It will be readily admitted by all who have had experience in public works, on this side of India at least, that in any enterprize of magnitude the chief difficulty and source of delay is the collection or preparation for the requisite quantity of building material. This fact should in great measure regulate the arrangements for construction of the railway from Burdwan to Allahabad, which may be generally characterized as consisting of several principal works, or clusters of such, connected by long portions of mere embankment. The time required for the construction of the large works will regulate that for the completion of the whole undertaking, and half of this time will be devoted to the collection of materials: I would propose, therefore, that the line be permanently set out throughout its whole length; that the gradients be definitely fixed, and the land taken; that the designs for all the principal works be prepared; that where timber or brickwork are to be employed in the construction, timely arrangements be made for the provision of the requisite material; and where iron-work is preferred, that either detailed drawings, or the necessary dimensions and conditions, be transmitted to England, so as to give ample time for its preparation and despatch on the most economical terms; in the meantime bungalows should be built for the shelter of the engineering staff, and agreements should be entered into with native contractors for the collection of natural and artificial ballast, and for the formation of all the embankments, leaving the cuttings, where not very heavy, to be executed hereafter: a small annual expense would be incurred in the maintenance of the earthwork, but its thorough consolidation would be secured, and a most valuable and timely test would be obtained

obtained of the propriety and sufficiency of the provision that may be made for the passage of floods and local drainage.

54. The plan which I have suggested, and the circumstances which I have supposed to recommend it, would not suit contractors of the class with which we are connected on the present works, but it would not be unfavourable to a man of large capital and resources, competent to undertake the construction of 100 to 200 miles of railway; or, failing these, it might be worked by petty contractors for the different classes of work, under the general management of executive or resident engineers.

55. The partial failure of the contract system with us (for such, I fear, must be confessed, as regards both economy and rapidity of construction), is attributable to causes some of which are accidental and transitory, others permanent. The former are principally the novel nature of the work, the inexperience of the English contractor in the ways of India, and that of the Indian contractors in railway work; the absence of high professional standing as railway contractors of those engaged, and the want of capital, which cramps their energies, and renders them so dependent, that no temporary suspension of monthly payments (as a penal measure) can be attempted by the railway company, without risk of stopping the works altogether. The more permanent objections are the contractor's profit, and the greater expenses necessarily involved in the contract system by the double establishment required by the contractor for supervising the work, and by the engineers for checking it; but these sources of expense would be dried up, should the railway company determine to execute the work by their own engineers; and supposing that the latter were qualified to do justice to a task confessedly new to them in many respects, it is my own opinion that fit men might be found for the executive duties, but that those of account must be provided for separately and distinctly by the employment of clerks of the works, men who combine a qualification in book-keeping with a certain knowledge of railway work.

56. I would not be understood as pronouncing positively against the further employment of rich contractors, as we now have, but I would certainly wish to be independent of them, and I have seen good reason in the progress of the present works to desire that our future operations may be entrusted to a better and more efficient agency.

(signed) *W. E. Baker,*
Consulting Engineer to Government of India.

J. P. Grant, Esq.,
Secretary to the Government of India.

REMARKS by the Consulting Engineer to Government.

22 March 1853.

My report, dated the 19th instant, will stand in the place of lengthened comment on the accompanying papers.

I would merely point out that the series of unfavourable gradients at Rajmahal may be greatly improved, and near Calgong may be avoided by a very slight detour towards the river bank. The inundated and broken ground, as shown in this section near Benares, may be avoided (as mentioned in the 37th para. of my report), by a straight course, leaving Rajghaut a few miles to the right.

The estimates are, in my opinion, considerably too high; Mr. Stephenson indeed remarks, that the works have been advisedly estimated at excessive rates; the nearest possible approximation to the truth would, I think, have been more useful, with reference especially to the purpose of inviting tenders in England.

I am sorry to find that time would not admit of borings being taken to ascertain the nature of the soil in the bed of the Soane. The large sum, no less than four-and-a-half lakhs of rupees, at which Mr. Turnbull has estimated a part only of the provisional arrangements required in substitution for a bridge at this point,

gives additional importance to the inquiry as to what would be the least cost of a bridge, the temporary substitute for which would entail so heavy an expenditure.

(signed *W. E. Baker*, Major,
Consulting Engineer to the Government of India.

J. P. Grant, Esq.,
Secretary to the Government of India.

No. 1022.

From *R. Macdonald Stephenson*, Esq., Managing Director and Agent of the East Indian Railway Company, to Major *W. E. Baker*, Consulting Engineer to Government of India.

Sir,

Calcutta, 21 March 1853.

I HAVE the honour to forward, for the information of the Government of India, the results of the surveys carried on during the past cold season.

Enclosures,
Report No 6 of *G. Turnbull*, Esq, March
9th 1853
Estimates, Plans and Sections, Nos. 1 to 7.
Map, showing alternative directions of the
Line above Allahabad, as laid down in 1843, in
1845 and in 1847, by the East Indian Rail-
way Company.

Works - - - -	Rs	88,04,087
Surveying, Engineering, Direction, Management, Locomotives and carrying Stock - - - -		19,95,810
	Rs	1 07,99 897
Works - - - -		1,01,57,809
Additional, as above - - - -		12,98,750
	Rs	1,14,56,559
* Works - - - -		3,80,95,365
Surveying and Engineering, Di- rection, Management, Locomo- tives and carrying Stock - - - -		71,90,000
	Rs	4, 2,85 365

The report and estimates of Mr. Turnbull, the chief engineer, with the plans and sections specified in the margin, contain the ample details of the operations which, in addition to the trial sections taken on the direct Patna and the More and Bhaugulpore lines, have extended from Rajmahal (to which point the company had previously brought their series of levels), by the valley of the Ganges to Patna, Mirzapore and Allahabad, the route selected by the authorities to be pursued as the trunk line connecting Calcutta with the North Western Provinces.

From the estimates already forwarded, it will be seen that the cost of the 121 miles of the first or Raneegunge section will not exceed 1,07,99,897 rupees, or 89,255 rupees per mile, including all expenses of construction, surveying, management, locomotives, carrying stock and maintenance for one year after completion, both of way and works.

The section to Rajmahal is estimated to cost 1,14,56,559 rupees, or 93,906 rupees per mile, for a distance of 121 $\frac{3}{4}$ miles, and the continuation from Rajmahal to Allahabad is estimated at 4,52,85,365* Co.'s rupees, or 1,03,156 rupees per mile, the distance being 439 miles, the crossing of the rivers Touse, Kurrumnassa, and all the other large rivers, except the Soane and the Jumna (which it is proposed to cross at first by a ferry), being included.

The first section will be completed by the latter part of next year, portions of it being opened, and locomotives with carrying stock provided, and placed upon the line, within the next few months.

The construction of this section (equal in length to the English Great Western, and exceeding that of the London and Birmingham lines) will have taken four years to construct, a period which, when all the difficulties incidental to an entirely novel description of work in India are considered, will not, it is hoped, be regarded as excessive or unreasonable. Had it been the wish of the Honourable the East India Company that a much increased length of line should have been made, the period of completion (four years) would not have been exceeded, as proportionately augmented resources would have been provided.

The extent to which during the next few years the construction of the railway lines of communication through India may be proceeded with, will depend entirely upon the views and decision of the Government of India, and of the Court of Directors of the East India Company.

As regards the practicability of widely extended and simultaneous operations, and with a view to a clear understanding of the state of preparation of the East Indian Railway Company to carry out the intentions of the home and local authorities, I take the opportunity to state, that the Railway Company, being empowered under the Act of Parliament to raise the necessary amount of capital, are prepared within seven years, viz., between the 1st October 1853 and the end of 1860, to complete the entire line of railway communication by the Ganges Valley, through Mirzapore to Delhi, and if desired, within the same period

period to construct a further extension to Lahore, and a branch line through the Soane Valley, to connect Calcutta with the Bombay Presidency

The statement is made upon data which have been in course of careful collection during the last 10 years, and, from personal examination and knowledge of the country as far as Delhi, confirmed in all respects by the full and able reports of the engineer officers in the East India Company's service.

The accomplishment of a design which, in reference to the advantages derived both by the Government and the public, will be admitted to deserve the serious consideration of Government, must depend upon an early decision, upon advantage being promptly taken of the favourable state of the money market in England, and upon the exercise of the necessary foresight in providing those means and appliances which involve time as a primary and essential element

The cost of the line to Allahabad, complete, and including locomotives and rolling stock, having been advisedly estimated at excessive rates, to provide for the increased cost of iron and freight, will not exceed 6,75,41,821 rupees, upon 681½ miles, or an average of 96,300 rupees per mile. The probable cost above Allahabad may be estimated at 60,000 rupees per mile, the items of permanent way materials in both cases being liable to fluctuation from the varying price of iron.

The statement made officially to Parliament, that railway communication shall be made throughout India, and the decision by the authorities of the general direction of the route between Calcutta and the North Western Provinces, have removed the only two preliminary questions, which might have required longer delay in deciding upon the period at which future extensions in the Presidency of Bengal and the North Western Provinces should be made, and 2,000 miles can now be constructed by the Railway Company within the same period that will be occupied in completing 200 miles.

Should the Government of India consider the communication now forwarded to justify the Government in recommending that the construction of the entire lines of communication above referred to should be at once provided for, and that the instrumentality of the East Indian Railway Company, under the full and direct control of the Government, offers the most suitable means by which it can be accomplished, I feel assured that extraordinary exertions, proportioned to the importance of the undertaking, will be promptly made by the Directors of the Railway Company to ensure the due fulfilment of their contract, and I venture to express a hope that the mode of administering the affairs of the Company both in England and in India, in connexion with and under the control of the authorities, has been such as to deserve and secure their continued confidence.

I have, &c.
(signed) *R. Macdonald Stephenson,*
Managing Director and Agent.

EAST INDIAN RAILWAY REPORT, No. 6.

From *George Turnbull, Esq.*, to the Chairman and Directors of the East Indian Railway.

Gentlemen,

Serampore, 19 March 1853.

1. I HAVE now the honour of transmitting to you a plan, longitudinal sections and estimates of the proposed extension to Allahabad, on the lines which have been the subject of careful investigation during the months of November, December, January and February last.

2. My report on this subject must necessarily be brief, on account of the necessity which exists of submitting the documents to the Government of India for consideration without delay.

3. In order to meet your wishes, and those of the Government with respect to the cost of the works, I have devoted the short interval which has elapsed since the completion of the trial surveys to the preparation of minute and careful estimates, not only of all the proposed extensions to Allahabad, but also of the 121 miles now in course of construction, in preference to attempting any very detailed description of the country traversed, which description must now be made in general terms.

4. The first part of the extension, namely, that between the junction, a few miles west of Burdwan and Rajmahal, is fully described in my report of the 23d February 1852. Orders having been received to proceed with the surveys on this portion, I detached Mr. Sibley from Chandernagore, and put him in charge of the 45 miles from the junction to the River More. Since the month of November the country has been re-examined, the centre line marked out on the ground, the working longitudinal section taken, and the surveys of properties necessary for obtaining possession of land are drawing towards completion. Some have been already finished and sent in to Government. The designs of the works are also in progress.

5. On the length of about 76 miles from the River More to Rajmahal, nothing more has been done besides that which is described in my last report, because the number of engineers available was not more than sufficient to take the trial-levels up to Allahabad, and the alternative routes by Chuckai, and by the valley of the River More. It was deemed more advisable to ascertain the facts of the alternative routes suggested, and settle that much-debated question, and secure sections and accurate estimates up to Allahabad, than to prosecute the setting out of the line beyond the River More. This work will, however, be resumed as soon as it is possible to take the field after next rainy season.

6. I now proceed to a short account of the line from Rajmahal westwards. You are already in possession of a plan and longitudinal sections up to Rajmahal. For the sake of distinctness, I shall state all the estimates together in a tabular form at the end of this report.

7. The course proposed is indicated by a strong red line on the map. Commencing near Oodwa Nullah, the main line will take what may now be called the Oodwa Nullah or Rajmahal branch, about six miles from the River Ganges. The line here bends to the left, and turns the flank of the first of the Rajmahal hills, rising at the rate of 1 in 500. The line still bends to the left, and then to the north, keeping between the hills and the large swamp called the Jâlâ Jheet.

8. The soil here is favourable, and the works will not be attended with difficulty; there is a good deal of quartz rock, but what appears on the surface is of a loose friable nature, and excellent ballast can be obtained to any amount.

9. We next reach the old military station of Sickrugully (now deserted), keeping to the south of the rocky promontory, after having passed the remains of the ancient Mahomedan road, near a place where traces of coal have been found.

10. At Sikragully the line bends into nearly a due-west course, passing the out-lying hill of Gunga Persaud on the north, and on the old ruined fortress of Taleagurne, at which place the railway must keep close to the foot of the rock on which the ruins stand. This is the last of the rocky hills which must be passed. It is composed of basaltic boulders and red soil, and some quartz pebbles.

11. The direction is now straight to Colgong, where there should be a station and landing wharf in the River Ganges. East of Colgong the country is very jungly; but clearing is going on rapidly, and cultivation spreading.

12. From Rajmahal to Colgong the distance is about 50 miles.

By reference to the section, it will be seen that we have gradients of 1 in 300, 1 in 400, and 1 in 500, &c. I should remark here, that these gradients are capable of improvement, either by incurring the expense of heavier works, or by making bends or curves to the right or left, all which can be decided at the time of making the working sections, when the estimates of alternative lines can be compared.

13. From Colgong to Bhaugulpore, about 20 miles, the country is inundated by the annual overflowing of the Ganges. The high land is, as usual, found close to the margin of the river, and the line should be carried at no great distance from the present dawk road, and as near to the river as it would be prudent to place it, so as to avoid any danger to the works from the encroachments of the floods of the Ganges.

14. A stiff red clay appears at intervals in the bed of the river, which promises well for foundations of our bridges, of which there will be several in this length; one over the Koah Nuddy, another over Geroah Nuddy, and another over the Ghoga Nuddy, are the largest. A proportion of flood-openings will also be necessary.

15. We now reach the large and important station of Bhaugulpore. Two trial lines were taken here; but on more examination, we found that a third route would possess advantages over either of those shown on the plan and section. Here a large station and a communication with the river should be established.

16. From Bhaugulpore to Monghyr the distance is 32 miles by the line, more than half of this distance is subject to an annual inundation. It does not, however, appear that the works will be of a difficult character on the whole, as for a considerable distance an elevated natural bank occurs between the river margin and the railway works.

17. The principal rivers to be crossed are the Chumpan Nuddy, about 300 feet wide, besides a large extent of flooded ground on each side of it, and the Mun Nullah, about 350 feet wide. About half way stands the large thriving village and bazar of Sultan Gunge, close to the rocky promontory and Island Jehaugurah, with its temple and ruined mosque. These rocks permanently define the margin of the River Ganges at this place, and no alteration, it is stated, has ever occurred in the course of the river here, where there is always deep water, and a good landing place.

18. We now turn the end of the Kurrupore hills, and reach Monghyr by an easy curve. Future investigation must decide whether it be most advisable to bring the line close to the town, or carry a short branch down to the river banks, and keep the main line at a few miles distance. The trial section shows the line as laid down on the map.

19. From Monghyr, westwards, for above 30 miles, the country is inundated every year; two trial sections were taken, which are shown on the plan, one keeping near the River Ganges, passing a short distance south of Soorujgurrah; the other route keeps a direction more to the south, near the base of the hilly range, and is almost beyond the reach of the inundations, and, which is of more importance, passes through better soil, saves two bridges, and avoids the black alluvial earth called *cureo*, which is about the worst possible material for making embankments. This line has been adopted for the estimates; it is about five miles longer than the other, but its advantages more than counterbalance the extra length of permanent way.

20. The Keeal and the Hullohur rivers must both be crossed; both will require large and expensive bridges; that over the Hullohur will be the most formidable. The Hullohur bridge will be 650 feet long, and with an average depth of about 40 feet.

The Keeal bridge will be about 500 feet long, and considerably less in height than the other; for both these bridges estimates have been made of cast-iron cylinders, and light wrought-iron superstructures. The applicability of such a construction can better be decided when the beds of the rivers are examined by borings and otherwise.

21. After crossing the Hullohur, the best direction will be northwards by Burheea, and keeping close to the high land on the banks of the river, passing the thriving village of Baar, and on westwards by Futwa, across the Poonpoon Nuddy, to the city of Patna. From the Hullohur to Patna the distance is about 63 miles; there are villages all the way, and the country is rich and in high cultivation. For nearly the whole of this distance the works will be out of reach of the inundations.

A bed of good red clay appears at intervals in the bed of the Ganges, which in a great measure prevents its south margin from being washed away by the stream during the time of floods.

22. The Poonpoon bridge will be a large and expensive work; an estimate of it has been made on the same principle as that for the River Hullohur.

23. Some low land occurs west of Futwa partially flooded, which will require to be provided with arching, or openings for the passage of the floods.

24. The best line for the railway through the city of Patna, will be on the old earthen mound or rampart, which runs east and west for a mile and a half, at a distance of three and a quarter miles from the river. The line here has some very favourable features, as the city can be traversed without the destruction of any valuable property. The old mound alluded to is stated to be the property of Government. The best site for the Patna passengers' station will probably be at the race course or Mydan, at the west end of the city. A good station may be made at any convenient point in the city opposite to the opium factory, or at such other point as may appear preferable.

25. From Patna to the River Soane two trial sections were taken, one touching Dinapore, and proceeding south-west to the small village of Purreo on the Soane; the other route goes by Phoolwarree, keeping considerably to the south of the other line, and is a much better one, inasmuch as it escapes a large extent of low inundated land, south and west of Dinapore, which would require large embankments, and many flood passages. The line by Phoolwarree is that which has been estimated.

River Soane.

26. The River Soane has been examined as far up as the crossing of the grand trunk road, and no better place of crossing has been found than that at the village of Pareu, at the south end of a small island.

At this place the banks are steep and well defined, and the clay bottom is occasionally visible, and, especially on the east side, appears of a more tenacious character than usual.

The earliest opportunity should be taken to sink wells and borings into the bed of the river, to ascertain the nature and depth of the soil and substratum.

No estimate has been made of a bridge across the Soane; first, for want of data; and, secondly, because the construction of a bridge is manifestly a work of so great expense, that it is worth consideration whether it would not be best to have a "break" in the railway, and a ferry, and landing piers for transport of goods and passengers, which can be done at a comparatively light cost, leaving the construction of a bridge until the increase of traffic should demand one.

If a "break" occur here, it would be necessary to have a station on each side of the river, with engine-sheds and turntables for reversing the engines, and other arrangements peculiar to a terminal station, for these I have made an approximate estimate.

27. Leaving the River Soane, the line proceeds nearly due west, in a perfectly straight direction, through a fertile and populous country, passing to the south of the large town of Arrah, where there is a civil station for the district of Shahabad. Here many flood-openings or arches will be wanted, as the country is in part inundated, principally from the overflowings of the River Soane.

28. We then proceed on a straight line westwards, on the north side of the Buheea and south of Bhojpoor, approaching the Ganges near Buxar.

The soil of the whole of this part is the ordinary alluvial clay, well adapted for brick and ballast burning in most places; but little kunker limestone is met with. The whole country is almost a dead level, and in a state of high cultivation.

29. From the River Soane to Buxar, the distance is 51 miles, and in that distance bridges will be wanted for the river near Arrah, for the Bunnas Nullah, for the Ganges Nullah, the Kao Nullah, and Bhynsae; none of these will be formidable works; their beds are almost dry during half the year.

30. At Buxar is a part of the large establishment for the breeding of cavalry and other horses, kept up by the Government of India; otherwise, it is not a place of much importance; it is, however, well situated on the banks of the Ganges, and opposite the old fort there is deep water; and an excellent landing-place for steamers and native craft could be established here with advantage. Part of the stud of horses is on the north and part on the south side of the Ganges.

31. A station

31. A station should be built at Buxar. The line now bends to the left, keeping a short distance from the Ganges, crosses the Thora Nuddy, passes the large native village of Chowsa, and on to the crossing of the River Khurramnassa.

32 The bridge over the Khurramnassa will be a heavy and expensive work; the channel is about 600 feet wide, and about 47 feet in depth; the rise and fall of the flood-waters is great: the soil seems stiff clay. I have estimated this bridge to be built with cast-iron cylinders, and a light iron superstructure, but until careful borings are taken, and other investigations made, the propriety of this or any other design is not to be decided.

33 On leaving the Kurrumnassa, the line now goes westward, keeping in the highest ground between the Kurrumnassa and the Ganges, it then approaches a bend of the Ganges near Lumaneeah, and afterwards proceeds nearly straight to Raj Ghaut, opposite the city of Benares, where a station may conveniently be built.

34. No heavy works will be wanted between the Kurrumnassa and Raj Ghaut; the country is almost a dead level, and the bridges and culverts are under the average.

The distance from Buxar to Benares is six and a half miles.

35. Leaving Raj Ghaut the country is occasionally flooded, but not every year. The line then passes Ramnuggur, a large village of some pretensions, with a Rajah, a palace, and a good bazar.

36. About 15 miles from Benares is the first crossing of the River Jurgoo, and the second is at 19 miles; both these will require large bridges. We now reach Chunar, where a good station should be built. The sandstone hills in this neighbourhood an inexhaustible supply of the finest building stone.

37. For a distance of 11 miles west of Chunar, the surface of the country is in general rough, and broken up into small ravines and gullies, cut by the rain-water. Many bridges will be required, about 24 in number, but none are of any magnitude, except that over the Belwun, which has been estimated in a similar manner to the Poonpoon and others already described.

38. At Poonah Hill, a cutting of about two miles in length, through sandstone, will be necessary; the sandstone seems easily worked, and is a good building material.

39. From the above to Mirzapore, nine miles, the country is level, and the works light, with the exception of one bridge, 198 feet long, over the Khujeree Nuddy.

40. The best site for the station at Mirzapore formed the subject of discussion with the authorities there, and with some of the principal merchants; the site near the hospital at the crossing of the great Jubbulpore road seems to possess the greatest advantages.

Mirzapore being the chief commercial city of these Provinces, a large amount of station buildings will be required, and branch lines to the river; it is probable also that this will be found to be the best place for locomotive sheds, workshops and repairing shops, as here skilled native workmen can be found, and many other facilities exist.

Mirzapore is 576 miles from Howrah by the line of railway.

41. From Mirzapore to Allahabad the distance is 52 miles.

The average cost of the works will be low; but several expensive parts occur, such as the bridge over the Ojhla, the Kurrowtee bridge, the embankment across a swamp west of the Kurrowtee, and the great bridge over the River Touse.

42. I have not gone into an estimate of a bridge over the Jumna, for the same reason which I have explained with reference to the River Soane.

43. A temporary station should be placed on the east bank of the river opposite Allahabad, and the traffic carried on, as at present, by the bridge of boats, this station would be 628 miles from Howrah.

44. An alternative line of railway was pointed out by Mr. Oldham in his Geological Report on the coal-producing districts of Damoodah and Bheerbhoom. Of this line I have made a careful examination; and trial sections have been taken, connecting it with the sections of the other lines.

I was requested to report on Mr. Oldham's suggestions, and made my comments thereon in a letter to Major Baker, dated the 18th August 1852, and it may not be necessary to repeat these remarks here.

The trial section accompanies this paper; it will be seen that the gradients are unfavourable; but there is nothing insuperable, or even of much difficulty, in the line, except at one place, a few miles north of Chuckai, where the line must traverse a broken country, intersected by deep ravines, the sides of which are covered with jungle, and the rocks of the hard gneiss formation, intersected by masses of whinstone and quartz.

A road passes through it circuitously at a place called Betteah Ghat, a little to the east of the gorge through which the River Burnur discharges itself.

The part so described is eight miles broad, and the descent is so rapid, that no better gradient can be obtained than one in 58 for four miles, and not without deep cuttings through these rocky hills; the only alternative is a tunnel, which in such a place should not, I think, be entertained.

On account of the above objections, I have not considered it necessary to make any estimate of this line.

45. I have also made an examination of another alternative line, diverging near Sooree, and following the valley of the River More, proceeding by Nori Haut, nearly straight to Bhaugulpore.

This one suggested itself to me when examining the country near Sooree.

A trial section is annexed, and an estimate of the works.

46. The country traversed by it for the greater part of the way is of a jungly and wild description, and we cannot expect much, if any accession of traffic after leaving Sooree, until we reach Bhaugulpore, a distance of 110 miles.

47. The gradients are, 1 in 1,000, 1 in 700, and 1 in 450; and on the north side of the summit a gradient of 1 in 300 for 14½ miles; anything better than these need not be anticipated.

48. For a considerable length the railway must be made through the prevailing gneiss rocks, the excavations in and through which will occupy time.

To counterbalance which, however, an ample supply of ballast will be met with.

49. I consider it to be my duty to lay before you the engineering facts and peculiarities of these routes; there are no very important difficulties in either, that is, between Sooree and Rajmahal, and between Sooree and Bhaugulpore direct.

50. It will be for you to decide the question whether the commercial advantages of the Rajmahal line traversing a more fertile and populous country, confessedly at present without means of transport for its valuable products, gaining whatever goods traffic may accrue by opening up the country between the River More and Rajmahal, carrying passengers so far as Rajmahal on their way to Darjeeling, and other parts, and gaining the competition with the uncertain Ganges and Bhaugrutty, for the rich traffic of Purneah, should not decide you to adhere to the route *viâ* Rajmahal.

I may also call your attention to the fact, which should have been stated in the engineering part of the question, that it will be seen, by inspection of the sections, that the summit near Nori Hat on the More line is 447 feet above the summit by the other line; so that all commodities destined for the Calcutta market must be taken up to that extra height—an important point as regards locomotive power, and an offset against the additional 25 miles of the Rajmahal route.

51. Under these circumstances, and having been informed that the extension to Rajmahal has received sanction, and that capital is ready to execute it, I shall, unless countermanded, make such arrangements as are in my power to prosecute the works to that place as speedily as possible.

52. With this view, I have indented for two more assistant engineers, who should be sent out as soon as possible, to take the field immediately after the rainy season, now approaching.

I shall also require two more European inspectors skilled in brickwork.

53. In conclusion, I would respectfully call your attention to the importance of proceeding simultaneously with all the works enumerated in this report. The general establishment would not thereby be greatly increased; but, as regards the final completion of the whole, the advantages are incalculable.

54. For example, in all heavy embankment across inundated lands, the banks should be thrown up at once, leaving gaps equal to the openings of the bridges. This would enable us to decide the difficult question as to the right area for the passage of the floods, by watching the effects of the first year's inundation, and might, on the one hand, save much expenditure in superfluous flood-openings, and, on the other hand, might prevent serious disasters, by constructing too few of them.

55. Secondly, in those places where large rivers must be crossed, such as the Hulohur, Poonpoon, the River Khurumnassa, and the River Touse, and whose bridges would occupy a much greater time in construction than other parts of the works, a commencement cannot be made too soon.

56. I recapitulate the estimates in the Table as follows, adding the electric telegraph, necessary for the safe working of a single line.

	Distance.	Co.'s Rs		
	M.	a.	p.	
1st. Works in hand from Howrah to Raneegunge -	121	83,04,087	13	5
2d. Works sanctioned from near Burdwan to Rajmahal	121½	1,01,57,809	12	-
3d. Works proposed from Rajmahal to Allahabad -	439	3,80,95,365	10	2
4th. Works at the crossing of the River Soane - - -	-	4,50,000	-	-
5th. Electric Telegraph, 782 miles, at per mile, 100 l. - - -	-	7,82,000	-	-
	Co.'s Rs.	5,82,89,263	3	7

I have, &c.
(signed) Geo. Turnbull.

(True copies.)
(signed) R. Macdonald Stephenson,
Managing Director and Agent.

A.
EAST INDIAN RAILWAY.

SUMMARY OF ESTIMATES.

—	DESCRIPTION.	TOTAL COST.		COST PER MILE.	
		Co.'s Rs.	a. p.	Co.'s Rs.	a. p.
121	WORKS now in Progress: Miles from Howrah to Raneegunge, including Howrah and other stations -	88,04,087	13 5	72,761	- -
45	EXTENSION to RAJMAHAL: For a single Line of Railway: Miles from near Burdwan, to the River More - - - - -	35,33,540	- -	78,523	- -
76½	Miles from the River More to Rajmahal -	66,24,269	12 -	86,507	- -
242½	Miles. Co.'s Rs.	1,89,61,897	0 5	78,112	- -

19 March 1853.

(signed) Geo. Turnbull.

B.
EAST INDIAN RAILWAY.

SUMMARY OF ESTIMATES.

MILES.	DESCRIPTION.	TOTAL COST.			COST PER MILE.		
	EXTENSION from RAJMAHAL to ALLAHABAD, for a single Line of Railway:	<i>Co.'s Rs.</i>	<i>a.</i>	<i>p.</i>	<i>Co.'s Rs.</i>	<i>a.</i>	<i>p.</i>
77	Rajmahal to Bhaugulpore - - -	60,55,131	-	-	78,638	-	-
157½	Bhaugulpore to the Soane - - -	1,38,76,873	-	-	88,294	-	-
112¾	River Soane to Benares - - -	96,03,216	10	2	85,172	-	-
92	Benares, <i>viâ</i> Mirzapore to Allahabad -	85,60,145	-	-	93,045	-	-
489	Miles. <i>Co.'s Rs.</i>	3,80,95,365	10	2	86,777	-	-

19 March 1853.

(signed)

Geo. Turnbull.

C.

MEMORANDUM of Estimate of the Line by the Valley of the River More.

MILES.	DESCRIPTION.	TOTAL COST.		
118½	Miles from the junction near Sooree, by Noni Hât to Bhaugulpore - - - - - Of, per mile, Rs. 79,634.	<i>Co.'s Rs.</i>	<i>a.</i>	<i>p.</i>
		94,56,518	-	-
	COMPARISON of the MORE VALLEY Route with that by RAJMAHAL:			
67	Miles from the River More to near Oodwa Nullah - -	57,74,060	-	-
77	Miles from ditto to Bhaugulpore - - - - -	60,55,131	-	-
144	Miles.	1,18,29,191	-	-
118½	Miles as above - - - - -	94,56,518	-	-
25½	Miles difference <i>Co.'s Rs.</i>	23,72,673	-	-

19 March 1853.

(signed)

Geo. Turnbull.

D.

MEMORANDUM as to the River Soane.

If, as I suppose, a "break" in the line should be made at the River Soane, until the increase of traffic may render the construction of a bridge advisable, it will be necessary to provide two stations, one on each side of the river, with engine-sheds, carriage-sheds, large 42 feet turntables, for reversing the engines and tenders, and other accommodations peculiar to a terminus of a long line of railway.

I assume each of these stations to cost 1,50,000 rupees: for two stations at the Soane - - - - - *Co.'s Rs.* 3,00,000
Ferry-boats, landing-piers, wood platforms on the land, and other arrangements for facilitating the traffic across the river, say - - - - - 1,50,000

Co.'s Rs. 4,50,000

19 March 1853.

(signed)

Geo. Turnbull.

NOTE E.

The aggregate number of miles which have been examined, and of which the trial sections have been taken this last cold season, including November, December, January and February, amounts to 818.

To do this, six working parties of engineers were employed, which gives an average of 156 miles to each party.

The parties so employed were Messrs. Vigors and Denham, between Rajmahal and Monghyr.

Messrs. King and Fox between Monghyr and the River Soane.

Mr. Claxton from the River Soane to Benares; Mr. Lancey, from Benares to Allahabad; Messrs. Perry and Bourne from Absensole by Chuckai, near the Ganges.

Messrs. G. and H. Smith on the More Valley Line.

19 March 1853.

(signed) *Geo. Turnbull.*

EAST INDIAN RAILWAY.

MORE VALLEY LINE.

ESTIMATE of Cost of Works on a Line of Railway commencing at a Point on the Rajmahal Line near Sooree, following the Valley of the River More by None Hât, and terminating at Baugulpore, being a Length of 118½ Miles.

			<i>Co's Rs. a. p.</i>
Earthwork	250,000,000 cube feet of clay, at per 1,000 cube feet	3/8	8,75,000 - -
	126,651,353 cube feet of rock, at per 1,000 cube feet	8/	10,13,210 13 2
Brickwork	3,656,750 cube feet, at per 100 cube feet	22/	8,04,485 - -
	Superstructures of 20 openings, of 80 feet each, for the Sedh and other Nuddies, each	12,000	2,40,000 - -
Ballast	14,256,000 cube feet natural ballast in main line, at per 100 cube feet	4/	5,70,240 - -
	4,714,400 cube feet burnt clay, for main line, at per 100 cube feet	.	
	1,425,600 cube feet natural ballast in sidings and stations, at per 100 cube feet	4/	57,024 - -
	471,440 cube feet burnt ballast in sidings and stations, at per 100 cube feet	6/	28,286 6 4
Permanent way materials	130½ miles of permanent way, being 10 miles per cent. added for sidings and stations, at per mile, Co.'s Rs. 26,67,000	- -	34,80,435 - -
	130½ miles, at per mile 5,280 rupees	- -	6,89,040 - -
Laying permanent way Turntables, &c	Turntables, water-cranes, switches, crossings, &c., on	- -	1,18,750 - -
	118½ miles, at per mile 1,000 rupees	- -	
Fencing	118½ miles fencing, at per mile 2,000 rupees	- -	2,37,500 - -
Stations	Sooree Roomrabad, None Hât, Dauka, and others, say	- -	2,00,000 - -
			85,96,835 3 6
Add for Contingencies, 10 per cent			8,59,683 8 4
TOTAL for 118½ miles - - <i>Co.'s Rs.</i>			94,56,518 11 10

Or per mile, Co.'s Rs. 79,634.

19 March 1853.

(signed) *Geo Turnbull.*

SUMMARY OF ESTIMATES.

Miles.		TOTAL COST.		Average Rate per Mile.	
		<i>Rs.</i>	<i>a. p.</i>	<i>Rs.</i>	<i>a. p.</i>
	WORKS NOW IN PROGRESS :				
121	Miles from Howrah to Raneegunge, including Howrah and other stations - - -	88,04,087	13 5	72,761	- -
	EXTENSION TO RAJMAHAL for a single Line of Railway :				
45	From near Burdwan to the River More -	35,33,540	- -	78,523	- -
76½	From the River More to Rajmahal - -	66,24,260	12 -	86,308	- -
242½		<i>Rs.</i>	1,89,61,809 9 5	78,112	- -

19 March 1853.

(signed) *Geo Turnbull.*

EXTENSION FROM RAJMAHAL TO ALLAHABAD for a Single Line of Railway.

Miles.		TOTAL COST.		Average Rate per Mile.	
		<i>Rs.</i>	<i>a. p.</i>	<i>Rs.</i>	<i>a. p.</i>
77	Rajmahal to Bhaugulpore - - - -	60,55,131	- -	78,638	- -
157½	Bhaugulpore to the Soane - - - -	1,38,76,873	- -	88,294	- -
112½	River Soane to Benares - - - -	96,03,216	- -	85,172	- -
92	Benares <i>via</i> Mirzapore to Allahabad - -	85,60,145	- -	93,045	- -
439		<i>Rs.</i>	3,80,95,365 - -	86,777	- -

19 March 1853.

(signed) *Geo. Turnbull.*

MEMORANDUM of Estimate of the Line by the VALLEY of the RIVER MORE.

		TOTAL COST.	
		<i>Rs.</i>	<i>a. p.</i>
118½	Miles from the junction near None by None Hât, and to Bhaugulpore, at rupees - - Or per mile, 79,634 rupees.	94,56,518	- -
	COMPARISON of the MORE VALLEY Route with that by RAJMAHAL :		
67	Miles from River More to near Oodwa Nullah	57,74,060	- -
77	Miles from River More to Bhaugulpore -	60,55,131	- -
144	Miles - - - - -	1,18,29,191	- -
118½	Miles - - - - -	94,56,518	- -
25½	Miles difference - - - - - <i>Rs.</i>	23,72,673	- -

19 March 1853.

Geo. Turnbull.

(True copies).

(signed) *R. Macdonald Stephenson,*
Managing Director and Agent.

EAST INDIAN RAILWAY

ESTIMATE of Cost of Works in that Part of the Line commencing near Oodwa Nullah, Rajmahal, and proceeding along the South Shore of the River Ganges, by Sikragully and Calgong, and terminating at Baughpore, a Distance of 77 Miles, 15th March 1853.

		Rate.				
		Rs.	Rs	a.	p.	
Earthwork	-	36,225,490 cube feet in cuttings in clay, at per 1,000 cube feet	3/8	1,26,789	4	-
	-	14,370,720 cube feet in rock, at per 1,000 cube feet	3/8	1,14,965	12	-
	-	123,370,810 cube feet in embankment, at per 1,000 cube feet	3/8	4,31,797	13	-
	-	8,167,488 cube feet in sidings, at per 1,000 cube feet	3/8	28,586	3	-
	-	8,000,000 cube feet in road approaches and level crossings, at per 1,000 cube feet	3/8	28,000	-	-
Brickwork	-	4,217,300 cube feet brickwork, at per 100 cube feet	20/	8,43,460	-	-
Ballast	-	12,196,800 cube feet for 77 miles.				
	-	609,840 cube feet, 5 per cent for sidings.				
	-	12,806,640 cube feet, say one-half natural ballast and half burnt clay.				
	-	6,403,320 cube feet burnt clay, at per 100 cube feet	6/	3,84,199	-	-
		6,403,320 cube feet natural ballast	4/	2,56,132	-	-
<i>Memo — ESTIMATE of One Mile of Permanent Way :</i>						
			Rs.	a.	p.	
		1,760 sleepers, at per each 3/	-	5,280	-	
		3,520 chains, 35 tons, at per ton 80/	-	2,800	-	
		8½ tons of fishing plates, screws, bolts, nuts, at per ton 150/	-	1,275	-	
		129 tons of rails, assumed price :	£.	s	d.	
		Shipping in England, per ton	-	10	-	
		Freight to Calcutta	-	2	-	
		Carriage to the works	-	1	-	
		<i>Co.'s Rs. 130</i>	£. 13	-	- = 16,770	
		3,520 keys, at per 1,000 <i>Co.'s Rs. 55/</i>	-	193	-	
		7,040 trenails at per 1,000 - 50/	-	352	-	
		Per Mile	-	26,670	-	
Permanent way	-	77 miles. 7 miles added for stations and sidings.				
		84 miles permanent way, at per mile <i>Rs. 26,670</i>	-	22,40,280	-	
Laying permanent way	-	84 miles, at per mile <i>Rs. 5,280</i>	-	4,43,520	-	
Gates at level crossings	-	120 gates, at per each	50/	6,000	-	
Fencing	-	25,000 linear feet, at level crossings	70/	17,500	-	
Road metal	-	200,000 cube feet at level crossings and road approaches, at per 100 cube feet	4/	8,000	-	
Fencing	-	77 miles fencing, at per mile, <i>Rs. 2,000</i>	-	1,54,000	-	
Road-side stations	-	Assume the same proportion as on the Sooree district.				
		77 miles, at per mile <i>Co.'s Rs. 1,655</i>	-	1,27,435	-	
Baughpore station	-	Similar to that at Rajmahal	-	1,50,000	-	
Turntables, &c.	-	Turntables, water-cranes, switches, crossings, &c., assume same proportion as on the Sooree district.				
		77 miles, at per mile <i>Rs. 1,000</i>	-	77,000	-	
Bridges	-	Add iron superstructure for one bridge of 5 openings, at 80 feet each, over the Geroah Nuddy, at <i>Rs. 11,000</i> each	-	55,000	-	
		Add pumping water and getting in foundation of iron bridges, each at <i>Co.'s Rs. 3,000</i>	-	12,000	-	
Contingencies	-	Add 10 per cent. for contingencies	-	55,04,665	-	
			-	5,50,466	-	
		TOTAL for 77 Miles	<i>Co.'s Rs.</i>	60,55,131	-	
		Or per mile, <i>Rs. 78,638.</i>				

19 March 1853.

(signed) Geo. Turnbull.

ESTIMATE of Cost of Works from Bauglepore, by Moonghyr, Barr and Patna, to the East Bank of the River Soane, being a Distance of 1,576 Miles.

		Rate.	Rs.	a.	p.
Earthwork	380,000,000 cube feet in embankments and cuttings, including sidings, &c., at per 1,000 cube feet	3/8	13,30,000	-	-
Road approaches	17,000,000 cube feet in banks, at per 1,000 cube feet	3/8	59,500	-	-
Brickwork	10,432,566 cube feet of brickwork, at per 1,000 cube feet	20/	20,86,513	-	-
Ballast for 157½ miles	24,895,200 cube feet ballast, burnt clay. 1,244,756 cube feet, 5 per cent. add for sidings. 26,139,956 cube feet, at per 100 cube feet	8/	20,91,196	-	-
<i>Memo.—ESTIMATE of One Mile of Permanent Way:</i>					
			Rs.	a.	p.
	1,760 sleepers, at each 3/		5,280	-	-
	3,520 chains, 35 tons, at per ton 80/		2,800	-	-
	8½ tons fishing plates, screws, bolts, nuts, &c. at 150/		1,275	-	-
	129 tons of rails, assumed price :				
	Shipped in England		£. 10	-	-
	Freight to Calcutta		2	-	-
	Carriage from Calcutta to works		1	-	-

	Co.'s Rs. 130		£. 13	-	-

	3,520 keys, at per 1,000 55/		193	-	-
	7,040 trenails, at per 1,000 50/		352	-	-

Permanent way	157½ miles 14½ miles add for stations and sidings.		26,670	-	-
	172 miles, at per mile Rs. 26,670		45,87,240	-	-
Laying permanent way	172 miles, laying permanent way, at per mile 5,280		9,08,160	-	-
Gates at level crossings	200 gates, at per each	50/	10,000	-	-
Fencing at ditto	42,000 linear feet fencing, at per 100 feet	70/	29,400	-	-
Road metal at levelling crossings.	333,000 cube feet, at road approaches, at per 100 cube feet	6/.	19,980	-	-
Fencing	157½ miles fencing, at per mile Rs. 2,000		3,14,333	-	-
Road-side stations	Assume the same proportion as Sooree district. 157½ miles, at per mile Rs. 1,655		2,60,111	-	-
Moonghyr station	Similar to Bhauglepoor		1,50,000	-	-
Patna station			2,50,000	-	-
Turntables, &c.	Turntables, water-cranes, switches, crossings, &c., same proportion as on the Sooree district. 157½ miles, at per mile Rs 1,000		1,57,166	-	-
Iron work in bridges	Iron work in bridge over Kulloohurnuddee. <i>Note.—Cast-iron cylinders, 9 feet diameter, 1 inch thick, weigh 9½ cwt per foot; flanges 9 cwt. each; cylinders cast in lengths of 9 feet.</i> 14 columns, 66 feet each, 840 × 10½ cwt., 441 tons, cast in London Freight to Calcutta Insurance, 5 per cent. Unloading at Calcutta, and loading in boats, and discharging at Nuddy Fixing in place of sinking				
			£. 16	-	-
	441 tons, at per ton Co.'s Rs. 160/		70,560	-	-
	In 84 joints of pipe, each 2 cwt. 168 cwt. of wrought iron, in screw-bolts and nuts, for flanges, at per cwt.	10/	1,680	-	-
	Iron superstructure as before, 7 openings at Rs. 11,000 each		77,000	-	-
	<i>Note.—The estimate of Hulloohur Nuddy Bridge, 600 feet long, Rs. 1,49,240, estimate per linear foot, say Rs. 250.</i>				
	IRON WORK IN KIEMT NULLAH :				
	500 feet long, at per linear foot Rs. 250		1,25,000	-	-
	IRON WORK IN POONPOON NUDDY :				
	350 feet long, at per linear foot Rs. 250		87,500	-	-
	Add contingencies, 10 per cent.		1,26,15,339	-	-
			12,61,534	-	-

	TOTAL for 157½ Miles	Co.'s Rs.	1,38,76,873	-	-
	Or per mile, Co.'s Rs. 88,294.				

EAST INDIAN RAILWAY.

ESTIMATE of the WORKS on that Part of the Line commencing on the Left or West Bank of the River Soane, proceeding by Arrah Buxar, and terminating at Raj Ghaut, opposite Benares, being a Distance of 112½ Miles.

		Rs.	Rs	a	p
Earthwork	- - 281,256,700 cube feet earthwork in cuttings and embankments, at per 1,000 cube feet	3/8	9,84,398	7	1
Brickwork	- - 7,441,500 cube feet brickwork in bridges and culverts, &c., at per 100 cube feet	20/	14,88,300	-	-
Ballast	- - 19,819,800 cube feet burnt clay, including sidings, at per 100 cube feet	7/	13,87,386	-	-
Laying permanent way	123 miles of permanent way, at per mile	5,280	6,49,440	-	-
Permanent way materials	123 miles, at per mile 28,507½ rupees	-	35,06,422	8	-
Fencings	- - 112½ miles of fencing, at per mile 2,000 rupees	-	2,25,500	-	-
Gates at level crossing	250 gates, each at	60/	15,000	-	-
		Rs.			
	Arrat	- - - - -	40,000		
	Beheca platform	- - - - -	2,000		
	Bhogpore platform	- - - - -	20,000		
	Buxar	- - - - -	40,000		
	Chowsa and wharf	- - - - -	20,000		
	Teemeneah	- - - - -	16,000		
	Seekuldeah	- - - - -	16,000		
		- - - - -	1,36,000	-	-
	Add for sundry small road stations, say 15, at 1,000 rupees each	- - - - -	15,000	-	-
Turntables, water-cranes	Switches, &c, for 112½ miles, at per mile 1,000 rupees	- - - - -	1,12,750	-	-
Bridge over the River Kurrumnassa.	Similar to those over the Hullokur Keeul Rivers, 600 feet, at per foot 350 rupees	- - - - -	2,10,000	-	-
			87,30,196	15	1
	Add 10 per cent. for contingencies for 112½ Miles	- - - - -	8,73,019	11	1
			96,03,216	10	2
		TOTAL for 112½ miles	- - -	Co.'s Rs.	
		Or per mile	85,172	Co.'s Rs.	

Note—If, as I propose, a break in the line should be made at the River Soane until the increase of traffic may render the construction of a bridge advisable, it will be necessary to provide two stations, one on each side of the river, with engine-sheds, carriage-sheds, large 42 feet turntables for reversing the engines and tenders, and other accommodations peculiar to a terminus of a long line of railway, I assume each of these stations to cost 1,50,000 rupees.

	Rs.	s.	d
For two stations at the Soane	3,00,000	-	-
Terry-boats, landing-piers, wood platform on the sand, and other arrangements for facilitating the traffic across the River Say	1,50,000	-	-
	Co.'s Rs.	4,50,000	- -

19 March 1853.

Geo. Turnbull

ESTIMATE of the WORKS from Raj Ghat, opposite Benares, by Mirzapore, to the Right Bank of the River Jumna, at Allahabad, being a Distance of 92 Miles.

		Rs.	Rs.	Rs.	a.	p.	
Earthwork - - -	10,900,000 cube feet rock cutting, at per 1,000 cube feet 10/	-	-	1,09,000	-	-	
	5,500,000, cube feet earth cutting, at per cube foot 4/	-	-	22,000	-	-	
	118,000,000 cube feet embankment, at per cube foot 4/4	-	-	4,72,000	-	-	
				6,03,000	-	-	
Brickwork - - -	5,060,000 cube feet brickwork, at per 100 cube feet -	-	22/	11,13,200	-	-	
Ballast - - -	2,787,840 cube feet, in 10 miles, of natural ballast, at per 100, 4/-	-	-	1,11,512	-	-	
	13,242,240 cube feet, in burnt clay, 6/	-	-	7,94,532	-	-	
				9,06,044	-	-	
Permanent way materials.	1,760 sleepers, each 3/	-	-	5,280	-	-	
	3,520 chains, 35 tons, at per ton 80/	-	-	2,800	-	-	
	82 tons of fishes, at per ton 150/	-	-	1,275	-	-	
	129 tons of rails, assumed price						
		£	s	d			
	Shipped in London	-	-	10	-	-	
	Freight to Calcutta	-	-	2	-	-	
	Carriage	-	-	1	-	-	
		£.	13	-	-		
		or Rs. 130	Rs	16,770	-	-	
	3,520 keys, at per 1,000, 55/2	-	-	193	-	-	
	7,040 trenails, at per 1,000, 50/	-	-	352	-	-	
	Extra freight on 175 tons, at per ton, 10/8	-	-	1,837	8	-	
				28,507	-	-	
	92 miles.						
	8 add for station and sidings.						
	100 miles, at per Co.'s Rs. 28,507/8	-	-	Rs. 28,50,750			
	Laying Permanent Way.						
	100 miles, at per mile, 5,280 rupees	-	-	5,28,000			
					33,78,750	-	
Fencing gates at level	92 miles fencing, at per mile, 2,000 rupees	-	-	-	1,84,000	-	
Crossing stations -	140 gates, at per gate	-	-	-	8,400	-	
	Raj Ghat (Benares)	-	-	Rs. 50,000	-	-	
	Ramnaggur	-	-	20,000	-	-	
	Clumar	-	-	40,000	-	-	
	Mirzapore, a large station with engine-sheds and workshops, as at Howrah	-	-	3,00,000	-	-	
	Two small road-side stations	-	-	30,000	-	-	
	Sirsa	-	-	20,000	-	-	
Opposite Allahabad	-	-	50,000	-	-		
					5,10,000	-	
Turntables, water cranes	Switches, crossings, &c.						
	92 miles, at per mile 1,000 rupees	-	-	-	92,000	-	
Bridge over the Tons -	Wrought-iron Superstructure, part on Cast iron Cylinders and Part on Brick Piers						
	12 wrought-iron girders, each 11,000 rupees	-	-	Rs. 1,32,000			
	7 cast iron piers, containing 198 cylinders, weighing 935 tons, at per ton 160	-	-	1,49,600			
	396 cwt wrought-iron screws, &c, in ditto, per cwt 10/	-	-	3,960			
	Extra freight on 955, say	-	-	10,000			
						2,95,560	-
Brickwork - - -	76,800 cube feet of brickwork on piers, at per 100	-	22/	16,896	-	-	
	130,000 cube feet in arching for flood-opening, at per	-	22/	28,600	-	-	
Bridge over the Kur- nowlee.	Similar to the above, 800, at per foot	-	250/	2,00,000	-	-	
Bridge over the Bel- wan River.	Similar to the above., 858 feet, at	-	250/	2,14,500	-	-	
					77,81,950	-	
	Add 10 per cent. for contingencies	-	-	-	7,78,195	-	
	TOTAL for 92 Miles	-	-	Co's Rs.	85,60,145	-	

From Messrs. *Hodgson, Concanen & Noyes* to the Most Noble the Marquis of *Dalhousie*, К. Т., Governor-General of India, in Council, Calcutta

5, Lincoln's-Inn Fields,
24 December 1852.

My Lord,

REFERRING to the statements which we had the honour of placing before the Governor-general of India in Council in the year 1845, on behalf of, and as the solicitors for, the Great North of India Railway Company, we have the honour to state, that the Upper India Railway is formed for the purpose of carrying out the objects of the Great North of India Railway Company, and is in part a substitution for that Company.

Understanding that the subject of railways in Upper India has been referred to your Lordship in Council by the Honourable the Board of Directors of the East India Company, we have, on behalf of the Upper India Railway, respectfully to beg of your Lordship in Council to give us an opportunity of stating the Company's case, before your Lordship in Council gives a decision on this most important subject.

We should add, that the Company has the active co-operation and support of Sir Herbert Maddock, late Deputy Governor of Bengal, and other eminent persons connected with India

We have, &c
(signed) *Hodgson, Concanen & Noyes.*

From *J. N. Campbell*, Esq., Chairman, to the Most Noble the Marquis of *Dalhousie*, К Т, Governor-General of India, in Council.

Upper India Railway Company, 2, Moorgate-street,
London, 8 January 1853.

My Lord,

BY the last mail, Messrs Hodgson, Concanen & Noyes, solicitors to this Company, had the honour of calling your Lordship's attention to the correspondence which they had conducted with the Government of India on behalf of the Great North of India Railway Company, so far back as the year 1845, and to the fact, that the Upper India Railway Company was founded for the purpose of carrying out the objects of the Great North of India Railway Company, and was, in fact, a substitution for that Company.

I have now, as the chairman of the Upper India Railway Company, to submit with every deference to the consideration of your Lordship in Council the following circumstances :

1st. That the line from Allahabad to Delhi was originally projected and brought before the authorities and the public by the Great North of India Railway Company ; and that a memorial to this effect, founded on acknowledged facts and authentic documents, is now in course of preparation by Mr Harry Borradaile, late chairman of that Company, for transmission to your Lordship in Council.

2d That the Upper India Railway Company has received the support of the public in this country, and the active and cordial co-operation of many persons of influence connected with India.

3d. That the 3,000,000 of capital set apart for this country has been taken up by a highly respectable proprietary, who would have readily subscribed for a still larger amount ; and that measures will be taken to have that portion of the capital reserved for India appropriated with as little delay as possible

4th That on the 25th of November last the following proposal was made to the Honourable East India Company, in a letter addressed to Mr. Secretary Melvill, by the managing Director, on behalf of the Upper India Railway Company ; viz.

“ To undertake the construction of its proposed railway on terms more moderate than those hitherto granted to any of the other three Companies to which the Honourable Court have extended their sanction and support, and I am now further instructed to state, that this Company is prepared to raise capital to construct, to the satisfaction of the Honourable Court, the section from Allahabad to Cawnpore, or, at the option of the Honourable Court, to carry the line on to Agra and Delhi, commencing operations simultaneously on as many points of the route as the Court may judge expedient, the Railway Company being bound to complete the line or sections agreed upon by a specified time, and for a specified sum.”

I beg to call your Lordship's attention to the enclosed list of Directors and officers of the Company.

I have, &c.
(signed) *J. N. Campbell,*
Chairman.

The MEMORIAL of *Harry Borradaile*, late a Member of the Bombay Civil Service, to the Most Noble the Marquis of *Dalhousie*, K.T., Governor-General of India, in Council,

Respectfully sheweth,

THAT your memorialist, whilst a member of the said service, was deputed on special duty to Bengal, once as member of the Customs and Post-office Committee for all India, and again as member of the Indian Law Commission, and whilst so employed resided in Calcutta for a period of eight years and a half, and during that time had a favourable opportunity of making himself acquainted with the wants and resources of the Upper and Lower Provinces of Bengal.

That after your memorialist returned to England, the attention of the English public began to be turned towards the improvement of communication in India by the formation of railways in that country, and a Company was formed for the construction of a railway from Calcutta to Mirzapore, called "The East India Railway Company."

That about three months after that Company had issued its prospectus, another Company was established for the construction of a railway from Allahabad (where the river steam navigation ceases) to Delhi, under the title of "The Great North of India Railway Company," and of this Company your memorialist became a director, and subsequently chairman of the board of directors.

That sometime after the prospectus of the Great North of India Railway Company was issued, the East India Railway Company issued a new prospectus, taking up the line advocated by the Great North of India Railway Company, and asking their proprietary to raise the capital from four millions to ten millions, thus clearly showing that the line from Allahabad to Delhi, originally selected and brought before the public by the Great North of India Railway Company, had never been contemplated as part of the scheme of the East India Railway Company.

That, prior to any steps being taken by the projectors of the Great North of India Railway Company, they ascertained that no pledge whatever had been given or promise held out by the Honourable the East India Company to any company regarding the country proposed to be traversed by their projected railway, which fact was afterwards confirmed by official communications to your memorialist and his co-directors.

That the Great North of India Railway Company was repeatedly recognised by the Honourable the Court of Directors of the East India Company and the Government of India, and its managing committee was invited by the latter authority, on the 6th April 1846, to forward to the Home Department the draft of the provisions for a law for its incorporation.

That ultimately, from several causes, unnecessary to detail, but which were then principally produced by the unfavourable state of the money market in England, the Great North of India Railway was not further proceeded with, under the belief that more favourable circumstances might thereafter arise, and it was accordingly allowed to remain in abeyance.

That it was thus left apparently open to the East India Railway Company to obtain powers to construct the line of railway so projected by the Great North of India Railway Company; but the directors thereof found themselves unable to raise the requisite capital, or to conclude a contract with the East India Company for the construction of the said line.

That such failure of the East India Railway Company to effect anything for the good of Upper India, led again to the formation of a Company for constructing a railway from Allahabad to Delhi, and therefore under a new name the Great North of India Railway Company was resuscitated, and the Board of Directors thereof has been joined by several of the directors of that Company, and a large number of the shareholders therein have become shareholders in such resuscitated Company, and its affairs are conducted under the legal advice of the solicitors of the Great North of India Company, who have already had the

the honour of communicating with your Lordship in Council on behalf of your memorialist, and the Company he now represents.

That the Great North of India Railway Company was a fully registered company, with a capital of 4,000,000*l.*, and the present Company having raised its capital to the same amount, steps have been taken to introduce a Bill to Parliament, and application has been made to the East India Company for a grant of a concession to enable the carrying out of its objects.

That the Upper India Railway Company, having had the whole of that portion of its capital set apart for England readily subscribed for by highly influential parties, is in a position to carry out the original plans of the Great North of India Railway Company, if a grant be given to it on such terms as the Government of India may recommend the Home authorities to accord

Your memorialist, and many others of the original shareholders of the Great North of India Railway Company, having merged their interests in the Upper India Railway Company, have resolved to come before your Lordship in Council, and to solicit your Lordship's favourable consideration, on account of their priority of claim for permission to form a line of railway from Allahabad to Delhi.

And your memorialist will ever pray, &c.

(signed) *H. Borradaile*, late Bengal C. S.,
Late Chairman of the

Upper India Railway Company, Great North of India Railway Company.
2, Moorgate-street, London,
24 January 1853.

No. 9.

From *J. P. Grant*, Esq., Secretary to the Government of India, to
Captain *T. E. Rogers*, Superintendent of Marine.

Sir,

Council Chamber, 12 April 1853.

I AM directed by the Governor-general in Council to transmit to you the accompanying copy of a despatch from the Honourable the Court of Directors in the Financial (Railway) Department, dated 16 February last, No. 3, and to request you will at your earliest convenience favour the Government with your opinion generally on the project therein disclosed.

Home Department
Railway

I have, &c.

(signed) *J. P. Grant*,
Secretary to the Government of India.

No. 1,861.

From Captain *T. E. Rogers*, Superintendent of Marine, to *J. P. Grant*, Esq.,
Secretary to the Government of India, Home Department.

Fort William, Marine Superintendent's Office,
23 April 1853.

Sir,

I HAVE the honour to acknowledge the receipt of your letter No. 9, of 12th instant, forwarding copy of a despatch from the Honourable the Court of Directors in the Financial (Railway) Department, dated 18 February last, No. 3, and requesting my opinion on the project therein disclosed.

2. The Honourable Court in the first para. of the despatch, adverting to the dangers that attend the navigation of the Hooghly between Calcutta and the river's mouth, suggest that these would, in a great measure, if not altogether, be avoided by connecting Diamond Harbour with Calcutta by a railway communication, and that such a work would in other respects be productive of much public benefit, and would materially promote the shipping and mercantile interests connected with this Presidency. It also appears to the Honourable Court that the establishment of docks at Diamond Harbour in connexion with the railway would be highly advantageous to the public.

3. With reference to the above, I beg to refer to the accompanying statement of total losses that have taken place between the outer floating light and Calcutta during the last 20 years of vessels entering and leaving the river, particularizing the place where each loss occurred: from this statement it will be seen, that the very great majority of losses, 42 out of 51, have taken place below

Diamond Harbour ; I must also remark, that all the losses that have taken place above Diamond Harbour, as well as below, with one exception, have been in cases when the vessels have been proceeding without steam, or having driven from their anchors when not in tow. There is but one instance on record of a ship grounding in tow of a steamer having been lost, that of the Brig "Queen," below Diamond Harbour ; and although seven ships have been lost on the James and Mary's and Fultah Sand (the only dangerous places above Diamond Harbour) within the last 20 years, the majority of these have been inferior ships. In fact, I believe that there is no instance of a really strong ship having been lost above Diamond Harbour. The Honourable Company's Steamer "Feroze" lay on the James and Mary's Sand for seven days, and was by the strength of the current driven through it into deep water, yet the hull of the vessel sustained no injury. The reason of the comparative safety of vessels that get on shore above Diamond Harbour is that the river being much more confined, there is no room for a swell to get up to cause the vessel to strain and make water.

4. The amount of registered tonnage arriving at and leaving Calcutta may be now taken at 4,000,000 tons each year, and it may be estimated that the ships land and take away 1,000,000 tons of cargo. A ship of 400 tons would therefore bring and take away 1,000 tons, which, if she is to remain at Diamond Harbour, must travel over to the rail : 1,000 rupees will on the average fully cover the expense of such a vessel for steam from Diamond Harbour to Calcutta and back. If therefore the rail can compete with the river in point of cheapness, goods must be conveyed to and from Calcutta at a cost not exceeding one rupee per ton. But if ships are to remain at Diamond Harbour and land their goods, then either docks or warehouses must be built, which would involve a further expense, as ships must either pay warehouse or dock line ; the uncertainty of the river would interfere with the lading of the trains direct from the ships in the river.

5. It must also be remembered, that the generality of commanders of smaller classes of vessels live on board, but must be daily in communication with their agents, whose offices are in Calcutta. As there must be on an average 1,850 tons of cargo down and 1,450 tons up every day in the year, exclusive of Sundays, even with a double rail, trains other than cargo trains could not run many times during the day, and thus commanders would lose the benefit of frequent communication with their agents and their ships, which they now enjoy.

6. Diamond Harbour has hitherto been considered no less healthy than Calcutta ; and, looking to all the drawbacks to remaining so far down the river, I believe that very few ships would stop there except it were made compulsory ; in fact, I think it may be doubtful if any thing would be added to the safety of vessels by their remaining at Diamond Harbour. If docks were constructed there, the risk would not be great, although it would occasionally happen that ships would arrive at a time of day that they could not enter the docks, and thus be obliged to remain out for the night ; and a southerly gale, which would not affect vessels at anchor at or near Calcutta, would wreck many riding at Diamond Harbour.

7. The idea has been started of a railroad from Calcutta to the Chilka Lake, below Pooree, and if the entrance to the lake could be deepened to 24 feet, which it is possible might be done by steam dredges, Calcutta might then have the benefit of the class of steamers of 6,000 tons, which it is said some parties are prepared to build. Chilka Lake itself is large enough to hold half the shipping in the world.

8. As long as the Hooghly is open, as at present, I do not think that the class of ships which now frequent the port would, after reaching Kedgerree, remain down the river, if they have the option of coming up. If, however, the Chilka Lake could be converted into a port connected with Calcutta by means of a railroad, ships of all classes would resort to it. Those approaching the head of the bay in the north-east monsoon would resort to it, because they would end their voyage a fortnight sooner than if they come on to Calcutta. In the south-west monsoon vessels would resort to the Chilka Lake Harbour, because they would on leaving that port be in a position to make a comparatively fair wind to any port to which they might be bound, and be at least one fortnight in advance of a ship leaving Calcutta at the same time.

I have, &c.
 (signed) T. E. Rogers,
 Superintendent of Marine.

STATEMENT of VESSELS Lost between the Outer Floating Light and *Calcutta* during the last Twenty Years

NAMES OF VESSELS.	COMMANDERS.	Tonnage.	When Lost.	WHERE LOST	PILOT
Ship Lord Amherst - -	J. Hicks - -	507	1833	Cowcolly - - - -	T M'Dormond.
" Brunswick - -	J. Palmer - -	389	"	New Anchorage - -	J. Sharling
" Duke of York - -	R. Locke - -	1,327	"	- - Hidgelee, blown on shore in a hurricane.	No Pilot
" Lord of the Isles - -	G. Higton - -	352	1834	Jellingham Sand - -	E Bartlett
" Ase, F. - -	E. Heselton - -	418	1835	Diamond Sand - -	No Pilot.
" Iuttle Main - -	Nacoda - -	"	"	Old Mud Point Channel - -	W. Birch
" Windsor - -	W Taylor - -	1,418	1836	Gasper Channel - -	J. Sharling
" Asia - -	D. Forge - -	418	"	Saugor Point - -	T. M'Dormond.
Brig Highland Chief - -	J. Canning - -	181	1837	Long Sand - -	J G Davidson
Ship Raj Ranees - -	J. H. Harding - -	340	1838	Eastern Reef - -	T. Ghur.
Barque Sir Herbert Taylor	W Poole - -	392	"	Off Silver Tree Pagoda - -	J M Hamilton
Ship Protector - -	T. Buttonsaw - -	512	"	Eastern Reef Head - -	No Pilot
Barque Equitable - -	R. Howlett - -	320	1839	*Fultah Reach - -	R Arrowsmith
Ship Francis Warden - -	Nacoda - -	401	1840	Auckland Channel - -	C Jackson
" Lady Stormont - -	T. F. Liddle - -	358	1841	Mud Point Ridge - -	G F Clarke
Barque Water Lily - -	S. H. Pearce - -	150	"	S E Point of Saugor - -	W Laing
" William Barras - -	J. Norie - -	272	"	*Hospital Point - -	W Laing
Brig Symmetry - -	J. Lavill - -	250	1842	- - S W Point of Auckland Island	J Haydon
Barque Globe - -	R. Stewart - -	438	"	Auckland Channel - -	J. B. Filby
" Strathfieldsay - -	T. G Warren - -	476	"	Jellingham Sand - -	R F Barlow
" Ricardo - -	J. L. Goble - -	353	"	*James and Marys - -	G Moxon
Brig Floraville - -	W. Branthwate - -	200	1843	*James and Marys - -	W Bails
Barque Adele - -	C. Rocoffort - -	356	"	Diamond Sand - -	C Anderson
" Victor and Felice - -	- - " - -	"	{ 1843 or 1844 }	Kedgeree Point - -	J. Hamond
" Amoy - -	- - " - -	"	1844	Reef Head - -	No Pilot
Schooner Columbine - -	J. Townsend - -	146	"	Saugor Sand - -	W W Laws
Ship Camain - -	H. Barrett - -	388	"	Mizen Sand - -	W. Laing
Barque Brilliant - -	H. King - -	339	"	Saugor Sand - -	C A Anderson
Ship Marcombe - -	C. Dalatouchie - -	490	1845	Thornhill's Channel - -	J Cleghorn
" Arragon - -	G. Coffin - -	740	1846	Eastern Reef - -	No Pilot
" Samdany - -	Nacoda - -	414	"	Saugor Sand - -	G B Smart
Barque Carnatic - -	Ditto - -	575	"	Middleton Point - -	W J Etheridge.
" Dorothea - -	J. Harrison - -	305	1847	- - Lower part of Mud Point Channel.	T E Bond
Ship Stalkurt - -	A. Gardner - -	560	"	Saugor Point - -	W H Harrison.
Brig Queen - -	N. Pike - -	189	"	Auckland Ridge - -	G B. M'Kan
Ship Mustapha - -	Nacoda - -	400	"	*Western Gut - -	D. Sandeman
" Missor - -	Chaplin - -	522	1848	Reef Buoy - -	G Spence
Schooner High Flyer - -	T. Ansted - -	78	"	Lower part of Cowcolly Road	G. F Atkinson.
Barque Helan - -	J. P. Biale - -	685	"	Near Calpee - -	J Cleghorn
Ship Cabras - -	Nacoda - -	390	1849	Saugor Sand - -	C F. Harrison
Barque Fadge - -	J. Mansfield - -	350	"	*Saygrall Sand Baboo Ghaut	G F. Medley
" Hamoodye - -	Nacoda - -	259	1850	Saugor Reach - -	G Nooks.
" Ariadne - -	T. Goodsir - -	501	"	Saugor Sand - -	W H Harrison.
Ship Phenomene - -	A. A. Jansend - -	504	1851	Jellingham Sand - -	W. H. Gill
" Gasper - -	- - " - -	"	"	*Ninand - -	R. Arrowsmith.
" John Leach - -	- - " - -	"	1852	Reef Head - -	No Pilot
" Belle Isle - -	- - " - -	"	1848	Ditto - -	Ditto
Schooner Brilliant - -	- - " - -	"	"	Cowcolly - -	Ditto
Barque Homed Shaw - -	T. Hoffland - -	450	1853	*Fultah Sand - -	J. H. T. Full
" Nizam - -	S. Jarman - -	412	1852	*Sebgunge Sand - -	G. Collins.
" Parsee Merchant - -	N. Mayer - -	636	"	Eastern Reef - -	No Pilot.

* The places marked thus are above Diamond Harbour.

Fort William, Marine Superintendent's Office, }
23 April 1853.(signed) H. Howe,
Secretary.

(No. 1,000.)

From *R. M. Stephenson, Esq.*, Managing Director and Agent of the East Indian Railway Company, to Major *W. E. Baker*, Consulting Engineer to the Government of India, in the Railway Department.

Sir,

Calcutta, 10 March 1853.

I FEEL assured that you will concur in a suggestion which deserves the consideration of the Government at a period when new and important cities, towns and villages are about to be brought into existence upon the line of the railway, that before any buildings are erected, or any steps taken in that direction at the several railway stations, plans of the surrounding country shall be sent in, a valuation made of them, and a series of regulations framed for the observance of all who sell, let or purchase any of the land which may hereafter constitute a portion of the town, with a view to its being built upon sound sanitary principles of drainage, water supply and lighting.

The importance of early provision under this head is much greater than is generally recognised; and I confidently believe that if a little attention is bestowed upon it at the outset, the results will, in a very few years, become apparent and universally acknowledged.

It would be premature to enter more fully at present into the subject than to express the hope that you will deem it to be one of sufficient consequence to recommend the Government to provide against the consequences of disregarding it.

And I am, &c.

(signed) *R. M. Stephenson*,
Managing Director and Agent of the
East Indian Railway Company.

Submitted for the Orders of Government.

(signed) *W. E. Baker*, Major,
Consulting Engineer to the Government of India
in the Railway Department.

11 March 1853.

(No. 1,025.)

From *R. M. Stephenson, Esq.*, Managing Director and Agent of the East Indian Railway Company, to Major *W. E. Baker*, Consulting Engineer to the Government of India.

Sir,

Calcutta, 23 March 1853.

I BEG permission to state, for your information, in considering the estimates recently submitted through you to the Government, that the Railway Company have uniformly preferred the less popular and usual practice of adopting a high scale of charges in estimating the probable cost of constructing their works, with a view to prevent possible disappointment afterwards, and as a more equitable course towards their proprietary than by assuming lower rates, which, from the numerous contingencies constantly arising, they might be unable to obtain.

In the detailed estimates now before the Government for the works below Allahabad, the mileage cost averages about 96,000 rupees, including all charges, and rolling stock for 682½ miles. The Railway Company contemplate works of the strongest, simplest and most substantial character, and would scarcely be justified in putting forward a lower calculation under the existing circumstances of the high price of iron and freight; but as the utmost economy consistent with strength and durability is the especial object to which attention is and should be directed, the Government may depend upon every possible exertion being made to keep down the actual cost.

The Government views are, and will be, so scrupulously observed in all respects by the Railway Company, that if it was desired to limit the cost to 50,000 rupees per mile (or even a less sum above Allahabad), it can be effected; but it would necessarily involve a diminution in the strength of the structure, which on a trunk line, with a known large traffic, would imply a questionable policy.

The

The Company desire only to carry out the wishes and intentions of the Government, whatever they may be, and in advising any especial course of action or expenditure, they do so only as a duty they owe to freely express their views, with the grounds on which they are based, and to act upon whatever decision the Government may come to upon the data submitted.

The preferable mode of duration is also a question upon which the Company are at all times ready to pursue any course which can be indicated as holding out any prospect of advantage and economy. The contract system, as hitherto applied to India, is by many regarded as a failure; but it is not generally known, that so far back as 1847, the Railway Company invited and held out every inducement to the principal English contractors to embark in these works; but the objections outweighed the inducements. The Company advised the adoption of the contract system for the first contracts, because the practice has been found most advantageous in Europe and America, and is regarded as the most perfect realization of the principle of the division of labour. The Company anticipated increased competition in all future contracts from new contractors who might be brought out, and from parties who had been engaged under the first contractors, and still hope to realize these expectations. If, however, the Government consider that the works can be carried out in part or wholly by the Company themselves, or by any other means more advantageously, the Railway Company will spare no exertions to give full effect to any suggestions having this object in view.

In the cost of the iron, a saving of above 10,000 rupees per mile may be effected by arrangements with the New Indian Iron Company for the early construction of the necessary blast furnaces, forges, mills and machinery to supply the whole of the wrought and cast-iron required during the ensuing seven years, at agreed prices, hereby securing a certain supply at a most reduced cost, and affording direct encouragement to an important branch of Indian trade.

I have, &c.
(signed) *R. M. Stephenson,*
Managing Director and Agent.

REMARKS by the Consulting Engineer.

24 March 1853.

In my remarks dated 21st instant, I expressed an opinion that the estimates for a railway from Rajmahal to Allahabad are considerably too high, "not with any idea that the strength of constructions could be safely diminished, or its quality lowered," but because I believed, after careful examination of the estimates, that a railway on the scale adopted for the present section of the East Indian Railway could be, and would be executed on the line referred to at a lower rate.

The rate of 5,000*l.* per mile, assumed by Major Kennedy as generally applicable to India, is not, I think, sufficient for the Ganges Valley line, which, though favourable in many respects, will cross an extraordinary extent of still drainage and inundated land.

(signed) *W. C. Baker,* Major,
Consulting Engineer.

No. 106.

From the Chief Secretary to Government of Fort St. George to the Secretary to the Government of India.

1852
Home Cons 22d
December No. 21.

Sir,

Fort St. George, 23 October 1852.

1. WITH reference to a despatch from the Honourable Court of Directors in the financial department, dated 18th August 1852, No. 13, I am desired to state, for the information of the Most Noble the Governor-general in Council, that Major Pears has been directed to report immediately the result of the survey of the Ghauts, and of the country between them and Menil, with the view of ascertaining the most favourable line of ascent from the plain to the Balaghaut, and that when this further report is submitted, application will be made to the

Financial Department.

Government of India to determine the precise route which the railway at this Presidency is to take.

2. It is observed that by section 20, Act 20, of 1852, the provisions of Act 42, of 1850, for giving additional facilities for public works in Bengal, have been declared applicable to this Presidency, so that no further legislative enactment appears necessary to enable this Government to obtain land for the proposed railway, if, as is presumed, the Act has effect within the limits of Her Majesty's Supreme Court.

I have, &c.
(signed) *H. C. Montgomery,*
Chief Secretary.

No. 928.

From *A. R. Young, Esq.,* Under-Secretary to the Government of India, to
Sir H. C. Montgomery, Bart., Chief Secretary to the Government of Fort
St. George.

1852:
Home Cons. 22d
December, No. 22.

Home Department,
Railway.

Sir,

Fort William, 12 November 1852.

I AM directed to acknowledge the receipt of your letter, No. 106, dated the 23d ultimo, and to state that the Most Noble the Governor-general in Council awaits the promised communication from the Government of Madras regarding the route to be followed in the construction of a line of railway in that Presidency.

I have, &c.
(signed) *A. R. Young,*
Under-Secretary to the Government of India.

No. 66.

From *Sir H. C. Montgomery, Bart.,* Chief Secretary to the Government,
Fort St. George, to the Secretary to the Government of India.

1852:
Home Cons. 22d
December, No. 23.

Public Depart-
ment.

Sir,

Fort St. George, 9 November 1852.

WITH reference to my letter, No. 106, of the 23d ultimo, I am directed by the Right honourable the Governor in Council to forward, for submission to the Government of India, the accompanying printed copy of a report from Major Pears, the Railway Commissioner, communicating the result of his examination of the Ghauts in the neighbourhood of Vaniambady.

2. It will be seen that the lines proposed by Major Pears to be first constructed extend to nearly 260 miles in length, and consist of five parts; viz.—

1st. A trunk line to Menil	- - - -	48 miles.
2d. A branch to Vellore and Vaniambady	-	70 "
3d. The trunk line continued to foot of the Ghauts	53	"
4th. The Ghaut near Palmanair	- - - -	4 "
5th. From top of the Ghauts to Bangalore	-	84 "
		259 "

3. The Governor in Council is of opinion, as formerly stated, that the chief trunk railway should run direct west from Madras to Menil, where it will divide into two original branches, one leading up the Ghaut, near Palmanair, and the other to Vaniambady; of these original branches, he considers that by Palmanair, and thence to Bangalore and Bellary, to be the most important in all points of view, though it may not at the very outset prove so profitable. He would, however, also strongly urge the formation, at an early date, of the second line by Vellore to Vaniambady, connecting the Southern and Western Provinces with this Presidency.

I have, &c.
(signed) *H. C. Montgomery,*
Chief Secretary.

From Major *T. T. Pears*, c. B., Engineer, to the Chief Secretary to Government,
Fort St. George.

Sir,

Madras, 27 October 1852.

1. In my report dated the 6th of July last, I stated my intention of proceeding to Kongoondy, and examining the Ghauts in the neighbourhood of Vaniembady : I have now the honour of reporting the result of that examination Para. 30.

2. Having previously looked at the Ghauts between Toombah Droog (north of Palmanair) and Naikenary, and satisfied myself of the best locality for a pass within those limits, I have on this occasion made a general examination of that portion which lies between Naikenary and Sholegherry, and closely and carefully examined such portions as I judged, either from my own knowledge of the country, or from indications furnished by the maps, likely to offer facilities for the construction of a railway. Report 6th July-
Para 10.

3. Having completed this work, I passed on to Bangalore, and looked at a line, which appeared to promise favourably ; from thence to Palmanair On the sheet of the Indian atlas submitted herewith, the present high roads are marked by a red, the proposed lines of rail by a strong blue line.

4. The character of the Ghauts immediately south of Naikenary and Sallpet is very unfavourable to the passage of a railway ; the height to be surmounted at this particular spot I take to be (with reference to other parts of the range) about a maximum. The table-land above is relatively high, the plain at the foot, bordering on the Vale of the Palaar, is relatively low, and the total difference of elevation between the top and bottom is from 900 to 1,000 feet. The Ghauts, as might be expected, display in this neighbourhood features on a large scale, and more formidable difficulties present themselves to a railway projector. It appears practicable, though not without very serious expense, to run a line (marked by a blue dotted line) up from the neighbourhood of Sallpet, by a valley (more open than the rest), at the head of which stands the village of Nunyalum ; but though practicable, I see nothing else to recommend it in the present case.

5. From hence, proceeding southward, passing Amboor and Vaniembady, the Ghauts everywhere present an abrupt front. Near the latter place, indeed, as seen from below, they assume almost the appearance of a natural retaining wall, the face of which has been deeply furrowed by the fall of water from above. The village passes in this neighbourhood are exceedingly steep and stony ; in all cases very difficult, in some impracticable, for pack cattle ; dangerous even for a led horse.

6. In this portion of the Ghaut, the Palaar comes down on to the plain below . its course, not only where it passes down the Ghauts, but for several miles above (before it reaches their crest), is marked by steep and rocky hills, covered with thick jungle, giving no opening or encouragement whatever for a line of railway.

7. South Vaniembady, the Ghauts take a sweep round in a direction somewhat north of west, which they continue for about 25 or 30 miles At or near this bend I find two places, in either of which it seems perfectly practicable to carry a line of railway ; these have been marked in the accompanying map by a red and a yellow dotted line respectively.

8. Following on the line of Ghauts, I discover no favourable opening till beyond Kishnagherry, where, at or near a village now deserted, but marked "Kendody" on the maps, there appears to be considerable facilities upon two or three lines for carrying a railway up from the plain about Kishnagherry to the Mysore country. The general direction of these lines is indicated on the accompanying map by lines dotted black.

9. Between this point and Sholagherry the country becomes again very unfavourable ; and the rugged belt of the Ghaut, which is in some places limited to three or four miles, here becomes much broader, the country being broken and hilly for a breadth varying from seven to ten miles. The pass near Sholagherry, by which the present high road ascends the Ghauts, is unfavourable for a railway.

10. It thus appears that between Naikenary and Sholagherry there are several points at which a railway might be carried up without serious difficulty; in only one of these, however, should I anticipate so good or so cheap a line as that which I have selected near Palmanair; while the whole of them are so far from the course of any of the proposed trunk lines as to place them out of the question for our present purpose. The day may come when some one of these may be taken advantage of for a branch line; but they would lead us too far out of our way now.

11. It will be observed, on a reference to my report of the 5th March 1851, para. 9, and the sketch which accompanied it, that in the completion of the principal trunk lines required in this Presidency, two passes up these Ghauts, and only two, would be required; one upon the line from Madras, towards the west and north-west (Bangalore and Bellary), the other upon a line passing up the middle of the peninsula, connecting its southern and central districts with Hyderabad, Nagpore and the north-west. For the first of these, the pass near Palmanair is in the best situation; for the other, it is probable that a way down the Ghauts may be discovered hereafter near Rutnagherry or Royacottah. Those near Vaniembady, which I have now described, are, it will be seen, far removed from either of these lines.

12. I have mentioned that only one of these passes would be likely to prove as good and cheap as that proposed near Palmanair; this one, which is marked on the map by a line dotted yellow, deserves more particular notice, were it only as offering a remarkably favourable line for a common road.

13. Although not shown on any of the maps that I have seen, there is at the present time, and has been for many years, a cart-road on this line, by which the produce of the Kongoondy zemindaree is brought down to Vaniembady. There is a tolerable road, over an easy country, from Coppum (six miles west of Kongoondy) to the top of the Ghaut, near the village of Sadainoor; from thence the descent is effected by a road running parallel to, and occasionally in the bed of a stream of no great magnitude, which passes down into the low country with an apparent uniform fall, the character of which is indicated by the fine sand which forms its bed throughout; in fact, there is a cleft in the Ghaut at this point through which the stream passes. This natural opening, so small as to be not distinguishable a short distance off, resembles otherwise the remarkable gap in the western Ghauts at Palghaut. The road, which, as far as I can see, is wholly a natural pass, presents from bottom to top one continued and uniformly easy slope, without in any single case the appearance of steepness or difficulty, and is at the present moment an easier pass for a loaded bandy than any that I have seen either on these or the western Ghauts. Had this been known before the adoption of the Sholagherry line, I cannot doubt but that the high road to Bangalore would have been carried by this route, the country being perfectly favourable the whole way, and the distance certainly not greater than by the present road.

14. It only remains for me to report, that my examination of the country between Bangalore and Palmanair has been very satisfactory. The line which seems to me the most eligible for a continuation of that from Madras to Palmanair is shown in the accompanying sheet of the atlas; it crosses in its course three distinct valleys, that of the Goriattum river near Palmanair, that of the Palaar, between Moolwagle and Colar, and that of the Penmure Keney, between the latter place and Bangalore. These valleys, with their intervening ridges, constitute the principal features on the line; but the whole country is made up of minor undulations, involving in the construction of a railroad a considerable amount of earthwork.

15. A general view of the Mysore country would produce an impression of difficulty in the way of railway work, in consequence of the frequent appearance of surface rock; but the character of the country varies much; and while in some places the undulations appear to consist of nothing but solid rock, in others clay or loam is found to overlie the rock to a very great depth; and the line which I have now looked at appears very favourable in this respect. I should expect an average depth of earthwork of eight or ten feet to give gradients nowhere exceeding 25 feet in the mile. Bangalore is about 900 feet
above

above Palmanair, the distance on the proposed line 80 miles, the average rise, therefore, 11 feet in the mile, but the greater part of the rise is effected upon the first 30 miles from Palmanair.

16. It may be well to refer again briefly to the question of the proper direction for the first line of railway; in doing so, it may save trouble if I recapitulate some statements and opinions that have been already given by myself and other officers.

17. With a former report I submitted a sketch, showing the general direction of the lines which would probably be considered of the first importance within the limits of this Presidency; and presuming that the scheme there proposed is approved, it would now appear merely a question of time which line shall be constructed first. 5th March 1851.
Para. 9

18. The two most important of those lines, that from Bellary and that from Vaniembady and Salem, are shown to form a junction within 50 or 60 miles of Madras, and thence to follow one trunk line

19. There can be, I presume, no doubt as to this trunk line.

20. The question then arises whether from that point the line shall be carried on by Palmanair to Bangalore and Bellary; whether we should first construct that to Vaniembady, or whether we should do both as soon as possible

21. The Honourable Court of Directors, in their despatch to the Supreme Government in the Financial Department, No. 17, of 1851, dated 12th of March, desired that it should be explained that the survey of this line should have reference not to an experimental portion only, but to the ulterior destination of such a mode of conveyance as forming part of a general system, the object of which would be to facilitate communication for political as well as commercial purposes, and to effect more ready intercourse with other Presidencies.

22. In a former report I gave my opinion that the most important line, as far as the interests of the country or Government are concerned, was that from Madras to or towards Bellary, having in view ultimate connexion with the Bombay railways; but I added that, as an experimental line, it did not hold out such good promise of immediate results as one of less ultimate importance, viz, that to Vaniembady. 5th March 1851.
Para. 57.

23. Mr. Bourdillon, in his report to Government, gives it as his opinion that we should begin with one complete line to the centre of the peninsula, as, for instance, Bellary or Bangalore, and subsequently, if this complete line is not to be undertaken, proposes a line to Mooglee (in the direction above recommended), and a branch to Vellore or Vaniembady. 4th July 1851.
Para. 3.
Para. 15.

24. Major Cotton writes strongly in favour of the direction of Bellary. Report 12th July
1851. Para. 9.

25. At the time these several reports were made, the mode, as well as the particular place, by which the Ghauts might be surmounted, were altogether undetermined, having now ascertained that a pass, perfectly practicable for locomotive engines, may be made near Palmanair, and that the approach through North Arcot to that pass can be made at much less cost than would have been anticipated, from the known character of that district; additional weight is given to the arguments in favour of the Bangalore and Bellary line.

26. As, however, I observed before, it is a mere question of which shall be done first, and it is perhaps of no great importance which is first taken in hand, since there can be no doubt of a rapid extension of the railway system when a beginning has once been made.

27. The capital raised by the Madras Railway Company amounts to 500,000 £., and I believe that sum laid down towards Vaniembady would meet with an earlier and better return than the same taken in the direction of Palmanair and Bangalore or Bellary: not only because that road is better fed by the high-ways of the country as they at present exist, but because, lying over a very favourable country, its construction would be cheaper: in other words, the same amount of capital would make a longer railway.

28. On the other hand, I am satisfied that the line to Bangalore and Bellary would be of far greater ultimate value to the country, as it is of much higher importance to the Government; and seeing that the Government has undertaken to secure to the Company a liberal interest on their capital, there can be no doubt as to its right to determine the direction of the line, and, in so doing, to consult its own interests and those of the people of the country.

29. The reasons, then, in favour of the Vaniembady line, are the cheapness of construction, and the traffic now existing upon it.

30. The extent and fertility of the two districts, Mysore and Bellary, their distance from the coast, the importance of the military stations, the peculiar nature of the chief agricultural product of Bellary and the neighbouring district of Cuddapah, viz., cotton, the circumstance that such a line would tend directly to a connexion with the western Presidency, all pleads strongly in favour of the Palmanair line.

31. The traffic from the Mysore country towards Madras at present is not great, and is, I apprehend, overestimated by many, as it has been by Mr. Bourdillon, in his letter to Government of the 4th July 1851; but, possessing a fine climate, enjoying periodical rains, which rarely, if ever, fail, extensively irrigated by an immense number of tanks, there is sufficient evidence of this traffic being susceptible of large increase in sugar, sooparee, coffee, cotton, silk, wool, &c., while the peculiar character of its climate is further shown in the extensive cultivation of potatoes among the natives, and that of other foreign fruits and vegetables among European residents, the export of which to the coast and the districts below the Ghauts, appears only limited by the present imperfect means of transport.

Para 14
Suppose $\frac{3}{4}$ th of that
quantity to come
from Bangalore
and Mysore.

32. Having thus determined the best pass up the Ghauts, and considered the relative claims and merits of the principal lines proposed, I conclude that the best mode in which the Railway Company could commence operations would be by undertaking the line to Palmanair and Bangalore, with a branch to Vellore and Vaniembady; and that the branch should take off from Menil.

33. Upon this latter point it is necessary that I should offer a few words of explanation. In an extract from Minutes of Consultation in the Public Department, No. 35, dated 12th January 1852, para. 7, I was instructed to "study to carry the trunk-road as far forward as it can conveniently serve in common for a line in that direction, as well as for one by Vellore to Vaniembady." In carrying out these instructions, I expected to run it, or nearly, to the Poiney river, *i. e.*, about 65 miles from Madras.

34. I find, however, that after Menil (48 miles from Madras) that line rapidly steepens, and within a few miles assumes quite a different character in regard to gradients. If, therefore, the trunk line were carried beyond Menil, and near the river, the communication between Madras and Vellore would be broken at that one place by some stiff gradients, which would rule the whole line, and prove very prejudicial; whereas if the branch were made from Menil, the whole line from Madras even to Vaniembady would be homogeneous, characterized by gradients not exceeding 16 or 18 feet in the mile.

35. This is an important consideration, as affecting most materially the economical working of the line.

36. It may be said, however, that by thus striking off at the 48th, instead of the 60th mile, we render necessary the construction of 12 more miles of rail; were this the case, the country being remarkably favourable, I should consider it money well spent in preserving the cheap, workable character of the entire line; but, in fact, it is likely to prove otherwise; as I apprehend that, before long, the trunk line, and that alone, whether it is 48 or 60 miles, will have to be laid double, while single lines will for many years to come suffice for the others.

The line branching from Menil would sink rather to the south, to avoid the Nelacontria cluster of hills, and would so pass at Ammoor, within four miles of Arcot and Wallajahnuggur.

37. It is of great importance to the economical and successful working of a railway, that the character, as well as the extent, of the line, or of any particular section

section of it, should admit of a locomotive engine doing a fair day's work, at its full, or nearly its full power. To insure this, it is not only necessary that there should be sufficient length for it to work upon, but that there should be sufficient length for it to work upon; * but that there should be no ruling gradient, such as to compel the engine to run under-weighted during the greater portion of the line.

* Sic in orig.

38. For example, if the line which I propose as far as Menil, with gradients never exceeding 17 feet in a mile, were broken about midway, by one of 20 or 25 feet, on a length of one mile, it is evident that, to meet this, the engines must travel throughout the whole of the remaining 47 miles under-weighted.

39. I conceive that the lines which I now propose as a commencement, would work very economically; they would consist of five parts—

	Miles
1st. A trunk line to Menil - - - - -	48
2d. A branch to Vellore and Vaniembady - - - - -	70
3d. The trunk line continued to foot of the Ghaut - - - - -	53
4th. The Ghaut near Palmanair - - - - -	4
5th. From top of the Ghaut to Bangalore - - - - -	84
	259

40. In working the first of these (the trunk line to Menil) it would be necessary to provide power to convey the whole of the traffic island† from Madras. The gradients not exceeding 17 feet in the mile, engines of moderate power would do this. The second (the branch to Vellore and Vaniembady) would receive only a portion of the above traffic, and the gradients remaining equally favourable, a much lighter engine might be substituted, and would have fair work in running to Vaniembady. On the third portion (the trunk line continued to the foot of the Ghaut) the average rise is greater, and the gradients are consequently steeper, viz. 25 or 30 feet in the mile; but the same engine which carried a train of 80 or 100 tons (gross) from Madras to Menil, would carry up these steeper gradients that train reduced by the waggons turned off towards Vellore. The engine would thus find a good day's work in running from Madras to the bottom of the Ghaut, being 101 miles.

† Sic in orig.

For the fourth portion (the Ghaut itself) an engine of special construction, of greater power and less speed, must be provided.

The 5th portion, being 84 miles from the top of the Ghaut to Bangalore, would require an engine similar to those used below the Ghauts.

41. The lines above proposed for first construction amount to nearly 260 miles in length. Taking the cost of construction and stocking at an average of 40,000 rupees per mile, would give the total capital required 1,04,00,000 rupees, or something more than 1,000,000 sterling. The interest on this, at 4½ per cent., amounts to 4,68,000 rupees, which, if we take the working expenses at 50 per cent., on the receipts, would require an annual mileage of 57,600 tons upon the whole extent of way, or traffic of various kinds equivalent to it.

42. I have already shown that the traffic between Madras and Wallajahnuggur may be even now taken, on a very reasonable estimate, at 50,000 tons of goods, besides parcels and passengers; and when I think of the vast influence the lines now proposed would exercise upon some of the finest districts in southern India, the impulse they would give to education and commerce, of their importance also in a political point of view, I cannot doubt either of the success of the work as a speculation, or of the great and lasting benefits it is calculated to confer on all classes of people in this part of India.

Report, March 5th, 1851. Para. 29.

I have, &c.
(signed) T. T. Pears,
Railway Commissioner.

P. S.—I beg to state, that the survey of the line to Palmanair has been, after many hinderances, arising from the sickness of the surveyors, and the frequent rains, at length completed, and the drawings are now in course of execution.

The levels, which have been much delayed from similar causes, are also near completion; and I trust in a few days to be in possession of all the necessary data for the preparation of the estimate.

(signed) *T. T. Pears,*
Railway Commissioner.

From Major *T. T. Pears, C. B.,* Engineers, to the Chief Secretary to Government, Fort St. George.

Sir, Poiney, 15 December 1851.

* Rs. 17,99,693. 3.

1. With reference to an extract from Minutes of Consultation, No. 812, in the Public Department, dated 29 August 1851, I have now the honour to forward, for submission to the Right Honourable Governor in Council, a survey and estimate,* of the first 48 miles of a proposed trunk line of a railway running westward from Madras as far as Menil.

2. In my report of the 4th July last I recommended that, should the Government desire, without any special reference to the town of Wallajah-nugger, to lay down the best trunk line westward, the line marked No. 2 (and shown in the map which accompanied that report) should be adopted, and carried out as far as Menil, leaving the question of its prolongation thenceforward, whether by Ammoor or Sholinghur, to depend upon the determination of the best pass up the Ghauts.

3. The survey and estimate now submitted, have been framed for a single line of railway as far as Menil, 48 miles 5 furlongs from Madras: a further survey from Menil to the top of the Ghauts will be submitted as soon as I have ascertained in a satisfactory manner the best point and mode of ascent for a railway.

4. The line, if carried to Menil, as now proposed, would start from the canal basin, near the north-west corner of Black Town, pass near the villages of Peramboor, Coratoor, Avady and Thodoor, and cross the present high road (by Naggery) to Cuddapah, at a point about four miles south-east of Trivalloor. Skirting the northern bank of the Coomu, it then crosses the valley of the Coortilliar; ascending from which, it reaches, at Moshoor, the high ground which forms the water-shed between the Coortilliar and the Tritany rivers, which elevated ridge continues to offer a most convenient line for a railway, until it reaches the broken and hilly country between Sholinghur and the Poiney river.

5. This line offers no difficulties of any kind. The earthwork is light, the soil generally favourable. The total amount of earthwork in 48 miles and five furlongs is—

† Appendix B.

	Yards.
Embankment†	793,495
Cutting	362,364
TOTAL	1,155,859 cubic yards.

or 23,822 cubic yards per mile. This is nearly the same as that found on the line to Wallajah-nuggur, reported on by me on the 4th July last; but the country on this line is, nevertheless, much more favourable, and the earthwork has been brought to nearly the same amount, in consequence of my having adopted much better gradients in this case.

6. By the table of gradients (A), it will be seen that the steepest is only 1 in 309, and that the character of the country has admitted of my carrying the line from Madras to Menil (rising in the aggregate 360 feet) with only three counterslopes; of which, one may be considered to all practical purposes level, and the other two might be got rid of at the expense of a little heavier earthwork.

7. The tanks through which the line has been carried are in almost all cases shallow enough to admit of the road being lifted above the highest water, without

without much embankment. In some instances I allow for cutting off a portion of the tank, by an addition to the bank.

8. I would observe here, that the line shown in the accompanying survey has been laid down for the purpose of measurement and estimate, and as showing the probable general course for a railway.

9. It has been attempted as much as possible to avoid encroaching on the villages themselves, and the deeper portions of the most important tanks, but in laying down the line hereafter, it will probably be found both practicable and expedient to deviate in some places from that followed in the survey, and to cut through villages occasionally, where the character of the line is likely to be prejudiced, by an attempt to pass clear of them, some such probable deviations are shown by dotted lines on the survey. These will only affect the estimate as shortening, and therefore cheapening it on the one hand, while something more might be required in compensation for lands and houses

10. The works of masonry are of the commonest and most trifling description, with the one exception of the bridge over the Coortilliar. Appendix C.

11. I recommend here a work of sufficient length to span the entire bed, and afford ample space with the least possible headway. I would propose, therefore, a bridge of 30 vents, of 30 feet each, with abutments and piers of brick and chunam, and iron or teak girders for the support of the road, which of these materials shall be used is a question of economy, to be determined upon inquiring into the probable cost of each. The construction of such a bridge is a work of the simplest kind; and, for a single line of rails the sum I have allowed, viz. 50,000 rupees, will I doubt not, be found ample. In the statement of bridges and drains, will be found a great number of irrigation channels I have allowed, I believe, very liberally for these, both as to the number and individual cost.

12. The permanent way has been calculated on my former data; and I have entered in the present estimate the same relative amount (considering the different lengths of the two lines), for building and rolling-stock, and contingencies. This I have done in order that a comparison may be readily made between the total cost per mile on the Menil line and that shown upon the former survey, not as considering Menil a desirable terminus, or with any view of representing the line carried up to that point as a complete work. Appendix D.

13. A comparison between the two estimates shows the following results:

Amount of Earthwork per Mile :		<i>Cubic Yards</i>
Wallajahnuggur line	- - - - -	24,342
Menil	- - - - -	23,822
Cost of Earthwork per Mile :		<i>Rupees</i>
Wallajahnuggur line	- - - - -	2,300
Menil	- - - - -	1,820
Cost of Bridges and Drains per Mile :		
Wallajahnuggur line	- - - - -	1,568
Menil	- - - - -	1,530
Total Cost per Mile, including Stock :		
Wallajahnuggur line	- - - - -	36,730
Menil	- - - - -	36,488

14. It will be seen, that though the amount of earthwork per mile is nearly the same, the cost differs. This arises from the actual depth of cutting and embankment being less on the Menil than on the other line.

15. The value and extent of land through which the line passes, are shown in the following statement :

Nunjah	- - - - -	24,861 yards.
Punjah	- - - - -	12,410 "
Manium	- - - - -	1,636 "
Jope	- - - - -	520 "
Garden	- - - - -	133½ "
Waste	- - - - -	45,922½ "

Assuming, as in my former estimate, 25 yards as the average breadth of land required, the following would be the superficial extent of land of each kind taken for the work :

Nunjah	-	-	-	-	-	-	97,066	cawnies.
Punjah	-	-	-	-	-	-	48,476	„
Manium	-	-	-	-	-	-	6,390	„
Joep	-	-	-	-	-	-	2,033	„
Garden	-	-	-	-	-	-	0,520	„
Waste	-	-	-	-	-	-	179,657	„

The estimated full value of the above, at the rates before assumed, would be as follows :

Nature of Land.	Rate.	Total Value.
	<i>Rupees.</i>	<i>Rupees.</i>
Nunjah, at per cawnie	175	16,986
Punjah - ditto	50	2,423
Manium - ditto	175	1,118
Joep - ditto	100	203
Garden - ditto	175	90
Waste	—	—
TOTAL Value of Land		<u>Rs. 20,820</u>

or about 428 rupees per mile.

I cannot pretend to great accuracy in this calculation ; but I have attempted to allow sufficient for the full and absolute value of the land and its probable cost to the railway, including the Government claim upon it, as well as the purchase of the tenant right ; the latter being a very variable quantity, and very difficult to ascertain satisfactorily.

17. I have not considered it necessary to enter again upon the subject of the traffic, the working expenses and profits. The statements and calculations, submitted with my report of the 5th March 1851, will apply with equal force to any line running from Madras westward, and monopolizing all the traffic between that port and the central districts of the Peninsula, Bellary, Cuddapah, Mysore, Salem and North Arcot.

18. The gradients on the line by Menil being of a much better character than those on the Wallajahnuggur line, the working expenses would, of course, be proportionably lighter ; so far, therefore, in an estimate of profits this line would have the advantage.

19. The circumstance alluded to in the 60th para. of my report of 5th March 1851 respecting the fall of the line being with the bulk of the traffic, is strikingly illustrated by the section now submitted. There will be seen an almost unbroken and steady fall from west to east, along the whole 48 miles. Since in the total estimated traffic on this line the amount running towards the east is to the return traffic nearly as 10 to 7, the above constitutes a very favourable feature in the working prospects of the line.

20. The extension of the line from Menil to whatever point may, in the first instance, be selected as a terminus, whether Vellore, Vaniembady, Gorriattum or Palmanair, will be effected under circumstances more or less favourable, according to the result of that selection, and to the direction taken for a pass up the Ghauts ; but it is to be observed, that whatever may be the result of the deliberations on the above points, the extension from Menil will be made under at least as favourable circumstances as it would be on the Wallajahnuggur line.

21. If, for example, the result of my present examination of the Ghauts should lead to the adoption of the line of the Palaur for the trunk line, the run from Menil to Vellore, by Ammoor, would lie across a most favourable country. If, on the other hand, it is determined to carry the line through North Arcot, to or near to Palmanair, the position of Menil is much more favourable for such an extension than Wallajahnuggur would be. In this case, our course would be by

by Quodekel (near Sholinghur), to some convenient point near the left bank of the Poiney; from whence divergent lines might be carried to Palmanair on the one hand, Vellore and Vaniembay on the other.

22. Under any circumstances, therefore, this line to Menil appears the best for a trunk line.

23. In recommending this project to the most favourable consideration on the part of Government, I would briefly remark on the many circumstances that conspire to prompt and encourage an undertaking of this nature in this part of the country, and at this juncture.

24. The character of the country is most favourable; labour is cheap and abundant; there are no costly or difficult works required: for viaducts, simple embankments; for bridges, unpretending structures of brick and chunam; as they are the simplest, so they are the cheapest works we could construct for the purpose. We have no navigable rivers, and none that are not dry, or nearly so, during a great part of the year. We are at liberty, therefore to apply works of the cheapest and plainest description, in carrying a railroad across them, laying the foundations, and raising the piers on dry beds.

25. The greater part of the land is of small value; much of it of no value at all, and not likely for many years to be turned to so profitable an account as in carrying a railway.

26. Iron also is, or was very lately, cheaper in England than it has been for many years*—I believe I may say than it ever was before: we may reasonably doubt whether it will long remain at so low a figure; at all events, the proportion which in the Madras Railway the rails would bear to the whole cost, renders this circumstance one of great importance, and deserving of early consideration.

27. In this part of the country the railway, carried at once far enough towards the interior, would literally meet with no competition. There are no canals, and but few good roads.

28. It is obvious, therefore, that this line would commence operations under peculiarly favourable circumstances: it would not only monopolize the entire traffic proper to the direction it takes, but, from its great superiority over other existing modes of transport, would attract largely from all directions, and would have the vast resources of this country, hitherto but partially developed, to draw upon for an increase in the amount of traffic. I shall not, to prove the probability of such increase taking place, trouble Government with arguments familiar to all, and drawn from the examples of rails in Europe; but merely observe, if the increase in traffic in England, where the rails had to contend with a very perfect system of transport, has been in every case large beyond all expectation, we are entitled to assume that under our circumstances such increase would take place in a much higher ratio. We advance at once from roads of an inferior description, pack cattle and bullock bandies, to the locomotive engine and its train of waggons.

29. The proposal to lay down this line of railway has excited much interest among the natives, with many of whom I have conversed on the subject. The benefits that would arise from such a work are fully understood, and are readily acknowledged: the effect upon the people produced by one such work in operation, would be very beneficial, while the Government would have, in the experience gained in its construction, as well as the commercial and social statistics furnished in the course of its working, a good basis for their deliberations on further similar projects.

30. Among the advantages possessed by us here, must not be forgotten the cheapness of labour of almost every kind, as required in the management of a railway.

31. With the exception of one department (the drivers), which must at the outset be supplied entirely from England, the heads of departments would alone be

* I learn from the public papers, that tenders have been made to deliver rails at Alexandria for the Egyptian railway at 5 *l.* and 5 *l.* 2 *s.* 6 *d.* per ton.

be required from home. With a few good mechanics, and plate-layers as instructors, the Indoo Britons and Natives would be found well fitted for any and every duty connected with a railway. Active, steady, intelligent men, as Lascars (porters) or policemen may be had for 6 or 7 rupees a month; common labourers to assist in the repairs of the way and works will be well paid with 5 rupees per month, and for this sum a class of men not easily surpassed in activity or natural intelligence, in the quick eye and steady hand, may be obtained to an almost unlimited extent in the Madras Cooly. I doubt not that the arsenal of Fort St. George and the gun-carriage manufactory will show a number of men of these classes quick to learn and ready to perform any duties (not involving actual mechanical skill), required of them in the various departments of a railway.

32 Higher pay would, of course, be required for mechanics; but of those, too, there would be no want. The extended field offered by a railway department would affect not only the number, but the character and qualifications of the mechanics of Madras, and the supply would, I have no doubt, keep pace with the demand.

33. The railway offers, indeed, a gratifying prospect of useful and honourable occupation to the members of the Indo-British community; while that community, on the other hand, presents itself at once as the source to which we may confidently look for valuable public servants in every department.

34 In conclusion, I take this opportunity of reporting, that my examination of the Ghauts, as far as it has yet been carried, has proved much more satisfactory than I had anticipated.

35. I am not yet prepared to pronounce decisively either upon the best line or the best mode of ascending them; but I am satisfied that the passage up can be effected with little difficulty. We shall, I believe, require no works of serious cost or magnitude—no tunnels—but shall probably run the rail by an incline perfectly practicable for locomotives of special construction the whole way up from the plain below to the general level of the Balaghat.

36. I have arrived at this conclusion, from a partial examination of the Ghauts in this neighbourhood; and although the most favourable line for ascending the Ghauts may not prove the most favourable for approach to them, I am very sanguine that the difficulty will be got over at much less cost than has been generally anticipated.

37. Should the Government determine on sanctioning this line of railway, I would recommend that attention be given to the completion of the first 24½ miles from Madras to a station near Trivalloor (and Tripasoor), and opening that portion as soon as possible. There would be found a considerable passenger traffic so far in connexion with Trivalloor, Tripatty and Cuddapah; and, besides the local traffic in fire-wood and ordinary agricultural produce, the contemplated improvement in the Naggery line of road would probably throw an increased amount of goods traffic upon the rail at that point.

38. This first section of the line falls short of the Coorsilliar river, and the works would consist merely of earthwork, and small works of masonry.

39. The line might subsequently be opened as far as Menil; to which point, by making some improvements on the present country roads, traffic now taking the Wallajahnuggur road (or a great portion of it) might be drawn, until such further extension of the line took place as should take up that traffic completely at Vellore, or other approved terminus.

40. It will be observed, that though the outlay upon 60 or 100 miles of rail-road at 36,488 rupees per mile is large, the actual sum expended upon the works, earth and masonry, is comparatively small; and, consequently, the demand for labour is not likely to be large enough to create any embarrassment, or to enhance in any degree its cost. The earthwork, for example, amounts to about 1,160,000 cubic yards; which, assuming the small amount of two yards per diem for each man, would require less than 200 men for its completion in 300 days. I have been lately engaged in collecting information upon the capabilities of the neighbouring districts in regard to the supply of labour and material;

material; but there can be no doubt of a far greater amount of labour than this being available, if required, in the districts through which this line would pass, or in those adjacent. It may be as well, however, to observe, that the cost of a work of this nature, if executed by Government, might be somewhat reduced by a judicious employment of convicts, the larger buildings ultimately required at the principal stations being at once built for their shelter and security. The services of a company of Sappers would be of the greatest importance; I should employ them on this, as on all similar occasions, entirely as artisans or superintendents: if not well qualified for such duties (as I believe most of them now are) their employment upon any public work in an inferior capacity appears to me waste of money.

41. I should anticipate great advantage from their services, not only from their skill in various handicrafts, as carpenters, chucklers, brick and tile makers, &c., rendering us, in a great measure, independent of any possible temporary strike among the daily labourers of these classes, but also from their characteristic intelligence, general usefulness, and, perhaps more than all, from the means afforded us of introducing, through their agency, order and regularity into the management of large bodies of workmen, a point which is of the utmost importance in the conduct of large works; and one in which, unfortunately, the ordinary native superintendents very generally and entirely fail.

The honour of taking a leading part in the construction of the first railway in Southern India is not only well deserved, but would, I doubt not, be fully appreciated by that distinguished body of men.

I have, &c.

(signed) *T. T. Pears,*
Major Engineers.

ABSTRACT STATEMENT of the probable Cost of constructing and stocking a single Line of Railway between *Madras* and *Menil*.

NATURE OF WORK.		AMOUNT.		
		<i>Rs.</i>	<i>a.</i>	<i>p.</i>
Earthwork	{ Embankment - - - - -	57,633	7	-
	{ Cutting - - - - -	30,321	1	-
Stone facings	- - - - -	7,179	-	-
Side drains	- - - - -	16,444	11	-
Foot bridges	- - - - -	31,000	-	-
Level crossings	- - - - -	4,800	-	-
Bridges and drains	- - - - -	74,215	-	-
Catch drains	- - - - -	1,200	-	-
Fencing, inclusive of 1,100 yards wall	- - - - -	5,700	-	-
Permanent way	- - - - -	9,50,000	-	-
Rolling stock	- - - - -	2,20,000	-	-
Water tanks	- - - - -	5,000	-	-
Switches, crossings, guard-rails, &c.	- - - - -	3,200	-	-
Buildings and stations	- - - - -	1,20,000	-	-
Turntables, travelling platforms, and rails for ditto	- - - - -	8,000	-	-
Furniture, fittings, tools	- - - - -	40,000	-	-
Superintendence	- - - - -	1,15,000	-	-
Contingencies	- - - - -	80,000	-	-
TOTAL - - - <i>Rs.</i>		17,69,693	3	-

(signed) *T. T. Pears.*

Appendix (A.)

TABLE of PLANES on the proposed Line of Railroad from *Madras* to *Ment*

Number of Planes.	Length in Yards	Rate of Inclination		Number of Planes.	Length in Yards	Rate of Inclination	
		Rise.	Fall.			Rise.	Fall.
1	1,266 $\frac{2}{3}$	- level.		23	2,920	1 in 953	
2	863 $\frac{1}{2}$	1 in 942		24	2,024 $\frac{1}{2}$	- level.	
3	3,427 $\frac{1}{2}$	1 in 551		25	1,055 $\frac{2}{3}$	1 in 1,919	
4	885 $\frac{2}{3}$	- level.		26	660	1 in 1,261	
5	658 $\frac{1}{2}$	1 in 1,795		27	4,400	1 in 590	
6	933 $\frac{1}{2}$	1 in 493		28	880	1 in 696	
7	1,483 $\frac{1}{2}$	1 in 3,134		29	2,420	- - -	1 in 6,482
8	1,488 $\frac{2}{3}$	1 in 744		30	2,640	1 in 2,010	
9	1,313 $\frac{1}{2}$	1 in 24,625		31	1,702	1 in 622	
10	2,272 $\frac{1}{2}$	1 in 643		32	276	1 in 4,140	
11	140	- level.		33	1,777	1 in 26,655	
12	1,001 $\frac{1}{2}$	- - -	1 in 673	34	911 $\frac{2}{3}$	1 in 882	
13	348 $\frac{2}{3}$	- level.		35	2,703	1 in 657	
14	2,377 $\frac{2}{3}$	1 in 430		36	498	1 in 4,980	
15	2,660	1 in 407		37	5,332	1 in 11,676	
16	880	- level.		38	1,540	1 in 658	
17	2,420	1 in 395		39	1,465	1 in 493	
18	352 $\frac{1}{2}$	- level.		40	15,035	1 in 309	
19	980	- - -	1 in 479	41	880	1 in 10,560	
20	1,426 $\frac{2}{3}$	1 in 966		42	2,640	1 in 387	
21	1,200	1 in 8,780		43	2,933 $\frac{1}{2}$	1 in 10,260	
22	880	1 in 596					

(signed) T. T. Pears.

Appendix (B.)

ESTIMATE of the probable COST of EARTHWORK, DRAINS, BRIDGES, &c.,

Number of Miles	Description of Soil.	EMBANKMENT.					CUTTING.				
		Length in Yards.	Cubical Content in Yards.	Average Height in Feet	Rate per cubic Yard.	Amount.	Length in Yards.	Cubical Content in Yards.	Average Depth in Feet.	Rate per cubic Yard.	Amount.
<i>M. fur</i>				<i>ft in.</i>	<i>Rs a. p.</i>	<i>Rs a.</i>			<i>ft. in.</i>	<i>Rs a. p.</i>	<i>Rs. a.</i>
1 0	Soft clay - - -	1,760	11,661	2 6	- 1 -	728 13	- - -	- - -	- - -	- - -	- - -
2 0	Ditto - - -	- - -	- - -	- - -	- - -	- - -	13	50	1 6	- - 10	2 10
0 0	Ditto - - -	1,747	13,483	2 9	- 1 -	842 11	- - -	- - -	- - -	- - -	- - -
3 0	Ditto - - -	- - -	- - -	- - -	- - -	- - -	80	225	1 3	- - 10	11 12
0 0	Ditto - - -	1,662½	16,799	3 6	- 1 -	1,049 15	- - -	- - -	- - -	- - -	- - -
4 0	Loose, sandy and alluvial	1,751	22,170	4 3	- 1 -	1,385 10	- - -	- - -	- - -	- - -	- - -
5 0	Ditto - - -	- - -	- - -	- - -	- - -	- - -	22½	23	0 6	- - 10	1 3
0 0	Ditto - - -	1,737½	8,659	2 0	- - 11	496 1	- - -	- - -	- - -	- - -	- - -
6 0	Loose sandy - - -	- - -	- - -	- - -	- - -	- - -	68	364	1 6	- - 10	13 12
0 0	Ditto - - -	1,692	21,141	4 3	- 1 -	1,321 5	- - -	- - -	- - -	- - -	- - -
7 0	Ditto - - -	1,760	18,038	3 9	- 1 -	1,127 6	- - -	- - -	- - -	- - -	- - -
8 0	Loose sand and laterite gravel	1,760	32,429	4 5	- 1 2	2,364 10	- - -	- - -	- - -	- - -	- - -
9 0	Laterite gravel - - -	- - -	- - -	- - -	- - -	- - -	1,027½	37,982	9 3	- 2 -	4,747 12
0 0	Loose sandy - - -	692½	24,082	8 9	- 1 6	2,257 11	- - -	- - -	- - -	- - -	- - -
10 0	Ditto - - -	- - -	- - -	- - -	- - -	- - -	415½	4,711	4 0	- - 1	294 7
0 0	Clayey - - -	1,344½	45,820	8 9	- 1 6	4,295 10	- - -	- - -	- - -	- - -	- - -
11 0	Red earth and gravelly	- - -	- - -	- - -	- - -	- - -	646	2,312	1 6	- - 10	120 -
0 0	Loose sandy - - -	1,094	6,804	2 4	- 1 -	425 4	- - -	- - -	- - -	- - -	- - -
12 0	Laterite gravel, and light soft soil.	- - -	- - -	- - -	- - -	- - -	1,150	23,054	6 0	- 1 2	1,681 -
0 0	Ditto - - -	610	4,480	2 9	- 1 -	280 -	- - -	- - -	- - -	- - -	- - -
13 0	Light soft soil - - -	- - -	- - -	- - -	- - -	- - -	270	10,895	9 9	- 1 6	1,021 7
0 0	Ditto - - -	1,490	42,231	7 9	- 1 4	3,519 4	- - -	- - -	- - -	- - -	- - -
14 0	Ditto - - -	- - -	- - -	- - -	- - -	- - -	780	17,592	6 4	- 1 2	1,282 12
0 0	Ditto - - -	980	11,927	4 3	- 1 -	745 7	- - -	- - -	- - -	- - -	- - -
15 0	Ditto - - -	- - -	- - -	- - -	- - -	- - -	700	15,915	6 4	- 1 2	1,160 7
0 0	Ditto - - -	1,060	28,126	7 6	- 1 4	2,343 13	- - -	- - -	- - -	- - -	- - -
16 0	Ditto - - -	- - -	- - -	- - -	- - -	- - -	136½	133	0 3	- - 10	6 15
0 0	Ditto - - -	1,620½	8,779	2 3	- 1 -	548 11	- - -	- - -	- - -	- - -	- - -
17 0	Ditto - - -	- - -	- - -	- - -	- - -	- - -	880	10,787	0 6	- - 10	561 13
0 0	Ditto - - -	660	4,069	2 4	- 1 -	254 5	- - -	- - -	- - -	- - -	- - -
18 0	Ditto - - -	- - -	- - -	- - -	- - -	- - -	432	4,351	3 9	- 1 -	271 14
0 0	Ditto - - -	1,290	29,084	6 6	- 1 2	2,120 11	- - -	- - -	- - -	- - -	- - -
19 0	Ditto - - -	- - -	- - -	- - -	- - -	- - -	1,570	23,664	5 0	- 1 1	1,602 12
0 0	Ditto - - -	170	1,495	3 3	- 1 -	93 7	- - -	- - -	- - -	- - -	- - -
20 0	Ditto - - -	- - -	- - -	- - -	- - -	- - -	110	112	0 6	- - 10	5 13
0 0	Ditto - - -	1,650	21,108	4 3	- 1 -	1,319 4	- - -	- - -	- - -	- - -	- - -
21 0	Ditto - - -	1,760	9,084	2 0	- - 11	520 7	- - -	- - -	- - -	- - -	- - -
22 0	Clayey and soft light soil	- - -	- - -	- - -	- - -	- - -	8½	41	2 0	- - 11	2 6
0 0	Ditto - - -	1,751½	35,362	8 0	- 1 4	2,946 13	- - -	- - -	- - -	- - -	- - -
23 0	Ditto - - -	- - -	- - -	- - -	- - -	- - -	163	1,167	2 9	- 1 -	72 11
0 0	Ditto - - -	1,597	24,550	5 0	- 1 1	1,662 4	- - -	- - -	- - -	- - -	- - -
24 0	Soft loose soil - - -	- - -	- - -	- - -	- - -	- - -	1,090	42,443	9 6	- 1 6	3,979 -
0 0	Ditto - - -	536½	1,246	1 0	- - 10	64 14	- - -	- - -	- - -	- - -	- - -
25 0	Ditto - - -	1,760	14,691	3 0	- 1 -	918 3	- - -	- - -	- - -	- - -	- - -
26 0	Ditto - - -	1,760	6,564	1 4	- - 10	341 14	- - -	- - -	- - -	- - -	- - -
27 0	Ditto - - -	- - -	- - -	- - -	- - -	- - -	52	184	1 6	- - 10	9 9
0 0	Ditto - - -	1,708	16,103	3 6	- 1 -	1,006 7	- - -	- - -	- - -	- - -	- - -
28 0	Ditto - - -	- - -	- - -	- - -	- - -	- - -	123½	419	1 6	- - 10	21 13
0 0	Ditto - - -	1,636½	12,540	2 9	- 1 -	783 12	- - -	- - -	- - -	- - -	- - -

Appendix (B.)

on the proposed Line of Railway between Madras and Menil.

STONE FACING				Side Drains, Laterite Rough Stone, in Brick and Chunam.		Drains, Bridges, &c, vide Statement		Foot Bridges.		Level Crossings.		TOTAL.
Length in Yards.	Cubical Content in Yards.	Rate per cubic Yard	Amount.	Length in Yards.	Amount	No.	Amount	No.	Amount.	No.	Amount.	
		Rs a.	Rs a.		Rs. a.		Rs. a		Rs a		Rs a	Rs. a
									1,000 -	3	450 -	2,178 13
180	270	1 -	270 -			1	100 -		2,000 -	1	150 -	3,365 5
105	157½	1 -	157 8			2	250 -	1	1,000 -	1	150 -	2,619 3
752	440	- 12	330 -			2	350 -					2,065 10
						6	630 -	1	1,000 -	1	150 -	2,277 4
						1	100 -					1,435 1
480	360	- 12	270 -			2	200 -	1	1,000 -	1	150 -	2,747 6
						7	850 -			1	150 -	3,364 10
600	1,200	- 12	900 -	2,054½	2,054 11	1	750 -					10,710 2
400	2	- 12	150 -			2	850 -	1	1,000 -			6,590 1
						1	350 -			1	150 -	1,045 11
				2,300	2,300 -	1	300 -	1	1,000 -	1	150 -	5,711 -
				540	540 -	2	545 -	1	1,000 -	1	150 -	6,775 11
				1,560	1,560 -	2	515 -	1	1,000 -			5,103 3
600	900	- 12	675 -	1,400	1,400 -	2	595 -			1	150 -	6,324 4
						2	200 -	1	1,000 -			1,755 10
						1	225 -					1,041 2
						2	325 -	1	1,000 -			3,717 9
100	150	- 12	112 8					1	1,000 -	1	150 -	2,958 3
460	690	- 12	517 8			5	1,200 -					3,042 9
						3	300 -	1	1,000 -			1,820 7
800	1,200	- 12	900 -			5	625 -	1	1,000 -	1	150 -	5,624 3
						2	510 -	1	1,000 -	1	150 -	3,394 15
				2,180	2,180 -							6,223 14
						5	500 -	1	1,000 -	1	150 -	2,568 3
						5	690 -	1	1,000 -	1	150 -	2,181 14
338	567	- 12	380 4							1	150 -	1,546 4
1,133	1,343	- 12	1,007 4			3	535 -			1	150 -	2,497 13

Appendix (B.)—continued.

ESTIMATE of the probable cost of Earthwork, Drains, Bridges, &c.,

Number of Miles.	Description of Soil.	EMBANKMENT.					CUTTING.				
		Length in Yards	Cubical Content in Yards.	Average Height in Feet.	Rate per cubic Yard.	Amount.	Length in Yards.	Cubical Content in Yards.	Average Depth in Feet.	Rate per cubic Yard.	Amount.
<i>M. fur.</i>				<i>ft. in.</i>	<i>Rs a. p.</i>	<i>Rs. a.</i>			<i>ft. in.</i>	<i>Rs. a. p.</i>	<i>Rs. a.</i>
29 0	Soft loose soil - -	1,760	18,944	3 9	- 1 -	1,184 -	- -	- -	- -	- -	- -
30 0	Ditto - - -	- -	- -	- -	- -	- -	18½	12	0 3	- - 10	- 10
0 0	Ditto - - -	1,741½	19,559	3 0	- 1 -	1,222 7	- -	- -	- -	- -	- -
31 0	Ditto - - -	1,494½	14,062	3 6	- 1 -	878 14	- -	- -	- -	- -	- -
32 0	Ditto - - -	- -	- -	- -	- -	- -	99	273	1 3	- - 10	14 4
0 0	Ditto - - -	1,661	13,538	3 0	- 1 -	846 2	- -	- -	- -	- -	- -
33 0	Ditto - - -	1,760	16,486	3 6	- -	1,030 6	- -	- -	- -	- -	- -
34 0	Clayey - - -	1,760	26,033	4 9	- 1 1	1,762 10	- -	- -	- -	- -	- -
35 0	Soft loose soil - -	- -	- -	- -	- -	- -	440	961	1 0	- - 10	50 1
0 0	Ditto - - -	1,320	5,716	1 3	- - 10	297 11	- -	- -	- -	- -	- -
36 0	Gravelly, stony and soft clay.	1,740	23,673	4 6	- 1 1	1,602 14	- -	- -	- -	- -	- -
37 0	Ditto - - -	- -	- -	- -	- -	- -	480	3,745	3 0	- 1 1	253 9
0 0	Ditto - - -	1,280	23,456	5 9	- 1 2	1,710 5	- -	- -	- -	- -	- -
38 0	Gravelly, stony and clayey.	- -	- -	- -	- -	- -	160	553	1 6	- - 11	81 12
0 0	Ditto - - -	1,600	47,193	8 0	- 1 6	4,424 6	- -	- -	- -	- -	- -
39 0	Clayey and gravelly hard soil	- -	- -	- -	- -	- -	510	2,511	2 0	- 1 1	170 -
0 0	Ditto - - -	1,250	8,979	2 6	- 1 1	607 15	- -	- -	- -	- -	- -
40 0	Gravelly and hard soil	- -	- -	- -	- -	- -	1,760	13,900	3 0	- 1 2	1,013 8
41 0	Gravelly and clayey -	- -	- -	- -	- -	- -	1,100	29,161	7 6	- 1 4	2,430 1
0 0	Ditto - - -	660	15,275	6 6	- 1 6	1,272 15	- -	- -	- -	- -	- -
42 0	Clayey, gravelly hard soil.	- -	- -	- -	- -	- -	720	4,161	2 3	- 1 1	261 12
0 0	Ditto - - -	820	7,796	3 6	- 1 2	568 7.	- -	- -	- -	- -	- -
43 0	Gravelly hard soil -	- -	- -	- -	- -	- -	900	6,240	2 9	- 1 2	455 -
0 0	Ditto - - -	860	3,231	1 6	- 1 1	218 3	- -	- -	- -	- -	- -
44 0	Ditto - - -	- -	- -	- -	- -	- -	1,405	22,287	5 0	- 1 3	1,741 3
0 0	Ditto - - -	335	2,072	2 6	- 1 1	140 5	- -	- -	- -	- -	- -
45 0	Ditto - - -	- -	- -	- -	- -	- -	1,050	36,376	8 9	- 1 6	3,410 14
0 0	Ditto - - -	710	11,053	5 0	- 1 3	863 8	- -	- -	- -	- -	- -
46 0	Ditto - - -	- -	- -	- -	- -	- -	1,090	13,891	4 3	- 1 2	1,012 14
0 0	Ditto - - -	670	4,776	2 6	- 1 1	- -	- -	- -	- -	- -	- -
47 0	Ditto - - -	- -	- -	- -	- -	- -	1,055	24,983	6 9	- 1 4	2,081 15
0 0	Ditto - - -	705	11,799	5 3	- 1 3	921 13	- -	- -	- -	- -	- -
48 0	Ditto - - -	- -	- -	- -	- -	- -	610	6,884	4 0	- 1 2	501 15
0 0	Ditto - - -	1,150	13,362	4 0	- 1 2	974 5	- -	- -	- -	- -	- -
49 4½	Ditto - - -	1,073½	13,967	4 6	- 1 2	1,018 7	- -	- -	- -	- -	- -
-	TOTAL - - -	- -	793,495	- -	- -	57,633 7	- -	362,364	- -	- -	30,321 1

Appendix (B.)—continued.

on the proposed Line of Railway between Madras and Menil—continued.

STONE FACING.				Side Drains, Laterite Rough Stone, in Brick and Chunam.		Drains, Bridges, &c., <i>vide</i> Statement.		Foot Bridges.		Level Crossings		TOTAL.
Length in Yards.	Cubical Content in Yards	Rate per cubic Yard	Amount	Length in Yards.	Amount.	No.	Amount.	No.	Amount	No.	Amount	
		<i>Rs a</i>	<i>Rs. a.</i>		<i>Rs a.</i>		<i>Rs. a.</i>		<i>Rs. a</i>		<i>Rs a</i>	<i>Rs a</i>
1,100	880	- 12	660 -	- -	- - -	2	1,110 -	1	1,000 -	1	150 -	4,104 -
426	319½	- 12	239 10	- -	- - -	1	420 -	1	1,000 -	-	- -	2,882 11
-	-	-	-	-	- - -	4	50,465 -	-	- - -	-	- - -	51,343 14
-	-	-	-	-	- - -	10	1,310 -	2	2,000 -	1	150 -	4,320 6
-	-	-	-	-	- - -	8	800 -	-	- - -	-	- - -	1,830 6
-	-	-	-	-	- - -	2	1,700 -	-	- - -	1	150 -	3,612 10
-	-	-	-	-	- - -	6	770 -	1	1,000 -	-	- - -	2,117 12
-	-	-	-	-	- - -	1	675 -	-	- - -	-	- - -	2,277 14
-	-	-	-	-	- - -	1	1,050 -	-	- - -	-	150 -	3,163 14
-	-	-	-	-	- - -	3	550 -	1	1,000 -	-	- - -	6,006 2
-	-	-	-	-	- - -	2	350 -	1	1,000 -	1	150 -	3,277 15
-	-	-	-	-	- - -	-	- - -	-	- - -	1	150 -	1,163 8
650	812½	- 12	609 6	2,200	2,200 -	1	290 -	-	- - -	1	150 -	6,952 6
-	-	-	-	-	- - -	1	225 -	1	1,000 -	1	150 -	2,225 3
-	-	-	-	-	- - -	1	375 -	1	1,000 -	1	150 -	2,198 3
-	-	-	-	-	- - -	1	375 -	1	1,000 -	1	150 -	3,406 8
-	-	-	-	2,100	2,100 -	3	805 -	1	1,000 -	1	150 -	8,329 6
-	-	-	-	-	- - -	1	180 -	1	1,000 -	-	- - -	2,516 4
-	-	-	-	2,110	2,110 -	2	420 -	-	- - -	1	150 -	5,683 12
-	-	-	-	-	- - -	1	100 -	1	1,000 -	1	150 -	2,726 4
-	-	-	-	-	- - -	2	750 -	-	- - -	-	- - -	1,768 7
-	-	-	7,179 -	-	16,444 11	-	74,215 -	-	31,000 -	-	4,800 -	2,21,593 3

Appendix (C.)

ESTIMATE of BRIDGES and DRAINS required on the proposed Line of Railway between
Madras and Mentl.

Number.	Miles.	NATURE OF WORK.	Number of Vents	Span.	Height of Piers.	Probable Cost of each.			Estimated Cost for each Mile.		
						£.	s.	d.	£.	s.	d.
1	2	Irrigation channel	1	3	1	100	-	-	100	-	-
2	3	- ditto	1	3	1	100	-	-	250	-	-
3	-	Culvert	1	5	2	150	-	-			
4	4	- ditto	1	5	2	150	-	-			
5	-	- ditto	1	5	2	200	-	-	350	-	-
6	5	- ditto	2	4	1½	130	-	-			
7	-	Irrigation channel	1	3	1	100	-	-	630	-	-
8	-	- ditto	1	3	1	100	-	-			
9	-	- ditto	1	3	1	100	-	-			
10	-	- ditto	1	3	1	100	-	-			
11	-	- ditto	1	3	1	100	-	-			
12	6	- ditto	1	3	1	100	-	-	100	-	-
13	7	- ditto	1	3	1	100	-	-	200	-	-
14	-	- ditto	1	3	1	100	-	-			
15	8	- ditto	1	3	1	100	-	-			
16	-	- ditto	1	3	1	100	-	-	850	-	-
17	-	- ditto	1	3	1	100	-	-			
18	-	- ditto	1	3	1	100	-	-			
19	-	- ditto	1	3	1	100	-	-			
20	-	- ditto	1	3	1	100	-	-			
21	-	Bridge	1	8	3	250	-	-	750	-	-
22	9	- ditto	1	18	4	750	-	-			
23	10	- ditto	1	18	4	750	-	-			
24	-	Irrigation channel	1	3	1	100	-	-	850	-	-
25	11	Bridge	4	5	1½	350	-	-	350	-	-
26	12	- ditto	3	6	1½	300	-	-	300	-	-
27	13	- ditto	1	6	2	225	-	-	545	-	-
28	-	- ditto	1	12	2	320	-	-			
29	14	- ditto	1	6	2	225	-	-			
30	-	- ditto	1	10	3	290	-	-	515	-	-
31	15	- ditto	1	10	2	275	-	-			
32	-	Culvert	1	10	4	320	-	-			
33	16	Irrigation channel	1	3	1	100	-	-	200	-	-
34	-	- ditto	1	3	1	100	-	-	225	-	-
35	17	Bridge	1	6	2	225	-	-			
36	18	- ditto	1	6	2	225	-	-			
37	-	Irrigation channel	1	3	1	100	-	-	325	-	-
38	20	Bridge	2	15	3	800	-	-	1,200	-	-
39	-	Irrigation channel	1	3	1	100	-	-			
40	-	- ditto	1	3	1	100	-	-			
41	-	- ditto	1	3	1	100	-	-			
42	-	- ditto	1	3	1	100	-	-			
43	21	- ditto	1	3	1	100	-	-	300	-	-
44	-	- ditto	1	3	1	100	-	-			
45	-	- ditto	1	3	1	100	-	-			
46	22	- ditto	1	3	1	100	-	-	625	-	-
47	-	- ditto	1	3	1	100	-	-			
48	-	- ditto	1	3	1	100	-	-			
49	-	- ditto	1	3	1	100	-	-			
50	-	Culvert	1	6	2	225	-	-			
51	23	Bridge	1	6	3	225	-	-	510	-	-
52	-	- ditto	1	6	3	225	-	-			
53	25	Irrigation channel	1	3	1	100	-	-	500	-	-
54	-	- ditto	1	3	1	100	-	-			
55	-	- ditto	1	3	1	100	-	-			
56	-	- ditto	1	3	1	100	-	-			
57	-	- ditto	1	3	1	100	-	-			
58	26	Bridge	1	8	4	290	-	-	690	-	-
59	-	Irrigation channel	1	3	1	100	-	-			
60	-	- ditto	1	3	1	100	-	-			
61	-	- ditto	1	3	1	100	-	-	100	-	-
62	-	- ditto	1	3	1	100	-	-			

Number	Miles.	NATURE OF WORK.	Number of Vents	Span.	Height of Piers	Probable Cost of each		Estimated Cost for each Mile	
						£	s. d.	£.	s. d.
63	28	Culvert - - -	1	6	2	225	- -	535	- -
64	-	Irrigation channel - - -	1	3	1	100	- -		
65	-	Culvert - - -	1	8	-	210	- -		
66	29	- ditto - - -	1	8	-	210	- -	1,110	- -
67	-	Bridge - - -	3	15	3	900	- -		
68	30	- ditto - - -	2	8	-	420	- -	420	- -
69	31	- ditto - - -	1	3½	2½	140	- -		
70	-	Irrigation channel - - -	1	3	1	100	- -	50,465	- -
71	-	Culvert - - -	1	6	2	225	- -		
72	-	- - Large bridge across Coortilliar	30	30	6	50,000	- -		
73	32	Bridge - - -	1	6	4	275	- -	1,310	- -
74	-	- ditto - - -	1	3	2	125	- -		
75	-	Irrigation channel - - -	1	3	1	100	- -		
76	-	- ditto - - -	1	3	1	100	- -		
77	-	- ditto - - -	1	3	1	100	- -		
78	-	- ditto - - -	1	3	1	100	- -		
79	-	- ditto - - -	1	3	1	100	- -		
80	-	- ditto - - -	1	3	1	100	- -		
81	-	- ditto - - -	1	3	1	100	- -		
82	-	Bridge - - -	1	5	3	210	- -		
83	33	Irrigation channel - - -	1	3	1	100	- -	800	- -
84	-	- ditto - - -	1	3	1	100	- -		
85	-	- ditto - - -	1	3	1	100	- -		
86	-	- ditto - - -	1	3	1	100	- -		
87	-	- ditto - - -	1	3	1	100	- -		
88	-	- ditto - - -	1	3	1	100	- -		
89	-	- ditto - - -	1	3	1	100	- -		
90	-	- ditto - - -	1	3	1	100	- -		
91	34	Bridge - - -	2	10	3½	650	- -	1,700	- -
92	-	- ditto - - -	3	15	5	1,050	- -		
93	35	- ditto - - -	1	8	2	270	- -	770	- -
94	-	Irrigation channel - - -	1	3	1	100	- -		
95	-	- ditto - - -	1	3	1	100	- -		
96	-	- ditto - - -	1	3	1	100	- -		
97	-	- ditto - - -	1	3	1	100	- -		
98	-	- ditto - - -	1	3	1	100	- -	675	- -
99	36	Bridge - - -	2	10	4	675	- -		
100	37	- ditto - - -	3	15	5	1,050	- -	1,050	- -
101	38	- ditto - - -	1	12	3	350	- -		
102	-	Irrigation channel - - -	1	3	1	100	- -	550	- -
103	-	- ditto - - -	1	3	1	100	- -		
104	39	Bridge - - -	1	6	3	250	- -	350	- -
105	-	Irrigation channel - - -	1	3	1	100	- -		
106	41	Bridge - - -	1	10	3	290	- -	290	- -
107	42	- ditto - - -	1	6	2	225	- -		
108	43	- ditto - - -	3	4	-	375	- -	375	- -
109	44	- ditto - - -	3	4	-	375	- -		
110	45	- ditto - - -	5	4	-	475	- -	805	- -
111	-	Irrigation channel - - -	1	3	1	100	- -		
112	-	Bridge - - -	1	8	2½	230	- -	180	- -
113	46	- ditto - - -	1	6	-	180	- -		
114	47	- ditto - - -	1	12	2	320	- -	420	- -
115	-	Irrigation channel - - -	1	3	1	100	- -		
116	48	- ditto - - -	1	3	1	100	- -	100	- -
117	49	Bridge - - -	3	9	1½	650	- -		
118	-	Irrigation channel - - -	1	3	1	100	- -	750	- -
						£.	74,215		

(signed) T T Pears.

Appendix (D.)

ESTIMATE of the Probable Cost of laying the Permanent Way for a Single Line Railway from Madras to Menil, 50 Miles, including Sidings.

	Per Mile.		
	Rs.	a.	p.
Rails, 60 lbs. to the yard :			
Wrought iron rails, 94·3 tons, at 9 l. - - - - -	8,484	-	-
1,761 sleepers, each 8 × 10 × 5 5,283 cubic feet, at 1 rupee	5,283	-	-
Chairs, 706, joint - - - } Ditto, 2,816 intermediate } 25 tons, at 7 l. - - - - -	1,750	-	-
Ballast, 2,200 cubic yards, at 1 rupee - - - - -	2,200	-	-
3,522 keys, at 1 anna each - - - - -	221	-	-
7,750 spikes or tienails, at 1 anna - - - - -	487	-	-
Laying rails - - - - -	400	-	-
Sundries - - - - -	172	-	-
TOTAL for one Mile - - - - -	19,000	-	-
Ditto for 50 Miles - - - - -	Rs. 9,50,000	-	-

(signed) T. T. Pears.

EXTRACT from the Minutes of Consultation, No. 35, Public Department, dated 12th January 1852.

Para. 1. IN Minutes of Consultation, No. 812, dated 29th August 1851, the Government, considering the line running nearly due west from Madras by Menil to be one decidedly preferable for a trunk railway, to serve as a basis whence similar ways could be carried in the direction of the Mysore country and the ceded districts on the one hand, and towards Vellore, Salem, &c. on the other, Major Pears was instructed to survey that line as far as Menil, or onwards to some place on the right bank of the Poiney River, convenient for the divergence of the line towards Vellore and the Ghauts respectively.

2. Major Pears having completed the survey of this line as far as Menil, now submits a report upon it, with an estimate of the cost of a railway to that place, distant from Madras 48 miles. The survey has proved the line to be most eligible. It offers no difficulties of any kind, and the country through which it passes is much more favourable than that on the line to Wallajahnuggur before surveyed. The earthwork, though the amount per mile is nearly the same as in the Wallajahnuggur line, will cost less, from the soil being more easily wrought. The works of masonry required are of the commonest and most trifling description, with exception of a bridge over the Coortilliar, the construction of which will be a work of the simplest kind. The cost of this bridge for a single line of rails Major Pears estimates at 50,000 rupees.

3. The steepest gradient is only 1 on 309, the whole rise from Madras to Menil being 360 feet: the gradients in the line by Menil being more favourable than on that to Wallajahnuggur, the working expenses would of course be lighter. The total cost per mile is 36,488 rupees, including permanent way, rolling stock, &c., estimated on the same data as were adopted in the estimate for the Wallajahnuggur line.

4. It is not to be understood that Menil is a desirable terminus: it is only to be looked upon as a point to which, whatever may be the ulterior purpose, a railway to the westward may be carried with certainty that it is on the right line; and the Government concur with Major Pears that the line to Menil, the best for a trunk line, should be substituted for that previously surveyed to Wallajahnuggur.

5. The circumstances to which Major Pears refers as conspiring to prompt and encourage an undertaking of this nature in this part of the country and at this juncture are very important. The surveys and estimate show that this
Presidency

Presidency offers facilities and advantages for railroad construction greatly beyond those possessed by the other Presidencies; whilst its need of a superior land communication from its central district to the coast is as obvious; and, upon mature consideration of the subject in all its bearings, the Government deem it decidedly their duty to make an earnest application to the Honourable the Court of Directors for their sanction to the construction of a railway on this line as a public work at the expense of the State, and for authority to commence it immediately, if sanction is accorded, beginning with the portion indicated by Major Pears in the 37th para. of his report, and proceeding as he recommends, adopting his estimate for the earthwork and masonry, during the progress of which the other parts of the estimate can be tested in such manner as the Honourable Court may deem fit.

6 Major Pears' remarks on his examination of the Ghauts leading into the upper country, so far as it has gone, are highly satisfactory, as are likewise his observations with regard to the general features of the country between Madras and Menul, the facility with which labour can be rendered available, the period within which a portion at least of the railway might be completed, and the almost certain impulse which it would give to traffic, not merely on the immediate line, but to and from the districts lying within its influence.

pp 34-36

7. Major Pears will, therefore, proceed with his survey of the Ghauts and of the intermediate country, with a view to determine the most favourable line of ascent from the plain to the Balaghat, and of approach to the place at which the ascent will best commence, studying to carry the trunk road as far forward as it can conveniently serve in common for a line in that direction, as well as for one by Vellore to Vaniembady

8. The Governor in Council is glad to observe, that from the partial examination he has already made of the Ghauts, Major Pears is sanguine that the difficulty of ascending them will be overcome at much less cost than has generally been anticipated.

9 Referring to Major Pears's estimate for the bridge over the Coortulliar as for a single line, the Government consider it expedient that the bridges, at least on the trunk lines, should be adapted for a double railway.

10. Should the Honourable Court accord their sanction to the work, the necessary orders will be given for the employment of a detachment of sappers and miners on the railway, and Major Pears's suggestion regarding convicts and buildings for their accommodation, will receive consideration.

(True extract.)

(signed) *H. C. Montgomery,*
Chief Secretary.

From Major *T. T. Pears*, C. B., Engineers, to the Chief Secretary to Government, Fort St. George.

Sir,

Palmanair, 6 July 1852.

1. By an extract from Minutes of Consultation in the Public Department (No 35), dated the 12th January 1852 (para. 7), I was instructed to proceed with a survey of the Ghauts, and of the intermediate country, with a view to determine the most favourable line of ascent from the plain to the Balaghat, and of approach to the place at which ascent will best commence. Studying to carry the trunk road as far forward as it can conveniently serve in common for a line in that direction, as well as for one by Vellore to Vaniembady, I have now the honour to submit a report of the result of my inquiries up to the present time.

2. Assuming that a line running nearly due west from Madras, for 60 miles at least, is acknowledged to be the best for us to begin with as the trunk from which ramifications might be made to Salem, Bangalore and Bellary, the desiderata for a passage up the Ghauts are—

1st. That the pass should be made with the best possible gradients and curves, at the least possible cost.

2dly. That it should be in the most favourable position with reference to the proposed line from the termination of the above trunk to Bellary.

3dly. That the same pass should serve for the Bangalore as well as the Bellary line.

3. With respect to the first of these, it is to be observed, that the Eastern Ghauts, as they are commonly termed (which a line from Madras must pass to communicate with the Bombay or the north-western portion of our own Presidency), constitute here the steep and rugged slope of the Mysore tableland. Their elevation above the sea at their crest (as at Palmanair or Naikenary) is about 2,000 or 2,100 feet. The portion of the Ghauts with which we have to do, stands at a distance of about 110 or 120 miles from Madras.

4. We have, therefore, to begin a line to Bellary and Bangalore, by surmounting an elevation of 2,000 feet within the first 120 miles, and are led to the consideration of two different modes of accomplishing this; the one, by running to the base of the Ghauts on a nearly level plain, reserving the greater part of the height to be overcome at the Ghaut itself; the other, by selecting a line which shall lift us gradually towards the crest of the Ghauts, and leave as small a portion as possible of the height to be overcome by an abrupt pass.

5. In looking carefully over the map, two such lines present themselves to us here, leading nearly westward from Madras to the Ghauts. The one, falling on the bank of the Palaur, near Trevallum, would follow that river to Polecondah; and thence along the bank of the Goriattum river to Goriattum, and from thence at an increased rate of ascent, to the foot of the Ghauts beyond Lallpet, at which point it would have reached an elevation of about 1,100 feet, and a distance (from Madras) of 115 miles, having risen at an average rate of nine and a half feet in a mile; 900 or 1,000 feet would thus be left for the Ghaut.

6. On the other hand, if we carry a line from Madras, by Poiney, to the vicinity of Mooglee, we find that on reaching there the foot of the Ghauts (a distance of about 115 miles), we have ascended 1,600 feet, and that there remain but 500, or somewhat less, on the Ghaut itself.

7. Of two such projects, all other things being alike, the cost of the work, the gradients, and other characteristics of the passes, the same preference would be given to that which concentrated the rise at the Ghaut itself, running by very easy gradients up to its base. It would be preferable as a whole, still more decidedly so, when considered with reference to that considerable amount of traffic which has only to do with the portion below the Ghauts.

8. As far as the lateral traffic is concerned which falls upon the line short of the Ghauts, it is evident, the greater part of it having a downward tendency towards the sea, that the line kept on the lower level would be, to a certain extent, more advantageous than one raised to a level above the sources of that traffic. Considerations such as these are entitled to some weight, though perhaps not much in this case.

9. The great difficulty, however, when so great a height is reserved for the Ghaut itself, is to find a favourable pass. Thus, in the two cases above mentioned, we should in the one have to overcome at the pass itself 1,000 feet, in the other, 500; the length of the pass (the slopes being the same), would be in the former double that of the latter; while the difficulty and improbability of getting favourable curves would be proportionately enhanced.

10. I have examined the Ghauts between Toombah Droog (north of Palmanair) and Naikenary, and my attention has been particularly directed to the neighbourhood of the two latter places; the former appears to promise the best pass; the latter, the best approach to the pass.

11. The Ghauts about Naikenary, and between that and Cuddapahnuttum, are exceedingly rugged; the ravines generally narrow and abrupt. There is one very remarkable ravine, which appears on the map to run in nearly a direct line from the plain above, near Moolwagle, to the foot of the Ghauts, near the bottom of the old Naikenary Pass.

12. This I examined with care; and I came to the conclusion that, although it seemed to offer a singularly direct and convenient line for a railway, to be carried

carried by a gradual slope up to the higher country, such a work could not be executed without a vast expenditure of money, nor be subsequently maintained but at a constant and great cost. The sides of the ravine (which is remarkably narrow) are very steep; and though apparently direct, it is tortuous enough to render the construction of a straight line of railway very expensive; while the steepness of its rocky sides would render necessary a large amount of building and very expensive cutting in laying a line of railway along either of them. Seeing these difficulties, and the more favourable position of Palmanair, I turned my attention to that neighbourhood.

13. It would be readily observed, in looking at the map, that that part of the district of North Arcot which lies below the Ghauts and between the Rivers Palaur and Poiney, is divided into two portions by a ridge, which sinks gradually as it extends, in an indirect line, from a point a little south of Mooglee to Trivallum, near the junction of the two rivers.

14. This water-shed, the sides of which are intersected by numerous bold rocky ranges of hills, throws off the water in numberless streams to the Palaur on the one hand, to the Poiney on the other. The ridge abuts against the Ghauts at the village Taikmana, at an elevation which only leaves about 440 feet to be surmounted in ascending to the plains above.

15. I had ascertained, as stated in my report of 5th March 1851, that a line might be carried without difficulty to the foot of the Ghauts in this vicinity, it only remained, therefore, to find a convenient pass near Taikmana.

Para 89

16. The line which I have selected for the pass, after a very careful examination of the neighbouring country, starts near Taikmana, and, running up a valley south of, and immediately under, Mooglee Hill, reaches the top of the Ghauts, not far from the village of Mussulmarroo, about four miles south of Palmanair; it would then be continued over an undulating but very favourable country by the village of Pengragoonta, and, sweeping gradually to the north, would cross the present high road to Bangalore (from Madras and Chittoor), at a point two miles west of Palmanair; and here I propose that my present survey shall end.

17. The pass is four miles in length; the total ascent is 440 feet, being an average of 110 feet in a mile; the maximum slope is 1 in 36 or 37, according to two sets of trial sections which have been taken. Its length is divided into four parts, beginning at the bottom; viz.—

1st. A direct line for about	-	-	-	-	1,100 yards.
2d. A curve (to a radius of one mile)	-	-	-	-	1,000 "
3d. A direct line	-	-	-	-	3,600 "
4th. A curve to a radius of one mile	-	-	-	-	1,300 "

18 I do not anticipate that the construction of a railway on this pass will be attended with any difficulty, or with any very great expense. I have been struck with the singularly fortunate concurrence of the point of least elevation with one of the most direct and open valleys I have seen along the whole range

19 With regard to the applicability of locomotive power on a slope of 1 in 36 or 37 (in an economical point of view), although I have notes of many steeper gradients so worked, it will be sufficient to instance the case of the well-known "Lickey incline" on the Birmingham and Gloucester Railway.

20. The length of this incline is two miles and three chains, with a uniform gradient of 1 in 37; this has been always worked by locomotive power, at one time by the aid of an assistant engine. Mr. M'Connell, Superintendent of the Locomotive Department on that railway, stated before the Parliamentary (Gauge) Committee in 1845, that they had constructed an engine (which he describes) to work the incline without assistance; and that the engine carried a load of from 135 to 148 tons up the incline, at a rate of from 8 to 10 miles an hour: other examples show that trains may be worked down such inclines with perfect safety.

21. The other two desiderata for a pass up the Ghauts may be discussed in a few words. The object in this case being to get to Bellary, it will be found

that, though Palmanair appears somewhat south and west of a direct line, any attempt to pass to the northward would not only lead to a difficult part of the country below the Ghauts, but would entangle us among the hilly districts of Cuddapah above. Not only, therefore, have we a favourable line to this Ghaut, and a very convenient pass up, but we have the most direct line to Bellary that is to be found on anything like a favourable country.

22. I assume that we shall be obliged to pass to the westward of the Cuddapah district, to run (supposing it was determined to make a direct line to Bellary) towards Bangapilly from Palmanair, and to pass, when opportunity offered, into the Valley of the Pennar.

23. Further, with respect to this pass serving also for Bangalore, I need only add that it is in the direct line to that place from Madras; and the construction of a line from the head of the pass to that station would be attended with no difficulty.

24. Under these circumstances, I have not hesitated in undertaking a survey and estimate from Menil towards and up this pass, feeling assured that no other will be found so favourable, upon the whole, for a great trunk line of railway; and I shall describe the course of the line in a few words, leaving more particular report upon it to be submitted hereafter with the survey.

25. The line, starting from Menil, passes near the village of Quodekel, and follows a nearly westerly course till it arrives at the Poiney river, when it turns up the left bank of that river, passes the village of Poiney, four miles above which it turns short round, and crosses the river; it then pursues again a nearly westerly course, by Vencatapoorum, Narsapillay (four miles south of Chittoor) and Yadamari, passing up a succession of valleys, separated from each other by slight saddles. Approaching Vencatagherry, it has the choice of striking through, or turning by the north, a bold range of hills, which in this case cross its path; it then sweeps round the Valley of Bungaroo Pollium (near Vencatagherry), and runs up, at an increasing rate of ascent, to Taikmana.

26. From Menil to the Poiney the line is generally very favourable; from thence to Taikmana the average rate of ascent is greater, being about 25 feet in the mile, and the country becomes rugged.

I shall endeavour to submit the survey and estimates with as little delay as possible.

27. In the meantime, having satisfied myself that this is the most eligible line for a passage up the Ghauts, I have considered it my duty to make this preliminary report thereon, seeing that the question of the first line to be sanctioned depends in so great a measure on the best position for the pass, and that Government might desire to be informed on this point without delay.

28. Although a railway up the Amboor Valley to Vaniembady might, doubtless, be constructed at a much less cost than that now under consideration to Palmanair, the line which I have selected for the latter is much more favourable than I expected to find across a country justly described by the late Captain Best as "covered with rocks and rocky hills;" while the proposed pass up the Ghauts exhibits many unexpected and favourable features. Under these circumstances, the question of the choice between the two for an experimental line assumes a new aspect.

29. Of the superior value of this (the Bellary) line, in a political point of view, there can be no doubt; neither can there be any question, I think, as to its greater ultimate importance to the agricultural and commercial interests of this Presidency. How far the first, the experimental portion of it, would fall short of the other as a remunerative undertaking, must depend greatly upon the cost of construction; unless the estimated cost of this exceeds that of the other to a very serious extent, the Government will probably consider the superior importance of this, as a trunk line, gives it the preference over the other as the work to be first undertaken. I may observe here, that the pass up these Ghauts once overcome, the way to the north-west lies open; neither, as far as I know of the country, do I believe any serious difficulty to remain between that and Poonah.

Report, 5th July
1851.

30. I have not yet looked at the Ghauts south of Naikenary ; but it is my intention to proceed in a few days to Kangoondy, and while this survey is under preparation to examine the Ghauts in the neighbourhood of Vaniembady. From what I already know of that country, I have no expectation of finding any pass for a railway that shall offer in itself advantages over that near Taikmana sufficient to counterbalance the disadvantages of its position with reference to the proposed trunk line.

I have, &c.
(signed) *T. T. Pears,*
Railway Commissioner.

EXTRACT from the Minutes of Consultation, No. 724, Public Department, dated 28 July 1852.

Para. 1. IN the foregoing report Major Pears lays before Government the result of his survey of the Ghauts, and the intermediate country between them and Menil, up to which place his previous survey extended.

2. The portion of the Ghauts to be surmounted is distant about 110 or 120 miles from Madras, and rises about 2,000 or 2,100 feet above the sea To accomplish this, two modes have been considered—one by running a line to the base of the Ghauts on a nearly level plain, beyond Lallpet, whereby an elevation of about 1,100 feet, and a distance of 115 miles from Madras, will be attained, leaving 900 or 1,000 feet to be overcome at the Ghaut itself ; the other by conveying a line by Poiney to the vicinity of Moogley, by which a distance of about 115 miles will be gained, and an ascent of 1,600 feet, leaving but 500, or somewhat less, to be surmounted. Whatever advantages the former line may possess over the latter in its easier approach to the Ghauts, and in affording greater facilities for traffic, the greater difficulty of finding a favourable pass when a height of 1,000 feet is to be overcome at the Ghaut itself, has led Major Pears to give the preference to the latter line, which he asserts can be carried without difficulty to the foot of the Ghauts, in the vicinity of Taikmana, whence the line he has selected for the pass commences, and, pursuing the course described in para. 16 of the Report, crosses the present high road to Bangalore, at a point two miles west of Palmanair, the pass, moreover, serving as well for the Bellary as for the Bangalore line.

Para. 3.

Para. 4 and 6

Para. 7 and 9

Para. 25
Para. 35
Para. 16

Para. 21.

3. The favourable features of the portion of the country through which the railroad is proposed to be carried, coupled with the importance of this line in a political point of view as regards Bellary, offer, in the opinion of Major Pears, a sufficient reason for giving it preference also over a line up the Amboor Valley to Vaniembady, though the latter might be constructed at a much less cost. The Ghauts in this neighbourhood, Major Pears, it is observed, proposes now to examine.

4. In reviewing the arguments adduced by Major Pears in favour of the line he has selected for a railroad, the Governor in Council has to express his gratification at the favourable result of the careful survey conducted by the Commissioner, as detailed in his present highly satisfactory report on the Ghauts.

5. A copy of the report, with the views of Government thereon, will be forwarded to the Honourable Court by the next mail, with an intimation that the survey and estimates promised in the 26th para. will, when received, be also transmitted.

6. Copies of Major Pears's Report and of these proceedings, also copies of the Minutes of Consultation of the 12th August last, and the Commissioner's Report to which they refer, will be also forwarded to the Madras Railway Committee.

(True extract.)

(signed) *H. C. Montgomery,*
Chief Secretary.

Public Department, No. 1,048.

Home Cons.
22 December 1852,
No. 23 A.

EXTRACT from the Minutes of Consultation, under date 9 November 1852.

Read the following letter from Major Pears, Railway Commissioner.

(Here enter 27 October 1852.)

1. THE Right Honourable the Governor in Council has perused with great interest and satisfaction the very clear and excellent report submitted by Major Pears, the Railway Commissioner, on the result of his examination of the Ghauts in the neighbourhood of Vaniembady. It appears to him to afford the most ample information, not only as to the whole range of Ghauts over which a railway leading into the interior from Madras must be led, but also as to the best line.

2. The lines proposed by Major Pears to be first constructed, amount to nearly 260 miles in length, and consist of five parts; viz.—

1st. A trunk line to Menil	- - - -	48 miles.
2d. A branch to Vellore and Vaniembady	- -	70 "
3d. The trunk line continued to foot of the Ghaut	-	53 "
4th. The Ghaut near Palmanair	- - - -	4 "
5th. From top of the Ghaut to Bangalore	- -	84 "
		259 "

The cost of construction and stocking is estimated at an average of 40,000 rupees per mile, which would give the total capital required 1,04,00,000 rupees, or something more than one million sterling. The interest on this, at 4½ per cent., amounts to 4,68,000 rupees, which, computing the working expenses at 50 per cent. on the receipts, it is stated would require an annual mileage of 57,600 tons upon the whole extent of way, or traffic of various kinds equivalent to it. Major Pears observes, that the traffic between Madras and Wallajah-nuggur may be even now taken, on a very reasonable estimate, at 50,000 tons of goods, besides parcels and passengers, and that when the vast influence the proposed lines would exercise upon some of the finest districts in Southern India, the impulse they would give to education and commerce, and their importance also in a political point of view, are considered, he cannot doubt either of the success of the work as a speculation, or of the great and lasting benefits it is calculated to confer on all classes of people in this part of India.

3. The Governor in Council will briefly remark, that he still retains the opinion he formerly recorded, that the chief trunk railway should run direct west from Madras to Menil, where it will divide into two original branches, one leading up the Ghaut near Palmanair, and the other to Vaniembady; of these original branches, that by Palmanair, and thence to Bangalore and Bellary, is, in his opinion, by far the most important in all points of view, though it may not at the very outset prove so profitable. He would, however, also strongly urge the formation at an early date of the second line by Vellore to Vaniembady, connecting the Southern and Western Provinces with the Presidency.

4. As the selection of the line has been left by the Honourable Court to the Government of India, the Governor in Council resolves to transmit to them without delay, a copy of Major Pears's report, and to solicit their early orders on the subject.

5. Though not immediately connected with the railway question, the Government consider it desirable that the road described in the 13th para. of Major Pears's report as leading "over an easy country" from Coppum (six miles west of Kongoody) to the top of the Ghaut near the village of Sadainoor, "and presented from bottom to top one continued and easy slope, without in any single case the appearance of steepness or difficulty," should be opened up for carts the whole way to Bangalore, and with this view they will take an early opportunity of appointing a competent officer to be employed under the orders of Major Pears in examining the line and framing an estimate for the formation of a road.

(True extract.)

(signed) *H. C. Montgomery,*
Chief Secretary.

MINUTE by the Most Noble the Governor-General, dated the
14th December 1852.

MADRAS RAILWAY.

ACQUAINT Government of Madras, that as the Honourable Court has directed that the opinion of the Supreme Government should be taken regarding the line or lines of railway to be adopted in the Presidency of Madras, the Governor-general in Council has been desirous of communicating his views on the subject with the least practicable delay.

Home Cons.
22 December 1852,
No. 26.

But the Honourable Court has at the same time addressed to the Governor-general in Council a despatch upon Indian railways generally, which they refer for his careful consideration and judgment. The subject is of the highest importance and of large scope; and upon the decision of it must depend the judgment to be formed regarding railways in Madras. The Governor-general in Council, therefore, is wholly unable to pronounce an immediate judgment on the local question, and he desires to acquaint the Government of Madras with the cause, in order that it may not be supposed that the Madras Railway is overlooked, or a decision upon it unduly delayed.

2d. The Governor-general in Council conceives that his consideration of it would be much facilitated by the presence of Major Pears, and he requests that that officer may proceed to Calcutta by the next steamer, if possible

(signed) *Dalhousie*

No. 982.

From *J. P. Grant*, Esq., Secretary to the Government of India, to *Sir H. C. Montgomery*, Bart., Chief Secretary to the Government of Fort St. George.

Home Cons.
22 December 1852,
No. 27.

Sir,

Fort William, 14 December 1852.

I AM directed to acknowledge the receipt of your letter, No 66, dated the 9th ultimo, forwarding a copy of the report of Major Pears, the Railway Engineer, on the result of his examination of the Ghats in the neighbourhood of Vaniambady, with the sentiments of the Right Honourable the Governor in Council as to the line of railway proposed to be adopted in the Madras Presidency.

Home Department,
Railway.

2. As the Honourable the Court of Directors have desired that the opinion of the Supreme Government should be taken regarding the line or lines of railway to be adopted in the Presidency of Madras, I am directed to acquaint the Right Honourable the Governor in Council, that the Most Noble the Governor-general of India in Council has been desirous of communicating his views on the subject with the least practicable delay.

3. But the Honourable Court has at the same time addressed to the Governor-general in Council a despatch upon Indian railways generally, which they refer for his careful consideration and judgment. The subject is of the highest importance, and of large scope, and upon the decision of it must depend the judgment to be formed regarding railways in Madras; the Governor-general in Council, therefore, is wholly unable to pronounce an immediate judgment on the local question; and he desires to acquaint the Government of Madras with the cause, in order that it may not be supposed that the Madras railway is overlooked, or a decision upon it unduly delayed.

4. The Governor-general in Council conceives that his consideration of it would be much facilitated by the presence of Major Pears, and he requests that the Right Honourable the Governor in Council will instruct that officer to proceed to Calcutta by the next steamer, if possible.

I have, &c.

(signed) *J. P. Grant*,
Secretary to the Government of India.

No. 75.

Home Cons
14 January 1853,
No. 48.

From Sir *H. C. Montgomery*, Bart., Chief Secretary to the Government of Fort St. George, to *J. P. Grant*, Esq., Secretary to the Government of India.

Sir.

Fort St. George, 23 December 1852.

Public Depart-
ment

I AM directed, in acknowledging the receipt yesterday evening of your letter of the 14th instant, No. 982, to state, for the information of the Most Noble the Governor-general in Council, that immediate measures were adopted for summoning Major Pears to the Presidency, and it is possible he will reach Madras in time to proceed to Calcutta by one of the two steamers expected before the close of this month.

2. Major Pears is at present on leave at Mercara, distant from Madras 370 miles; but arrangements have been made for facilitating his journey, which it is hoped will enable him to reach the Presidency by the 29th instant at latest: in the event of Major Pears being too late for the steamers, he will be directed to take advantage of any favourable opportunity that a sailing vessel may afford.

I have, &c.
(signed) *H. C. Montgomery*,
Chief Secretary.

No. 77.

Home Cons
7 January 1853,
No. 79

From Sir *H. C. Montgomery*, Bart., Chief Secretary to Government, Fort St. George, to *J. P. Grant*, Esq., Secretary to the Government of India.

Sir,

Fort St. George, 30 December 1852.

Public Depart-
ment.

WITH reference to my letter of the 23d instant, in reply to yours of the 14th idem, I have now the honour to inform you, that Major Pears, c. b., of the Madras Engineers, who proceeds to Calcutta by the Peninsular and Oriental Company's steam ship, hourly expected at this port, and who is the bearer of this letter, is prepared to afford to the Most Noble the Governor-general of India in Council full information regarding the projected Madras railway.

I have, &c.
(signed) *H. C. Montgomery*,
Chief Secretary.

OBSERVATIONS upon a Memorandum by Major *Kennedy* upon Indian Railways.

THE subject discussed in Major Kennedy's Memorandum of the 14th of September 1852 is one of such vast importance, both to the interests of the Government and to the prosperity and progress of the people of this country, that it cannot be too carefully considered, neither can it be too promptly determined.

2. The writer points out the immense value to the Government, as well as to the people, of a well-arranged system of railways, and proposes certain general rules, by an adherence to which, the required arrangement of that system may be effected.

3. Major Kennedy's observations and rules are for the most part expressed in general terms, and cannot, therefore, be fairly objected to when any difference of opinion may exist by reference to any individual, and it may be, exceptional case or cases.

4. I differ from Major Kennedy in many points; but I give my views in opposition to his with diffidence, not forgetting that I labour under the disadvantage of forming my opinion chiefly from books or from observations made upon matters carried on at the other side of the globe. The opportunities which I have enjoyed of seeing the practical working of railways have been merely such as the liberality of the Honourable Court, during a short furlough to England some years ago, afforded me.

5. Of the importance of railways in this country, whether to the people or the Government, alluded to by Major Kennedy, I need say little; there can be no doubt that their effects will be, must be, very great and beneficial, greater relatively

relatively than they have produced in any country in Europe; neither can the importance of laying down our lines judiciously and constructing them economically with a view to the people deriving the greatest possible amount of benefit from them, be over-estimated.

6. It is difficult, it is, in fact, impossible, to say what the exact nature or the precise amount of benefit will be; nor is it of much consequence, if men may reasonably differ as to the relative value of the social, the commercial, and the political results. It is quite sufficient we should feel satisfied, that as surely as effect ever followed cause, the introduction of the most powerful of all known physical agencies, that by which rapid, safe, and cheap communication between the different parts of the empire is at once provided, must lead to great results. Its operation upon the minds of the people is enough of itself to ensure all the rest, and great as may be the consequence of a large saving in the carriage of men and goods from point to point, the spread of science and education will effect still more in promoting the material as well as the moral well-being of the people.

7. I believe these, the indirect results of the operation of railways, inestimable as they are, to be by far the most important. I believe the best interests of Government to be identified with those of the people, and I think therefore, as I have elsewhere observed, that "We are in danger of doing great injustice to the people of this country, by looking upon these great works as mere commercial speculations; and, by meeting every railway project with the condition that it shall at once pay its own expenses, together with the interest of the money laid out on its construction"

Report, 5 March
1851, Para. 41.

8. There are, however, direct savings in money, which may be estimated with more or less of exactness. Applied to military purposes, the savings to Government effected by the railways would be great. In moving troops on occasions of ordinary periodical relief, in the conveyance of Ordnance and Commissariat stores, an annual saving to a large amount would be effected. There would be little difficulty in making, from the returns of the several departments for a series of years, an approximate calculation of what this saving would be: the same returns would show the number of miles of railway necessary to provide for all these reliefs. I am inclined, from our experience in the south of India, during the last 30 or 40 years, to value above all these advantages the saving of life. Movement of troops in that part of India is so frequently attended by, and so commonly appears to give rise to, epidemic cholera, as to give grounds for just apprehensions of its appearance in all such cases. The frightful loss of life on such occasions is not confined to troops and followers, but the unfortunate inhabitants along the whole line of march come in for their share of suffering and death. An instance came lately under my notice of a native corps in the Madras Presidency making a march of about 400 miles across the Peninsula, carrying the disease with it during a great part of the way, tainting every village on its course. I cannot think it an exaggeration to estimate at several hundred lives the cost of that march from coast to coast; a steamer would have brought the regiment round in a week; a railway would have carried them safely across in one day. If we wish to form some more definite idea of the saving in money to be effected by these works, we cannot do it better than by calculating the difference between the cost of carriage for a known amount of produce by the present roads, and that by a railway over the same extent. Assuming the moderate amount of 50,000 tons to pass annually over any given 500 miles of road, and saying nothing of the loss of time, the risk of injury done to the goods, two annas per ton per mile may be taken as a fair average charge for land carriage at the present time. If the charge per rail were one anna (and I consider this a maximum), the saving in hard money to the people concerned on the supposed line of road would be 15 lacs of rupees per annum. Major Kennedy proposes to begin with nearly 6,000 miles of rail, the saving upon which at this rate would be 180 lacs of rupees annually. It is not possible, to say nothing of the great benefits arising from the improved means of personal communication, nor of the mode in which a reduction in the charge of transport and an increased amount of traffic, are with respect to each other, both the cause and effect,—it is not possible that the removal of these great present burdens on the raw produce of this country, could fail in giving a great stimulus to production, raising the general condition

of the people, increasing the demand for European manufactures, and telling most beneficially upon the public revenues.

9. It might be considered an uncalled-for extension of this paper, were I to discuss the effect to be anticipated from the establishment of railways on the strength and efficiency of the army. That they must greatly contribute to promote vigour and efficiency in all our military arrangements and operations, there can be no doubt; but considering the position and duties of the great mass of the force, and the very small portion that can be considered as a reserve, solely required for purposes of foreign war, I confess that Major Kennedy's estimate of the possible reduction in our standing army, as the immediate consequence of the railways, appear to me very greatly overdrawn. The operations of railways are essentially peaceful; they have arisen out of, and naturally belong to, an era of peace, civilization and commerce, and their maintenance and use as a means of communication appear to be in a remarkable manner dependent upon the will and pleasure of the people: although, therefore, they greatly tend to facilitate the preliminary arrangements for aggressive war, and perhaps, though in a far less degree, contribute vigour and efficiency to preparations of a defensive character, we cannot with any safety calculate upon them in the case of active operations within our own frontier, or venture, in reliance upon them, to reduce materially our garrison. They will, we may hope, though indirectly and remotely, affect the strength of the army by so operating upon the character and pursuits of the people as to render so large a body of disciplined troops unnecessary.

10. I shall now make observations on the rules proposed in the 31st paragraph of Major Kennedy's memorandum, for our guidance in the arrangement, construction and working of Indian railways; but before doing so, it is necessary to say something on the important subject of gradients generally. The subject is doubtless an important one, but the questions which arise out of it, seem to me in almost all cases to admit of easy solution. It is easy to propose a rule, fixing the maximum slope at which lines of rail shall be laid down in this or any other country, but it is hardly possible that such general rule could be acted upon in every case with a due regard to the interests of the country.

We may give up a project in obedience to the rule, where its application would be impracticable, or we may apply it at an inordinate expense, but since nature has liberally given certain gradients to work upon, and since each project for the establishment of railway communication between two points will have its peculiar characteristic features, the only general rule that it seems safe to adopt, is to take care to make the best of each particular case.

11. I attempted in my report of the 5th March 1851 to lay down a rule of this kind in the following words:—"The first thing to be done in projecting a railway is, to ascertain the nature and amount of work likely to be required of it; the next, is to make such arrangements in the construction and subsequent maintenance of the work, that the whole annual charge, including interest on capital, and working expenses, may be a minimum. The resolution of this problem," I observed, "will determine every important point connected with the subject, as the question of single or double line, the character of the slopes (gradients), the size and power of engines, and the weight of rails."

12. The subject of gradients, intimately connected as it is with other circumstances in each particular case, may be viewed for the present under two different aspects. The first is, that under which it is most commonly considered, viz., as affecting undulating lines, lines wherein there may be little or no difference in point of elevation between the two termini; in which, therefore, every undulation involves the necessity of lifting the load a certain height beyond that which is ultimately aimed at, since the load which can be moved at the same cost of power becomes less nearly in direct proportion to the rate of rise in the gradients; and since it is known that in undulating lines the saving on the down runs does not compensate for the additional power required at the ascents, it is evident that such lines must be more expensive to work than one uniform plane between the termini. It becomes, therefore, a question in each case, whether the interest on money required for the reduction of these undulations, is or is not more than the extra expense involved in working over them. Among the points that would enter into a calculation of this kind are, the nature and amount of traffic, the extent to which it is likely to be augmented, the direction of the greater portion, the physical characteristics
of

of the line, the cost of materials and labour. We can hardly lay down any general rule for cases which involve so many varying elements. It is important to observe, the more so, as we have had no experience yet in India, that the extravagant cost of some of the lines in England alluded to in Major Kennedy's 24th paragraph, though by no means wholly due in any, and in the most striking cases, not even chiefly due to any faults of the engineers, were, to a certain extent, attributable to a desire to obtain the best possible gradients. An opinion seems now to have become almost universal, among the most distinguished practical men, that this was an error. All the later lines are constructed at a much cheaper rate; first cost is much reduced by admitting and working, at an increased expense, gradients that some years ago would not have been tolerated.

13. But this question may be considered in another and totally different aspect. We wish to establish railway communication between two important localities; though they are but 200 miles apart, nature has placed one 2,000 feet higher than the other. We will assume the possibility of laying down a line upon a continued plane from point to point, the gradients would be one of 10 feet in the mile, or one in 528, the length of line 200 miles. Now, in many cases, it might be perfectly practicable to construct a railway between two such points, with a uniform gradient of 1 in 2,000, but then the line must be upwards of 750 miles long. This may appear an extreme case, but it serves the better to illustrate a subject which, in practice, often becomes a fair matter of inquiry. We shall have to consider the cost of the two entire lines, the nature and amount of traffic, the direction of its chief portion, whether up or down, the districts through which each line would lie, the advantages to be gained or conferred by the railway from or upon those districts. It is obvious, without any detailed calculations, that assuming the cost of construction per mile, and all other things, alike, there could be no comparison between the two lines above described, and no hesitation in choosing the shorter and steeper. It seems, then, that a gradient on a railway must ever be considered, like any other expedient, as a means to an end; its cost taken into consideration, its applicability on each particular case of difficulty.

RULES proposed by Major Kennedy.

1st Rule —That all railways constructed in India shall belong to one of two classes, the first or second class.

14. Nothing can be said upon this rule till we see how these two classes are defined.

2d Rule.—That the regulating gradient of the first class, or trunk railway, shall not exceed 1 in 2,000. By "regulating gradient," is meant the gradient which shall regulate the load of the engine.

This rule may be understood to mean either that railways with such a ruling gradient, and they alone, shall be called first class, or that none of the trunk railways, properly so called, shall be constructed at all unless such a gradient be attainable. Looking at the next rule, we may perhaps, without error, attach to this the former of these meanings, and assume that Major Kennedy has applied the term "trunk," commonly used to indicate the importance of the direction and amount of traffic, to denote the characteristic gradients of the railway.

In taking this meaning and following this rule, we should have to place all our railways with a ruling gradient not exceeding 1 in 2,000, among the first class as trunk lines. I think, however, that this application of the word "trunk" is likely to create some confusion. It is an old practice among engineers to class their railways in this manner, according to the gradients; a mere professional distinction; the word "trunk" is, in common language, generally applied to those roads or lines of railway which lie in the direction of the greatest traffic and importance. No trunk line, so understood, could be constructed within the Madras Presidency, with such a ruling gradient as this, unless by increasing the length of the line to an extravagant extent; in many cases even this would fail to effect it.

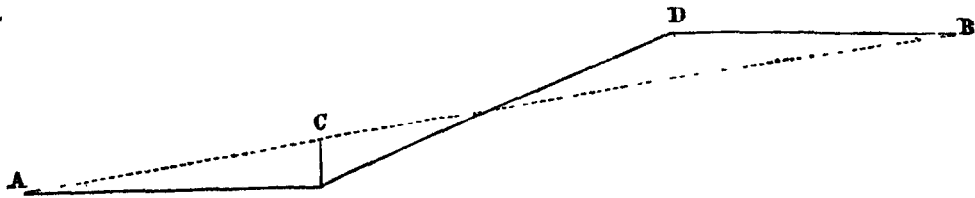
3d Rule.—That no regulating gradient of any second class or branch railway shall exceed 1 in 330.

As there are but two classes proposed, this rule may be otherwise rendered thus: that no railway shall be constructed in India having a ruling gradient of more than 1 in 330, or 16 feet to a mile. Now, although the application of this rule would be attended in many cases with much less difficulty than that of the former, I apprehend it would be found, in the south of India, that, with the exception of lines parallel to the coast, or running but a few miles from it, none could be constructed with advantage without a departure from this law. If we cast our eye over a map of Southern India, we find that a line drawn up the middle of the Peninsula will pass over towns and districts at heights above the sea, varying from 1,200 to 3,000 feet; these represent the heights of the several portions of a table land which forms the greater portion of the Peninsula, and is bounded by lines of Ghauts running nearly parallel to, and at varying distances from, each coast. The rise to these plains from the sea is in no case uniform; for some miles from the sea it is always slight; it is subsequently quickened either by a line of abrupt Ghauts, or through chains of hills, forming a succession of valleys, which rise rapidly till they reach the average elevation of the table land. There is but one line between Bombay and Cape Comorin where the Peninsula can be crossed, without passing one or two chains of Ghauts; that line would pass from the eastern coast at or below Madras, by Paulghaut to Ponany or Calicut. Even upon this the gradients proposed in this rule could not, I fear, be maintained throughout its whole length. I will take Bangalore, a large and populous town, and most important military station, as an example of a place which it would be impossible to approach, except by a most circuitous route, with anything like compliance with this rule. It is 3,000 feet above the sea, and 200 miles from Madras, but the direct line is broken by the Ghauts, which rise abruptly to a height varying from 400 to 1,000 feet. There is no way of avoiding these Ghauts, unless we can get (which is doubtful) through Cuddapah to Bellary, and thence back to Bangalore, making the distance from Madras to the latter place five hundred miles instead of two. Knowing these circumstances, the questions are, is it desirable to establish railway communication between Madras and Bangalore? If it is, how and in which direction can the line be laid down, so as to confer the greatest amount of benefit upon that part of the country and its inhabitants? The direct line between those two places may be described as consisting of three parts; the first, a plane with comparatively gentle ascent for 120 miles; the second, a steep incline for four miles; the third, a plane again for 80 miles. Now, assuming (for I am not here speaking of an undulating line) that we do not lift our loads in the aggregate more than 3,000 feet, ultimately aimed at, it seems probable that this natural section of the country is more favourable to the operations of a railway than a continued plane from end to end of 15 feet in a mile would be. The through traffic only is lifted the 3,000 feet, and much of the short traffic is confined to the two planes, upon which the rise is much less than the average upon the whole line. This concentration of the chief part of the rise, which enables us to apply special means to overcome the resistance of gravity, is advocated by many, as the best mode of overcoming a difference of level between two points. The effect of such an incline upon the cost of transport is easily calculated. I will suppose that the cost (locomotive expenses) of moving a ton along the first 120 miles is one farthing per mile; that the cost for the last 80 miles is the same; and that upon the incline is four times as much, or one penny per ton; we should have the cost for the whole distance—

<i>d.</i>	<i>s.</i>	<i>d.</i>
200 × ¼	-	4 2
4 × 1	-	- 4
	—	
	4	6
	—	

just threepence more upon the 204 miles than it would be if there were no incline; and if Bangalore be 400 feet lower, a similar plane extended from one terminus to the other. If, however, the two planes and the intermediate Ghaut could be resolved into one uniform plane, we should find the cost of moving a ton its whole length very little less than the above, while the expenses on the several portions at each extremity would be greater; that is, the cost of conveying

conveying a ton along the whole length of the dotted line A B, would be little, if anything, less than along the broad line between the same points,



while the cost of the local traffic on the portions A C and B D would be more

I conclude, therefore, with regard to these two rules respecting gradients, that none of the lines most required within the Madras Presidency could be laid down so as to comply with either, and that the question of what the ruling gradient shall be, is one that does not admit of a determination by any general rule, but must be considered with reference to the circumstances of each particular case.

4th Rule.—That short alternate impulsive planes may be introduced to assist the ascent, not to exceed a length of half a furlong each, and not to be nearer to each other than one and a half furlong.

I cannot agree with Major Kennedy in thinking that any advantage would be gained by this mode of construction. In any long-continued fall, however, there should be level planes at stations.

5th Rule.—That no line shall be undertaken when the estimated cost shall exceed the average rate of 5,000 *l.* per mile of single track. But that this rate of cost is not expected to include the bridging of large rivers, as the Soane, Jumna, &c., exceeding half a mile wide at flood level; such rivers are to be considered as breaks or temporary termini, where goods and passengers are to be carried across on rafts.

This is a question, again, which appears to me not to admit of a general rule beyond this, that the cost of bridging the river, irrespective of its breadth, should be considered with reference to the risk, the expense, the delay, and the discomfort of shifting the loads and carrying them across on rafts. There are rivers in India which exceed the half mile in breadth, and which are dry for a great portion of the year, falling occasionally with a volume and velocity which make it dangerous to attempt a passage in any way. A river of this kind 1,000 yards broad might be bridged for 20,000 *l.*, and as they may be supposed to occur upon a line of railway not more than once in 400 or 500 miles, I do not think an addition of 40 *l.* or 50 *l.* per mile to the 5,000 *l.*, which the line is supposed to cost, too much for overcoming such a difficulty, and getting rid of so serious a fault in the line. The propriety of bridging a river, no matter what its width, must be determined in each separate case by the position of the river on the line, by the cost of the bridge, by the safety and facility with which the river can be otherwise crossed.

6th Rule.—That no line shall be sanctioned, except for a single track of rails, with masonry cuttings and embankments to correspond. The ground, however, required for a double track to be in all cases secured.

I have elsewhere given my opinion on this point, and perfectly agree with Major Kennedy.

7th Rule.—That no locomotive engine shall be introduced to India for 10 years, except such as the ratio between the length of stroke of piston and the diameter of the driver-wheels shall sanction with reference to the maximum load, notwithstanding any sacrifice of velocity on the journey. Rule No. 11 contains an exemption from the restriction.

This will be best considered with Nos. 10 and 11.

8th Rule.—That when piling for foundations be requisite, the foundations are to be laid to suit a double track, although the superstructure is only carried up for a single track.

I agree with Major Kennedy on this point, having made the same suggestion elsewhere.

9th Rule. That no portion of any line shall be permitted to open for the transport of goods or passengers until the capital account for the construction of such portion shall have been closed.

This we have too much reason to know from proceedings in England to be a very important matter, and it will probably require much careful treatment here as our railways become extended, whether that extension be effected through the instrumentality of one or of different companies. It may be observed, however, that there will be much less chance of the same grave errors being committed here, so long as a Government guarantee places a known limit to the amount of capital. My own opinion is, that nothing but the extension of a line, its enlargement from a single to a double track, would justify an augmentation of capital when once the line has commenced working.

10th Rule.—That no more than one train daily shall run in each direction upon any line until the traffic shall furnish more goods and passengers than one engine can carry, after which a second may start daily each way; and that when the traffic calls for three trains fully loaded per day, then arrangements shall be made for laying down a second track of rail.

This Rule may be considered with No. 7 and No. 11. The "maximum load" which Major Kennedy alludes to in No. 7, may mean either the maximum, as defined by rule, or the largest amount which the circumstances of the line may bring at any given moment. In neither case can it be determined with safety until the line has been some time in work. I understand from these rules that there are to be no passenger trains as distinct from the goods, till the dividends have exceeded 6 per cent.; but what will the public say to this? Are they to be conveyed cheap, with the luggage trains, as cattle are carried in England, so long as the proprietors' dividends fall short of a fixed sum? or would they not rather go faster, and pay higher, and thus contribute more to the realisation of those profits? In another place, para. 38, Major Kennedy deprecates indulgence in the "luxury of superfluous velocity," but surely it would be as impolitic as unjust, for the managers of a railway to refuse to the public any velocity (within the limits of safety) for which they were willing to pay. If the Government or railway company contracted for a fixed annual payment to furnish the means of locomotion for the whole of the country, goods and passengers, it would be natural enough for them to discourage this luxury, as involving themselves in certain loss, it would be to their interest even to keep the amount of goods to be conveyed as low as possible; but constructed and worked as railways are, it is in every way desirable that they should be made to contribute to the convenience of the public in every possible manner, the charges being so arranged that every unit of work done shall bring a fair profit to the proprietors. The question of the description of engine, the number of trains, the speed, &c., will not be satisfactorily determined till the line is in work. In the mean time, some engines must be employed to begin with, and I should have preferred the lighter ones for the first experiment, to any calculated for an estimated maximum load.

11th Rule.—That, notwithstanding the tenor of Rule No. 6, if on any line it shall appear that the profits exceed a dividend of 6 per cent. per annum, it shall then be permitted, if thought advisable by the Directors of the Company interested, to introduce engines of higher powers of velocity with a view of running passenger-trains separate from goods trains.

This has been considered with the above.

12th Rule.—That the height above the sea of all obligatory points throughout India having reference to the construction of works, draining, irrigation, &c., such as the highest points or necks of valleys, the low passes in mountain ranges, be obtained and recorded with all convenient despatch on the maps now in progress of construction by the Surveyor-general's department; and that, in addition to this, the height of numerous points of inundation level to be taken upon the rivers of India, and recorded upon the maps at intervals of two or three miles, so as to admit of the protraction of proximate sections of the slope of such rivers; and that any striking peculiarity in the lines of rivers or of the ground between adjacent rivers be reported upon to the Surveyor-general by his subordinate officers; such reports to be methodically arranged in his office as records.

On this I have no remarks to offer, further than to express my opinion that such information would be interesting, and, no doubt, on occasions, of considerable use.

15. It is, no doubt, a matter of the very highest importance that our railways in India should be laid down judiciously, and constructed and worked with the utmost economy. We have to consider the objects of each proposed line, and the difficulties which present themselves in the attainment of these objects. The first question is one for the Government to determine with the aid of those best informed upon the commerce, the population, the resources and the necessities of different districts and localities. In this country, where we are especially bound to get the utmost possible advantages out of every rupee expended on these works, we have to make our first lines serve in the highest degree all important purposes, commercial, political and social.

16. I should say, therefore, that the course to be pursued is not to begin with any general rule limiting the gradients of our railways, but to ascertain where railways are likely to be introduced with the greatest advantage, what the best line or lines to adopt, and what encouragement we can gather from a comparison of the present probable cost with the prospective benefit.

17. It only remains for me to make a few observations on the particular lines which Major Kennedy has proposed for the railways in the Madras Presidency.

18. The propriety of determining as far as possible, before we commence upon these works, the principles upon which they shall be laid down, and the course to be followed by those great lines which should constitute the frame-work of the whole, will be admitted by all; and the first question connected with this subject which suggests itself in reading Major Kennedy's paper, is this: shall our lines be laid down with reference to the physical characteristic of the different parts of the country, or to the present arrangement of the population, the agricultural, commercial, manufacturing classes?

19. The lines marked red in the map which accompanied Major Kennedy's paper, denote his proposed first-class or trunk lines; and these it is intended should have no gradient above one in 2,000. These are coast-lines from Calcutta to Tanjore, about 1,200 miles; the same from Calicut to Bombay, 500 miles. There is also one across the Peninsula from Tanjore to Calicut, about 250 miles, and another from the coast-line near Rajamundry to Surat, about 700 miles. The latter connects Madras with Bombay by a line of which the total length is about 1,200 or 1,300 miles; the distances are taken on mere approximation from the map above mentioned.

20. With my report to the Madras Government of the 5th March 1851 (para. 9) I submitted a sketch, showing what I thought were the lines likely to be considered of the first importance in that part of India; and in that dated the 12th of July following, while considering the political importance of these works, I gave it as my opinion (paras. 7, 8) that the coast-lines were of secondary importance. I am of that opinion still; they are expensive lines to construct, of little commercial value, and while we have command of the sea, of no great political importance.

21. The lines proposed by Major Kennedy within the Madras Presidency, whether for 1st or 2d class lines, seem to have been selected almost entirely with reference to the course of certain streams, and after describing the drainage of an extensive portion of the Peninsula by the Soane, the Nerbudda and Taptee, the Godavery, Mahanuddy, &c., he adds, "These (the geographical features) force upon us the knowledge of what the great arteries of commerce must necessarily be, and with those arteries our trunk roads must necessarily correspond."

22. Now, the rivers in the south are not, and never have been, the great arteries of commerce. All those rivers upon which Major Kennedy has marked lines, the Godavery, the Kistnah, the Pennaar, the Polaar and the Cavery, exhibit in different degrees the same characteristic features. They rise on the table land (some at the crest of the Western Ghauts); they pass over it, by a course more or less circuitous, till they reach the eastern limits of that table, and they then plunge on to the Coromandel plain, either falling over abrupt Ghauts, or

by a turned and very tortuous course among an uninhabited or very thinly peopled range of rugged hills covered with forests; some of these rivers are dry during a great portion of the year, and all are subject to very great variations in their volume of water.

23. It is manifest that such streams as these cannot affect the condition of the people or the country as to the Ganges, the Indus, and the Nile. In the Ganges we see a large volume of water all the year round, serving as a great highway for the people; a broad fertile valley, subject annually to the fertilising influence of this noble stream, and the people clustering in large numbers on its banks, exhibiting in every possible way their appreciation of the benefits they receive from it. Here, then, we have a great artery of commerce, and we must recollect it has become so not merely because the country drains down the valley, but because that valley and the stream which flows down it are favourable to the ordinary commercial manufacturing and agricultural pursuits of mankind. The traffic to which the railway company look for their dividend is greatly due to the river in its operations as a highway. We may take encouragement from this in other parts of the country where the traffic is now less, and trust that, denied as they have hitherto been the great advantages of cheap transport, the railways may do for them what the Ganges has done for Bengal.

24. The Mahanuddy, the Godavery, the Kistnah, are rivers, as I have above shown, of a different character. Instead of being the great arteries of commerce, no populous or busy towns are found on their banks during their whole length. Instead of passing through a dense and industrious population, their course for several hundred miles lies through a region of mountain and forest, where the sound of man's voice is never heard; a great portion of which has never been surveyed or explored. It is to be observed that the principal lines here shown are not drawn with primary reference to Madras, the southern capital, but fall upon the coast at Coringa and Masulipatam, leaving a coast line of 200 and 300 miles to be traversed in order to reach Madras. We may believe that Madras, with the large amount of capital invested in its fortress, and its public and private buildings, its 700,000 inhabitants, is wrong placed; but can we venture thus far to act upon our belief to consider it as of secondary importance in our railway arrangements?

* Para. 19.

25. Of the second-class lines, two run nearly parallel to each other, and to the first-class lines above mentioned;* they constitute in fact trunks having no connexion with each other. Three lines from coast to coast are thus laid down: one starts from Masulipatam, follows up the Kistnah a few miles, crossing over the intervening high land by Hyderabad, falls on the Godavery, which it follows, to the vicinity of the Western Ghauts; the other starts from the same point, Masulipatam, and continuing to follow the Kistnah, passes by Kurnool in the ceded districts, up the valley of the Beema to Poonah. The latter portion of the line (from Bellary, instead of Kurnool) is that which I propose as the continuation of a line from Madras (not from Masulipatam) to Bombay, whenever such continuation is thought advisable. Another second-class line marked on the map is from Madras to Bangalore up the Ghauts. The last to be noticed is one from Trichinopoly to Seringapatam, of which I see no advantage; the line to Bangalore having already brought the rail to within 80 miles of Seringapatam; a continuation of which would throw the latter place into direct connexion with Madras, avoiding a second Ghaut between Seringapatam and Trichinopoly.

26. I think, then, that Major Kennedy is in error in acting upon the assumption that the lines of drainage in any country necessarily constitute the great arteries of commerce. The line of a large navigable river, flowing through a broad and fertile valley, will become, of course, a great artery of commerce, created, fostered and carried on by itself; but apart from the fact that the line of a navigable river is not that which, as a general rule, we should choose to begin railway operations in a country elsewhere without any means of communication, I think it will be found, in those countries where railways have been already established, that the great arteries, whether discovered or established by the railways, do not lie down the drainage in all cases,—in some, lie directly across it.

27. One more observation may be made upon this point; viz, that these streams do not necessarily give us good gradients, unless by a sacrifice in length and straightness. If we take any plain, such as that of Coromandel, inclined generally to the sea, at such an angle that a direct line drawn across it perpendicular to the coast would fall 10 feet in a mile; the general course of a river will have precisely the same fall, and it is only by following the numerous sharp sinuosities of the river, and so proportionately increasing our distance, that we could reduce the fall to that of the river's bed.

28. I conclude this paper, already I fear much too long, with the following summary :—

1st. Our lines are to be laid down, I think, with reference to the existing state of the country, the commerce, the population, the resources and necessities of the several districts and localities; not with reference to the physical characteristics of particular lines of country.

2d We have to bear in mind that the profitable permanent working of a line, alluded to by Major Kennedy in the 50th para., depends upon the amount of traffic, the length, the original mileage cost, no less than upon the gradients, and that a line laid along a river may, and certainly would, in some of these cases, be a very expensive one.

3d A short line with steep gradients may be a cheaper line to work, as well as to construct, than a longer one with easier gradients; it may also lie through more profitable districts.

4th. When for political purposes we desire to connect by a railway two distant termini, we should try to make the most out of the line, not lay it down with the sole view to communication between those points; but, as it were, coax the traffic of the country by seeking the more important localities adjacent of its general direction. "Direct lines will come in their turn, when those first made will take their proper places as valuable, though it may be then subordinate members of the entire system."

5th. In the case of navigable rivers, and such as the Godavery, which it appears probable might, at no great cost, be rendered navigable, that part of the country to which they already furnish a cheap and ready means of transport may, as a general rule, be left without railway, till the more pressing necessities of other portions of the country have been provided for.

Report to Madras
Government,
12 July 1851.

29. I have only further to remark, that the line proposed on the eastern coast of Madras lies over a country singularly favourable for the construction and supply of canals. The construction and working of a canal near Madras, so short as to produce little effect on the development of traffic, has been attended with very favourable results. A proposition has been made, and, I believe, sanctioned, for extending it a few miles; and there is no doubt that communication by canal might be opened along the coast between the now fertile deltas of the Godavery and the Cavery at a far less cost than a railway, and far more capable of competing with the present cheap coasting traffic.

30. Should the Government determine upon taking into serious consideration any grand trunk line or lines, such as that proposed between Bombay and Agra, I would suggest that preliminary inquiries be made for the purpose of obtaining what may be called information in the rough from civil and political officers employed in the intervening districts, as to the probable political effects, the nature and amount of traffic, and the course which the general features of the country seem to point out. Documents containing information of this nature, placed in the hands of an engineer at starting, would direct his attention at once in the right way, and save a good deal of time, labour and expense.

Calcutta,
1 February 1853.

(signed) *T. T. Pears*, Major,
Madras Engineers.

No. 13.

From Sir *H. C. Montgomery*, Bart., Chief Secretary to Government, to
J. P. Grant, Esq., Secretary to the Government of India.

Sir,

5 February 1853.

Public Department.

WITH reference to my letters of the 23d October, 9th November and 23d December last, I am directed to state, for the information of the most Noble the Governor-general of India in Council, that Mr. Smalley, the Agent to the Madras Railway Company, has reported his arrival on the 31st ultimo, and that this Government awaits the decision of the Government of India regarding the direction of the line to be followed, to permit of the orders of the Honourable Court, quoted in the margin,* being carried out.

I have, &c.
(signed) *H. C. Montgomery*,
Chief Secretary.

No. 164.

(No. 75)

From *J. P. Grant*, Esq., Secretary to the Government of India, to Sir *H. C. Montgomery*, Bart., Chief Secretary to the Government of Fort St. George.

Sir,

Fort William, 4 March 1853.

Home Department,
Railway.

I AM directed by the most Noble the Governor-general of India in Council to acknowledge the receipt of your letter, dated the 5th ultimo, No. 13, reporting the arrival, at Madras, of Mr. Smalley, the agent of the Madras Railway Company.

2. Major Pears, with whom, whilst in Calcutta, the most Noble the Governor-general communicated personally on the subject of the Madras Railway, and who, before his departure, was put in possession of his Lordship's views on the questions under consideration, returned to his Presidency in the steamer of the 6th ultimo.

3. The Governor-general in Council is not prepared at present to decide positively upon the general line which the railway now to be made should take. The south-westerly line, from Madras by Menil to Vaniembady, to be ultimately extended, by Salim and Coimbatore, to the West Coast, is admitted to be one of the lines which is essentially required in any good railway system for the Madras Presidency. As far as Vaniembady, the line presents all the engineering facilities that can be expected; and beyond it, with the exception of one pass, which is not expected to be a serious obstacle, no engineering difficulties are anticipated in the whole course of the line. Even when made only to Vaniembady, it is the expectation of the Madras authorities that the line will pay as a commercial speculation; and when completed throughout, uniting, as it will do, the two coasts, nearly approaching the great sanitarium on the Neilgherries, and affording a ready means of communication between the troops on either side of the Peninsula and those in the Mysore country, it will add to its commercial advantages the character of an admirable line in a political and military point of view. In this view, which, in the opinion of his Lordship in Council, in a railway constructed under a Government guarantee, should never be lost sight of, the advantages of the line will be greatly enhanced, if the new pass up to the table land near Vaniembady, discovered by Major Pears, is found upon survey to afford, as it promises to do, the best known line for a railway from the low country to Bangalore, and the table land generally.

4. On the other hand, the line to the top of the Palmanair Ghaut, to which, upon the whole, the Madras Government are inclined to give the precedence, on the supposition that it will be immediately extended to Bellary or to Bangalore, or to both places, promises many advantages; but, as compared with the other, it is not wholly free from objections. Amongst the objections are the
ascent

* Upon the arrival of the railway company's agent or chief engineer, we desire that you will adopt immediate steps, in co-operation with either of those officers, for the early commencement of operations.

ascent of a severe Ghaut to a height of 2,100 feet above the sea, part of which ascent will be lost in descending again to Bellary; and the circumstance that, in opening up the Bellary country, this line would fail to benefit the Cuddapah district, between which and Madras at present the trade is shown by the papers before Government to be very much greater than the existing trade between Madras and Bellary.

5. It is obvious that if such a line be feasible, by far the best line to Bellary, in every point of view, would be one through the Cuddapah district. Now, although access to the Cuddapah district is known to be very difficult, the Governor-general learns from Major Pears that we are not in a position yet to pronounce absolutely against the feasibility of such a line, no survey with such an object having been ever made. In the present state of our information, therefore, the Governor-general in Council is of opinion that nothing should be done which would commit us to the adoption of any other line.

6. As far as Menil, the Governor-general understands that the line recommended by the Madras Government is the best line, whether considered simply as a part of the Vaniembady line, or as a trunk line common to the Vaniembady line and the Palmanair line. Whether the Palmanair line be determined upon or not, the line recommended as far as Menil will be part of a line admitted on all hands to be essential to a good railway system for the Madras Presidency, and one of the importance of which, in a political and military view, the Governor-general in Council is convinced. His Lordship in Council therefore authorized the immediate construction of the line proposed from Madras to Menil.

7. In the meantime, he requests, with reference to the Vaniembady project, that a line be fully surveyed and estimated for up Major Pears' new Ghaut near Vaniembady, from the point where a line from Bangalore would join the low country line to the level of the tableland above the Ghaut; also, that a general survey be made of the line beyond Vaniembady, by Salem and Coimbatore, to the Malabar Coast, including a short branch from the neighbourhood of Coimbatore to the foot of the Neilgherry Hills. Further, he requests, with reference to the other object in view, namely, the attainment of Bellary, that such a survey of the country be made as will set at rest the question of the practicability of a line from Madras to that place, through the district of Cuddapah.

I have, &c.
(signed) *J. P. Grant*,
Secretary to the Government of India.

No. 23.

From the Chief Secretary to Government of Fort St. George to the Secretary to the Government of India.

Sir,

Fort St. George, 22 March 1853.

1. I AM directed to acknowledge the receipt of your letter of the 4th instant, No. 164, and to state, for the information of the most Noble the Governor-general of India in Council, that the authority therein conveyed for commencing a line of railway, to be carried as far as Menil, and his Lordship's general views on the subject, have been communicated to Major Pears, and the agent of the railway company; and that Major Pears has been requested to propose his arrangements for early carrying out the instructions of the Government of India, regarding the survey of the lines denoted in para. 7 of your communication. Public Department.

2. I am at the same time desired to submit copies of the correspondence noted in the margin,* and of the orders issued thereon, which will acquaint the Government of India with the arrangements that have already been sanctioned by this Government for the early commencement of railway operations, and for the

* From Major Pears, C. B., dated 16 February 1853; Extract Minutes of Consultation, 4 March 1853, No. 207; From Major Pears, C. B., 12 March 1853; Extract Minutes of Consultation, 22 March 1853, No. 289.

the survey of a line to Bellary, through the Cuddapah district, and of the Pass from Vaniembady to Coopum, leading to Bangalore, and to state, that the Right honourable the Governor in Council has appointed Major Pears to be "Consulting Engineer for Railways" at this Presidency, and with reference to the salaries paid to corresponding officers at Calcutta and Bombay, has authorised that officer, in anticipation of the sanction of the Supreme Government, to draw, while so employed, a consolidated allowance of (2,000) two thousand rupees per mensem; a proceeding which he trusts will receive the approval of the Governor-general of India in Council.

	Ra.
1 Writer - - -	50
1 Second Writer - - -	25
2 Peons, at 7 rupees each - - -	14
2 Lascars - - -	14
Total - - -	<u>Rs 103</u>

3. Major Pears has been authorised to entertain for the present the establishment, to the extent marginally noted, for which also the authority of his Lordship in Council is solicited.

I have, &c.
(signed) *H. C. Montgomery,*
Chief Secretary to the Government of
Fort St. George.

From Major *T. T. Pears*, c. b., Engineers, to the Chief Secretary to Government,
Fort St. George.

Sir,

Madras, 16 February 1853.

Para. 1. WHEN reporting to you in person my return from Calcutta, I had the honour of communicating, for the information of Government, and by command of the most Noble the Governor-general, his Lordship's views regarding the proposed Madras Railway. I had been instructed at the same time to state, that a communication will be made upon the subject in the usual manner, so soon as the press of business connected with the English mail then under despatch admitted of it.

2. As you have been good enough to make known to me the intention of the Right honourable the Governor in Council to confer upon me the important office of the Government Engineer in the Railway department, I beg to submit a few observations upon the work that appears to be immediately before us.

3. I understood his Lordship the Governor-general to be of opinion, that while the construction of a line of railway as far as Menil appears under any circumstances desirable, its prolongation thenceforward by the projected line of Palmanair depends mainly upon that being the best line that could be discovered to Bellary; since, if a practicable line of this latter place could be found by Cuddapah, the Palmanair Ghaut might be given up, and a very convenient line to Bangalore found from Vaniembady by the pass mentioned in my report of the 27th October 1852, para. 13. A trunk line to Vaniembady 120 miles in length, would thus serve both for an extension to Salem and the Malabar coast, and for a line to Bangalore.

4. In approving, therefore, of the immediate commencement of the line to Menil, his Lordship considered that the determination of its course beyond that point might be left until an inquiry had been made into the practicability of reaching Bellary by Cuddapah, into the character of the above-mentioned pass from Vaniembady to the Mysore country, and also into the nature of the country lying between Vaniembady and Salem and the Western Coast.

5. I was given to understand that Mr. Bruce, the gentleman who has been appointed Chief Engineer of the Madras Railway, would leave Calcutta by the steamer of the 6th proximo; a difficulty in finding any one qualified to take charge of his present office having prevented his leaving sooner.

6. Upon his arrival at Madras, measures may at once be adopted for laying out the line, obtaining possession of the land, and commencing active operations between Madras and Menil.

7. With respect to the surveys, I have been informed that the Honourable Court have determined that all surveys upon lines allotted to any railway company shall be carried out (under the general direction of the Government Engineer) by the engineers of that company.

8. I apprehend

8. I apprehend that it cannot now be determined what line shall be allotted to the Madras Railway Company, whether that by Palmanair, or that by Vaniembady to Salem, or both. It may be assumed, however, that a line to Bellary by Cuddapah (should such be found practicable) will be kept distinct from any line by Menil, either to be made over to a separate company or executed by Government, and the survey in that direction must therefore be made by Government servants.

9. Should such a line prove practicable and expedient, the present company will, I presume, take up that to Vaniembady, Salem, and the other coast, which will leave in their hands the survey of the line from Menil to Ponany or Calicut, a distance of about 375 miles.

10. I purpose, pending Mr. Bruce's arrival, to take a look at the Ghauts about Naggery, between this and Cuddapah, and have instructed Surveyor Oliver to proceed to Vaniembady and survey the pass in that neighbourhood as far as Coopum. My time and attention will be necessarily too much occupied with the commencement of active operations near Madras to admit of my taking in hand the survey through Cuddapah, even with the aid of a surveyor; and I trust therefore the Government will be pleased to place at my disposal some qualified officer to conduct, under my directions, this survey as far as Bellary, or until his reports may show the scheme to be impracticable. What assistance such officer would require I cannot at this moment say, but I should think that one assistant surveyor in addition to the ordinary establishment of an assistant civil engineer would be sufficient.

11. I would take this opportunity of observing, that although this application is made in reference to a particular line, and therefore for a temporary purpose, it seems to me very desirable, when once the construction of railways has commenced, that a Government Railway survey department should be constantly at work, making upon such lines as the Government may consider deserving of attention these preliminary surveys or reconnoissances, being in fact the pioneers of the railway executive bodies. Taking the work of examination thus in time, the establishment need be neither large nor costly, while if the work is conducted by an active intelligent officer, possessed of a fair share of professional skill, its performance will greatly tend to economize both time and money, in subsequently putting the executive officers at once upon the right course. We might hope, too, by thus deliberately and thoroughly examining the country beforehand, to avoid many of those errors which have in so many cases been found to result from these preliminary proceedings being undertaken too late. Considering the great extent of country and the imperfect acquaintance that we have with many parts of it, such careful examinations seem to be more necessary here than they would be in any country in Europe; they should be carried on, too, if possible, not only upon any line where it may be proposed first to lay down the rails, but even far a-head, until means are obtained for determining the proper course for the line between the two ultimate termini.

12. In illustration of my meaning I would observe, that in laying down a line from Madras to Bellary we furnish the country with a most important work; but Bellary is not the ultimate destination of the line, and it would hardly be safe (so long as any political importance is attached to a trunk line from Madras to Bombay) to carry such a line actually up to the vicinity of the town of Bellary, until we have formed a tolerably correct notion of the course it would have to follow on towards Bombay.

13. It appears that when once a few miles of railway have been completed and brought into operation, a desire for their extension will become general and urgent, and it would be well to be in some measure prepared at once to point out the best lines for the purpose.

14. The first lines to be examined (for I should propose little more than an examination) would be that from Madras to Bellary; thence towards Bombay, those from Vaniembady to Calicut and to Bangalore, and one from Palghaut-cherry to Negapatam.

15. Should it be determined to await no longer the result of "experimental" lines, and to adopt at once measures for constructing the principal trunk lines across the face of the country, the remarks which I have now ventured to make

upon the expediency of having a railway survey continually in advance of the works themselves, will, I trust, be considered not undeserving of attention.

I have, &c.
(signed) *T. T. Pears,*
Railway Commissioner.

No. 207.

Resolution of
Government, dated
4 March 1853.

Financial De-
spatches, 24 No-
vember, No. 20,
of 1852

Para. 1. MAJOR PEARS, C. B., having reported his return from Calcutta, and offered certain suggestions for giving effect to the orders of the Honourable Court of Directors, and of the Governor-general of India, with respect to the Madras Railway, which it appears it is decided is to be carried at first to Menil, and as Mr. Smalley, the Railway Company's Agent, has already arrived, and the arrival of Mr. Bruce, the Company's Chief Engineer, may be shortly expected, the Right honourable the Governor in Council considers it highly desirable to make all preliminary arrangements possible, so that no delay may occur in the commencement of operations as directed by the Honourable Court, so soon as the instructions of the Governor-general of India in Council shall have been officially communicated. He accordingly resolves to appoint Major Pears to be "Consulting Engineer for Railways," and with reference to the salaries paid to corresponding officers at Calcutta and Bombay, to recommend to the Government of India that this officer be allowed to draw, while so employed, a consolidated salary of (2,000) two thousand rupees per mensem; and in anticipation of the approval of the Government of India, he authorises that amount being passed to him from the 1st January last.

2. The Right honourable the Governor in Council considers that the views of the Honourable Court, with regard to the exercise of the supervision and control of railways, will be best carried out by adopting the practice which has obtained in Bengal, and is reported to have been found to work well, and to answer the ends contemplated by the Honourable Court, of making the "Consulting Engineer" the medium of communication between the officers of the Railway Company and the Government; and he, therefore, determines to request Mr. Smalley, the Company's Agent, to correspond with the Consulting Engineer, through whom he will receive the orders and decisions of this Government on all points referred for this purpose.

3. The Governor in Council believes it is unnecessary to give Major Pears any detailed instruction for his guidance; he will only, therefore, direct that he preserve a careful record of all his proceedings, and he anticipates from his judgment, and the character of the agent, that by the cordial co-operation of all parties, the affairs of the Madras Railway will be conducted with efficiency and economy to a successful issue.

4. The Government concur in the remarks of Major Pears on the expediency of having a railway survey continually in advance of the works themselves; and under the circumstances represented in paragraph 10 of his letter, they will be prepared to place at his disposal the services of an officer, to conduct, under his directions, the survey of a line to Bellary by Cuddapah, on his selecting an officer whom he may consider qualified to undertake the duty.

	Rs.
1 Writer	50
2 Peons, at 7 rupees each	14
4 Lascars, at 7 rupees each	28

5. Major Pears, under date the 28th November 1850, was permitted to entertain the establishment noted in the margin, and the services of a surveyor were also given to him. He will now report what establishment he considers he will require to exercise the supervision of the railway affairs of this Presidency.

Rs. 92

From Major *T. T. Pears*, C. B., to the Chief Secretary to Government.

Fort St. George, Madras,
12 March 1853.

Sir,

I HAVE the honour to acknowledge the receipt of an extract from Minutes of Consultation of the 4th March 1853, in which the Right honourable the Governor in Council has been pleased to honour me, by conferring the appointment of "Consulting Engineer for Railways" in this Presidency.

With

With reference to the 4th paragraph of the same extract, I beg to report, that during my late tour, which, in the expectation of Mr. Bruce's arrival, I was compelled to cut rather short, I have examined the country towards Cuddapah as far as Baulpilly, which is about 90 miles from Madras.

The three principal difficulties encountered in constructing a road into Cuddapah occur within that distance; viz. the passes of Naggery, Warramully and Baulpilly. I had been induced, partly from common reports, and partly from my own experience in the course of a march along that road, with troops, in 1840, greatly to over-estimate the difficulties which these several passes present in the formation of a road. I now find, moreover, that the two former may be altogether turned, and avoided by a line running up from Madras by the valley of the Nawaveraw River, as far as Naglapooram, thence towards Calastry, falling into the old line of road near Circumbandy. I am now sanguine in my expectation that this beautiful and important district of Cuddapah may be entered by a railway at far less cost than I had anticipated. I feel encouraged, therefore, in proposing that a detail survey should be made of a line through that district to Bellary.

The officer whom I would propose for this duty is Lieutenant Roberts, of the engineers. The determination of the best line for a railway through such a country as this requires peculiar intelligence and judgment, while the labour involved in the work demands a good deal of personal energy. I believe Mr. Roberts to be well qualified for the duty, and have ascertained that he is prepared to undertake it with cheerfulness and zeal. As the weather is almost insufferably hot in Cuddapah during the next two or three months, and it would take some time for this officer's relief and journey, it might be as well, perhaps, if he carried the operations upon which he is now engaged to a close for the present season, and join me at the end of May, when the work ceases on the other coast, and when the climate in Cuddapah becomes more tolerable.

In case the Government should consider Mr. Roberts' services too valuable where he now is, I beg to submit the names of Lieutenants Tyrrell and Norton, of the 18th Regiment Native Infantry, both of which officers, I have been informed on good authority, are well qualified for duties of this nature. Should the Government be pleased to place at my disposal one of these officers, I beg to recommend that, in addition to the establishment of a first Assistant Civil Engineer, an active and intelligent Assistant Surveyor may be placed under his orders. In reply to the 8th paragraph of the extract from Minutes of Consultation under acknowledgment, I beg to state, that in addition to the establishment therein named, I have, since the 16th October 1851, had the service of a draughtsman sanctioned in Minutes of Consultation, under date the 9th January 1852; but that I would recommend the following as the establishment of my office, at least until some experience has been gained on the actual amount of work to be done:—

	<i>Rs.</i>	<i>Rs.</i>
1 Writer - - - - -	50	50
1 Second Writer - - - - -	25	25
2 Peons - - - - -	7 each	14
2 Lascars - - - - -	7 „	14
Total - - -	<i>Rs.</i>	103

I propose this limited establishment for the present, from having observed that according to the system in Bengal, which has been found to work well thus far, the Consulting Engineer has the office of the Secretary to Government and that of the manager of the railway open to him, for such records as he may have occasion to refer to, and it has been considered desirable that his own movements should be encumbered as little as possible with records or office establishment. I apprehend, however, that the organization of the department cannot be considered yet final, and that more effectual means of auditing the railway accounts will require yet to be furnished to the Consulting Engineer. I would, therefore, suggest that the establishment now recommended be considered experimental.

I beg, in conclusion, to solicit the sanction of Government to the services of Surveyor Oliver being granted to me for a further period of six months. I am

about to employ him in surveying the pass from Vaniembady to Coopum, and when that is completed I anticipate much advantage from being enabled occasionally to place him at the disposal of the railway officers. The assistance which, from his long experience and local knowledge, he may thus render are the more important, from the circumstance of not one of Mr. Bruce's assistants having yet arrived.

I have, &c.
(signed) *T. T. Pears,*
Consulting Engineer, Railway Department.

No. 239.

Resolution of
Government,
22 March 1853,
Letter from Board,
Department of
Public Works,
1 November 1852,
No. 704.

1. LIEUTENANT ROBERTS having been deputed by the Board of Revenue, in the Department of Public Works, to proceed to the Munzerabad Ghaut, to carry on the work sanctioned under date 16th November last, the Right honourable the Governor in Council desires that so soon as the present working season at the Ghaut is over, the services of that officer may be placed at the disposal of Major Pears, consulting engineer for railways, for the proposed survey of a railway line to Bellary through the Cuddapah district, and that an active and intelligent assistant surveyor may, also be placed under his orders for this duty. The establishment of a First Assistant Civil Engineer required for Lieutenant Roberts will be entertained by Major Pears on that officer joining him.

Rs.
1 Writer - 50
1 Second writer 25
2 Peons, at 7
rupees each 14
2 Lascars, at 7
rupees each 14
—
Total - *Rs.* 103

2. Major Pears is authorized to retain the services of Surveyor Oliver so long as they may be required for the survey of the Pass from Vaniembady to Coopum, and for aiding the railway officers in their operations; and sanction is also granted for the office establishment proposed by him for the present at a monthly charge of 103 rupees.

(True Copies.)

(signed) *H. C. Montgomery,*
Chief Secretary.

Mem.—Regarding
the Madras Rail-
way.

Three printed
papers; two maps.

* See in No. 1, page 4,
Major Pears, para 8
and 9, page 38, Mr.
Bourdillon, para. 3,
page 50, Major Cotton,
para. 4, and page 53,
Major Pears' whole letter

† For the discussion
of the large view, see
in No. 1, page 4, Major
Pears, para. 8 and 9,
page 38, Mr. Bourdillon,
para 3, page 50, Major
Cotton, para 4, page 53,
Major Pears, whole
Letter.

NOTE by the Secretary to the Government of India, Home Department.

THE Madras engineers were hampered at first in their selection of lines by the experimental character which had been given by authority to the line to be made.* Till this idea of a short experimental line is abandoned, and a large view of the subject is taken, no good will be done. And now, happily, the Court of Directors have admitted this, and instructed the Indian Governments accordingly.†

No mile of railroad can claim a right to the public guarantee unless it forms part of a good national system of railroads.

The practical question as actually* referred to the Government of India by the Madras Government is this: shall the line now first to be made run from Madras, nearly west, up to the Palmanaire Ghaut to the Mysore table land, or south-westerly, keeping entirely in the low country to Vaniembady towards Salem? Both lines are approved by the Madras engineers and Government; the only question raised is which should have precedence.

Both lines are proposed with ulterior objects as part of a system of railroads, the Palmanaire line in order to extension to Bangalore and Bellary, and eventually to Bombay, the Vaniembady line in order to extension to Salem, Coimbatore and the west coast. Coimbatore is a cotton country, and Bellary is the great cotton country of the south of India. From both the cotton now goes to the west coast.

The existing traffic of Madras takes two main lines, one of these for the south-westerly traffic, runs by Wallajahnuggur (Arcot) Vellore through the Amboor Valley at Vaniembady to Salem, the Burramahl and the south-east portion of Mysore. The present high road to Bangalore runs along this line. The other of these for the north-westerly traffic runs also by Wallajahnuggur through Chittoon to Cuddapah, Bellary and the north-east portion of Mysore. The projected lines are directed with the view of securing both lines of traffic respectively.

The Madras Government think that the Vaniembady or south-west line will be

be more remunerative immediately, but they would give precedence to the Palmanaire or west line because of its greater ulterior importance.

The railway Committee selected the Vaniembady line as far as Wallajahnuggur, (Arcot) 60 miles, as being of all possible lines, of equal length, that on which the most traffic exists. Good reasons are given why this line, if resolved upon, should be produced at once to Vaniembady, 130 miles. The half million subscribed Major Pears reports will do this. The line presents no engineering difficulty and is remarkably cheap, being estimated at considerably less than 40,000 rupees a mile.

The line to Palmanaire, if not quite an equal length, will not be so cheaply constructed, having the Ghat to surmount, and the difficult country at the foot of it to get over. Palmanaire is 2,100 feet above the sea.

A very attentive perusal of all the papers and examination of the maps, after conversation with Major Pears, have led me to the conviction, that to give precedence, as proposed, to the Palmanaire line, would be very objectionable. My reasons may be thus summed up: It is only with a view to an ulterior object, viz., the Bellary extension, that the Palmanaire line is preferred. Now, no such examination of the country has been made as justifies any one in saying that the Palmanaire line is the best line to Bellary. It is about 70 miles longer than the direct line; it rises at least 500 feet only to fall again, and it misses the Cuddahpa traffic, now eight times greater than the Bellary traffic, without any equivalent. The direct line by Cuddahpa passes, it is known, through a difficult country, but it is not known to pass through an impracticable country. Till that country is surveyed, it seems to me unjustifiable to pronounce against what is obviously, if practicable, infinitely the best line for all the north-west traffic. The Vaniembady line, apart from ulterior objects, is acknowledged to be the most remunerative; it involves no engineering difficulty, and it forms part of the system which has been adopted as the great ultimate object equally with the Palmanaire line. It is true that the extension of the Vaniembady line to the west coast through the gap in the Ghats has not been surveyed, but the country is so well known to be favourable,* that no doubt could be entertained of its feasibility.

* The height of Palypatcherry in the gap is only 800 feet.

The actual proposition of the Madras Government is, to have a trunk line of 48½ miles, running due west from Madras, to an unimportant spot named Menil; whence have after a travel can go south-west to Vaniembady and the west coast, and whence immediately a branch shall be made running a little north of west up to the top of the Palmanaire Ghat to be thence extended to Bangalore and from Bangalore to Bellary, or else from Palmanaire to Bellary.

The trunk line to Menil is not stated to be the best line for either the Palmanaire or Vaniembady railway. It is, perhaps, not materially different from the best line to Palmanaire, but it is admitted to be materially different from the best line to Vaniembady, as it takes the rail quite off the existing line of the south-west traffic, and away from the large towns on that line.

If there is certainly to be one railroad to the top of the Palmanaire Ghat, then a trunk line to Menil is a good plan. But if there is not to be a railroad to Palmanaire, then a trunk or other line to Menil is unquestionably a bad plan. Thus, before the direction of the first mile of railway out of Madras can be properly determined, the question, shall there be a railway up the Palmanaire Ghat, or not, must first be determined.

One great reason for the Palmanaire line is, that by producing it 80 miles west, Bangalore is reached. But this consideration, I think, should be discarded, because Major Pears has just discovered from Vaniembady itself a passage up to the Mysore table-land, that promises to be much better than the Palmanaire Ghat. A railroad from Bangalore by this passage to Vaniembady will be shorter than one to Palmanaire, and thereby the whole distance from Madras to Bangalore by rail will be very little more than it would be by the Palmanaire. The Vaniembady line will be close to the present line of the high road to Bangalore, and Major Pears thinks his pass is the one up which the high road would have been taken, had it been known to exist.*

* See in No. 3, page 3, para. 12 and 13.
† Cuddapah and Bellary.

Two reasons in favour of the Palmanaire line only remain; first, that it will catch, below the Ghats, so much of the traffic of the Ceded Districts† as now passes the Chittoor way; second, that it may be extended in a direct line from Palmanaire to Bellary.

The first of these is only an immediate and temporary consideration, and on

such considerations the other line is admitted to have the advantage. It is maintained that Bellary must be eventually reached by a railroad, to be probably produced beyond it; and there can be no doubt that the cotton of Bellary is a great object. The making of a railroad to Palmanaire will not obviate the necessity of making one all the way to Bellary. At present the Bellary cotton goes to the west coast by very bad roads.

The second consideration is no reason at all, unless it is true that Palmanaire is the best line for a railroad from Madras to Bellary. It is not pretended that we are now in a position to pronounce that it is. Such a line would leave out Cuddapah, from which the existing traffic is estimated at 25½ lacs of rupees, whilst that of Bellary itself is only 2½ lacs. If feasible, unquestionably the proper line is through Cuddapah.* Major Pears tells me he is anxious to survey the country with this object.

The want of all information sufficient to justify any decision on a line for the north-west traffic, should not stand in the way of a railroad for the south-west traffic, about which the information is satisfactory.

The grand system of Madras railroads seems to me this :

1. A line from Madras to Cuddapah and Bellary, 316 miles.
2. A line from Madras by Vaniembady, Salem, Coimbatore, to the West Coast at Calicut, Penang or Cochin, 428 miles.†
3. A branch from north at Vaniembady to Bangalore, say 70 miles.
4. A branch from north at Coimbatore to the feet of the Neelgherry Hills, say 30 miles.

No. 1	-	316
No 2	-	428
No 3	-	70
No. 4	-	30
		844

The second of these lines involves no steep gradients, and will be a very easy and cheap line. When completed only to Salem, it will be so far a complete commercial line, as it will tap the centre of the Peninsula; when made throughout, it will be a complete work of the first order in a military and political view.

No. 1,026.

From *J. P. Grant*, Esq., Secretary to the Government of India, to *A. Malet*, Esq.,
Chief Secretary to the Government of Bombay.

Sir,

Fort William, 22 December 1852.

Home Department.
Railway.

I AM directed by the Most Noble the Governor General of India in Council to acknowledge the receipt of your letter, dated the 15th October last, No. 450.

2. In reply, I am desired to transmit the accompanying copy of a despatch from the Honourable the Court of Directors in the Financial Department, No. 51, dated 22d September 1852, and of the Memoir by Major Kennedy, referred to therein, and to request that this Government may be favoured as early as practicable with such remarks on it as may occur to the Right honourable the Governor in Council. On receipt of his Lordship's observations on Major Kennedy's paper, the Governor-general in Council will take into immediate consideration the question of "the extension of the Bombay line of railway beyond Callian.

3. His Lordship in Council will perceive that Major Kennedy approves of none of the lines which have been proposed as a line to be immediately executed; the line which Major Kennedy proposes to be first made avoids the Ghauts, and runs to Surat, where it would branch off towards Agra and the East Coast.

4. I am desired to take this opportunity of forwarding, for the information of the Government of Bombay, a copy of a letter addressed to the Government of Fort St. George on the 14th instant.

I have, &c.
(signed) *J. P. Grant*,
Sec. to the Govt. of India.

* Cuddapah, 490 feet above the sea; Bellary, 1,600 feet; Adoni, north of Bellary, 1,400; Palmanaire, 2,100; Bangalore, 3,000. The distance by road from Madras to Bellary by Cuddapah is 316 miles; by Bangalore it is about 100 miles more.

† Salem, 900 feet; Coimbatore, 900 feet; Palyhatcherry, the gap, 800 feet.

No. 57 of 1,853, Financial Department.—Railway Branch.

From *H. E. Goldsmid*, Esq., Secretary to the Government of Bombay, to
J. P. Grant, Esq., Secretary to the Government of India, Home Department.

Sir,

Bombay Castle, 11 February 1852.

I HAVE been instructed by the Governor in Council to annex, for submission to the most Noble the Governor-general of India in Council, copy of a report received from Captain Crawford, the Government Consulting Engineer, before whom there had been placed the Memoir by Major Kennedy, forwarded with your letter of 22d December last, No. 1,026, on the subject of railways in India

No. 17, dated 31 January 1853, with a Map of the Candesh Collectorate, referred to in para. 30.

2 His Lordship in Council considers that it is clearly and forcibly shown by Captain Crawford that the scheme which Major Kennedy proposes for adoption in this Presidency is not feasible.

The opinions of this Government in favour of the lines proposed by the Great Indian Peninsula Railway Company, and which were advocated in the papers submitted to the Government of India with Mr. Chief Secretary Malet's letter, No. 450, dated 15th October last, are strengthened by the facts stated and the arguments advanced by Captain Crawford.

4. A simultaneous extension of the railway system throughout India is, no doubt, desirable, while a line, such as that to which Major Kennedy's proposition more particularly refers, namely, to connect Bombay and Agra, is a line which would probably answer better for Government purposes than that contemplated by the railway company, yet it is one which appears to the Governor in Council, that a company seeking a dividend, cannot be expected to adopt; and, moreover, it is a line which, even if capable of construction, Captain Crawford shows could not be carried out by Government without alterations of the "disc designs," as they may be termed, of Major Kennedy; alterations requiring to be made after surveys and calculations that would entail a large expenditure of time and money.

5. His Lordship in Council is further of opinion, that if he were to withdraw his support from the railway company, and thus prevent them from carrying out their design until determination could be arrived at as to the propriety of constructing an account of the state of such a line as that suggested by Major Kennedy, the progress of railways on this side of India would be stayed for a long period, and the effect on capitalists at home and in this country be such, that if at a future period he had to revert to the original lines, as in all probability he would, or to other lines which he might wish to construct through the agency of a company; it would be difficult to raise the capital required.

6. Under these circumstances, the Governor in Council trusts that the Government of India will see fit to support the designs of the Great Indian Peninsula Railway Company, as set forth in the reports forwarded with the Chief Secretary's letter of 15 October last, No. 450.

7. The Government of India have already been informed,* that in the opinion of this Government, it is of great importance that the present experimental line should be at once extended, at any rate so far as to meet the general traffic of the country.

I have, &c.
(signed) *H. E. Goldsmid*,
Secretary to Government.

No. 17 of 1,853, Financial Department.—Railway Branch.

To *H. E. Goldsmid*, Esq., Secretary to Government.

Sir,

Bombay, 31 January 1853.

THE Memoir on Indian Railways by Major Kennedy, forwarded to the Government of India by the Honourable Court, and transmitted to the address of

* See Para. 4 of Letter to Secretary of the Great Indian Peninsula Railway Company, No. 448, of which copy accompanied Letter to Government of India, No. 450, 15th October 1852.

of Mr Chief Secretary Malet, in a letter, No. 1,026, under date 22d December, embraces questions of so vast and extended importance, that it seems to me useless to attempt the discussion of many of them in a paper like the present, which must necessarily be comparatively short, even if I were in possession of the requisite documents and information, and felt myself qualified for the undertaking

2 I propose, therefore, after some slight allusion to those matters which appear to be almost beyond my province, to confine myself to the portions of Major Kennedy's Memoir, more particularly affecting the question of railways on the Bombay side of the Peninsula, and I trust to be able to show, that the lines now selected and laid down, after so much expenditure of time and money, and so much labour and skill on the part of those employed in the operations, are to be preferred, on every ground, to that suggested by Major Kennedy, apparently, with the aid only of a map of the country before him

3 The first 22 paras of the Memoir allude generally to the vast influence for good which will attend the introduction of railways in India. All this, few will be found to dispute. The writer, however, appears to dwell principally upon their influence on military affairs, and the increased efficiency that will be given thereby to the army when the system is advanced to a certain point, this also will be readily granted: but when it is attempted to value in money the advantage thus gained, and to deduce therefrom with anything like precision the amount the Indian Government may at once raise as capital, or guarantee to private companies to push on the system in all directions at once, I must then confess, that the interests involved are too vast, and the questions, political and financial, much too complex, to warrant an individual in my position entering on the discussion; and it is, therefore, one of those subjects that I shall avoid

4 Passing over for the present paras 23 to 26 inclusive, which I shall consider in connexion with Appendix No. 3, "On opening a railway from Bombay to the table-land across the Syhadree range," to which they principally apply, we come to para 37, which is subdivided into 12 sections of rules, by which it is proposed to govern railway affairs in India.

5 Propositions 1, 2 and 3 * suggest that railways in India shall be ranged under two classes, in the first, the regulating gradient not to exceed 1 in 2,000, and in the second class, 1 in 330.

6 Under peculiar circumstances, where the traffic of rail is all one way, as, for instance, from the mouth of a coal-pit to the shipping point, a down incline is an advantage, but under ordinary circumstances, where it may be hoped that the traffic, though possibly not equal, will be of considerable amount both ways, every one will allow that the nearer the railway can be brought to a perfect level the better.

7 Few countries, however, will admit of any considerable extent of line on a perfect level; and the more the surface of a country is varied by undulations, the more expensive does the preservation of easy gradients become. Supposing no difference of actual level to exist between two termini, still, if the intermediate country be of a very diversified character, an approach to a level line between them can only be preserved either by heavy and costly works, or, if the features of the ground will admit of it, by a very considerable extension of the line in its length, so as to follow the contour of the country. In practice, the object would probably be attained by partial resort to both methods, and then the talent of the engineer is called into play so to balance these, that, when combined with the estimated expense of working the line so completed, the best return may be given for the capital expended.

8. Railways are of comparatively such recent introduction, that many of us may remember what are frequently, though improperly, called the absurd ideas that

* 1st That all railways constructed in India shall belong to one of two classes. The first or the second class.

2d. That the regulating gradient of the first class or trunk railway, shall not exceed 1 in 2,000. By regulating gradient, is meant the gradient which shall regulate the load of the engine.

3d. That no regulating gradient of any second class or branch railway shall exceed 1 in 330.

that were entertained with regard to the possibility of working them, not by the general public only, but by men of scientific note. It was, for instance, gravely asserted that an engine with a plain driving-wheel, acting on a plain rail, would not advance, and that the wheel would simply revolve without propelling the engine. When the contrary was shown to be the case, equally incorrect views were advanced regarding the power of ascending inclines, the rates of speed obtainable, the powers of traction, &c. ; in fact, with all our boasted power of reason, railways, like every improvement in art and science, have been completely established by experiment, after a series of trials and errors.

9. The consequence of all this was, that, as is now freely confessed, enormous sums of money were sunk in costly embankments, viaducts, tunnels, &c , with a view of preserving that close approach to true level, which after experience showed to be not absolutely requisite, and by the experience all parties are now profiting in setting out new lines. For it is to be remembered that, whilst the cost lines of works must remain pretty nearly constant, especially those, such as heavy embankments and tunnels, in which the principal expense is the labour employed, vast improvements are yearly being effected in the adaptation of our native powers ; and there is, therefore, the less reason to sacrifice money in the construction of costly works, which may be in a measure avoided by some increase of gradients.

10. Admitting, therefore, that the nearer the line of railway can be made to approach a true level the better, I still do not see the necessity for hampering ourselves with specific rules on the subject. It would appear quite sufficient, when a line of railway is proposed between any two places, that care should be taken that it be laid out with as easy gradients as possible, consistent with a due regard to economy in construction and working.

11. I shall say little on the subject of the 4th proposal * The plan may possibly be a good one, where the slope of a country is very flat, such as perhaps in Bengal, Sinde, the desert between Suez and Cairo, where the intervening summit is attained by a regular and almost unbroken ascent. It is, however, hardly applicable to Western India, on this side of the summit of the Ghauts.

12. Proposition 5,† is one of those which had much better be left open for consideration in any particular case. I can see no sound reason for tying ourselves down not to undertake a line, merely because it is estimated to cost more than 5,000*l.* per mile of single line. If, on account of physical difficulties, the construction of a line to connect any two places, must necessarily cost from 8,000*l.* to 10,000*l.* per mile, surely, if the traffic between them offered every prospect of being a paying one, there is no sound reason in refusing to commence such a line, merely because it exceeds an arbitrary amount per mile.

13. The proposition laid down as the 6th,‡ is at present the rule observed on this side of India, with the exception of the short line through the islands of Bombay and Salsette, which has been laid as a double line, for reasons on record.

14. Proposition 7,§ determining the character of engine to be used in India for the next 10 years ; proposition 10, relating to the number of trains daily on a line,

* 4th. That short alternate planes may be introduced to assist the ascent, not to exceed a length of a half furlong each, and not to be nearer to each other than one and a half furlong.

† 5th. That no line shall be undertaken when estimated cost shall exceed the average rate of 5,000*l.* per mile of single track ; but that this rate of cost is not expected to include the bridging of large rivers, as the Soane, Jumna, &c., exceeding half a mile wide at flood level. Such rivers are to be considered as breaks or temporary termini, where goods and passengers are to be carried across on rafts.

‡ That no line shall be sanctioned except for a single track of rails, with masonry, cuttings, and embankments to correspond. The ground, however, required for a double track to be in all cases secured.

§ 7th. That no locomotive engine shall be introduced to India for 10 years, except such as the ratio between the length of stroke of piston and the diameter of the driver wheels shall sanction with reference to the maximum load, notwithstanding any sacrifice of velocity on the journey. Rule No. 11, contains an exemption from this restriction.

10th. That no more than one train daily shall run in each direction upon any line, until the traffic shall furnish more goods and passengers than one engine can carry, after which, a second may

line, and proposition 11, relative to passenger trains, with engines of higher powers, are questions that might, I think, be left for consideration by the directors of a company when the occasion offers, and would probably be better arranged at the time, with the concurrence of Government, than by attempting to dispose of the subject by fixed rules at present

15. On proposition 8* I have little to remark, the circumstance of any particular case would be the best guide, but I do not anticipate any extensive application of piled foundations on this side of India.

No. 27 of 1849, to
the address of Go-
vernment of India.

16. The instructions conveyed in para 20 of the Honourable Court's despatch meet this point fully, as far as the real object of proposition 9 † is concerned. As no expenditure whatever can be made by the railway company without the sanction of Government, and it is determined at the time to which account it is to be charged, the great object of preventing anything being charged to capital, which is properly chargeable to income, is attained. If the letter of this proposition were enforced, much difficulty might be experienced with Indian railways. A very large portion of the expenditure will necessarily be incurred in England, and if the opening of a line were delayed until the actual and final closing of every account at home, vast delay might occur, and the capital expended in the meantime be unproductive, Government, on the terms of the guarantee, being obliged to pay the interest agreed upon. I trust, at any rate, that this rule will not be made applicable, in its strict letter, to our present line between Bombay and Tannah. The contractor is about to claim his completion certificate, from which date his year's maintenance of the line will commence, and should the line not be worked for that period, or the greater portion of it, the contractor will make an extremely good profit out of 20,000 rupees, for which he is bound to maintain the line in working order for 12 months.

17. On proposition 12 ‡ I shall offer no remarks, the information alluded to, if collected and recorded, would no doubt be of great value, but is applicable to many other improvements besides railways.

18. Paragraphs 39 to 58 treat of matters of such vast political and financial importance, that I feel it would only be presumption on my part to enter, in any detail, upon such questions as the relative position of Government and the Natives of this country as landlords and tenants, or what per-centage of the revenues is applicable to public works. Even the subject more particularly dwelt upon from paras. 50 to 55 of the Memoir, the Appendix No 1, and Table referring to Fly Sketch, No 2, viz, the grand trunk lines for the whole of India, I feel to be a question requiring much larger sources of information than is contained in a map of the country spread before me, and at any rate, it is not one to be discussed in a paper like the present; nor, I trust, will the progress of railways in this country be retarded for the full and final consideration of such an immense subject. We may, I think, whilst laying out our lines so as to occupy such parts of the country as offer fair chances of profitable working, at the same time keeping in view the grand communications of the country, very well leave the railway system in some degree to develop itself; for as the whole
project

start daily each way, and that when the traffic calls for three trains fully loaded per day, the arrangements shall be made for laying down a second track of rails.

11th That notwithstanding the tenor of rule No 6, if on any line it shall appear that the profits exceed a dividend of 6 per cent. per annum, it shall then be permitted, if thought advisable by the Directors of the Company interested, to introduce engines of higher powers of velocity, with a view of running passenger trains separate from goods trains.

* 8 That when piling for foundations be requisite, the foundations are to be laid to suit a double track, although the superstructure is only carried up for a single track.

† 9th That no portion of any line shall be permitted to open for the transport of goods or passengers until the capital account for the construction of such portion shall have been closed

‡ 12. That the height above the sea of all obligatory points throughout India, having reference to the construction of works, draining, irrigation, &c, such as the highest points and necks of valleys, the low passes in mountain ranges, be obtained and recorded with all convenient despatch on the maps now in progress of construction by the Surveyor-general's Department, and that, in addition to this, the height of numerous points of inundation level, to be taken upon the rivers of India, and recorded upon the maps at intervals of two or three miles, so as to admit of the protraction of proximate sections of the slope of such rivers, and that any striking peculiarity in the lines of rivers, or of the ground between adjacent rivers, be reported upon to the Surveyor-general by his subordinate officers, such reports to be methodically arranged in his office as records.

project suggested by Major Kennedy cannot be laid out and brought into action at once, the very progress of railways will probably tend, in some measure, to modify their future circumstances. I would also deprecate the attempting things on too great a scale in the first instance, and thereby risking failures and delays, which may cool the rising confidence which seems to be entertained at home with regard to India as a country for investment of capital.

19. I shall now proceed to notice the subject alluded to in paras. 28 to 36, of the Memoir, and Appendix No. 3, in which Bombay is more particularly interested.

20. It will be seen from para. 30, and also from the opening of Appendix No. 3, that Major Kennedy is not aware that the whole project for reaching the table-land of Candeish by the Malsej Ghaut route has, after a most careful reconsideration and survey of other routes, been rejected for that by the Tull Ghaut; and that there is no intention now of attempting the ascent by a "fixed engine incline of about six miles, with a gradient of about 1 in 18, or by an alternative incline of 13 miles long, with a somewhat reduced gradient" All exceptions, therefore, taken by Major Kennedy to these points, or to the branches from Alleh to Kandeish, and south-eastward to Sholapoor, are now of no force. Neither is it the intention that the grand trunk line between Bombay and Agra should pass over no fewer than four unnecessary and fierce ranges of mountains; indeed, it is no object, at any rate at present, with those in Bombay interested in railways, to look towards Agra at all. Our object is to reach the table-land of the Deccan and Candeish as speedily as possible; and this, I am fully persuaded, is provided for in the project now before Government in the report forwarded by the Railway Company.*

21. It is difficult to place in favourable contrast the magnificent projects put forward in the 31st and 32d paras. of the Memoir, viz., for establishing a railway communication between Agra, Candeish and Berar, the valleys of the Nerbudha and Soane, and west by Guzerat, Kurrachee, the Indus, &c., and the present more humble views of the railway company; the one plan being of so very general and extended a nature, and the other, comparatively speaking, so small; and, therefore, whilst not disputing the eligibility of Major Kennedy's mode for opening the communication of all those districts with Bombay, (*vide* conclusion of para. 32,) it will suffice to say, that the views of the capitalists interested in our present line are of a much less extensive description. Whether an immediate railway communication with Surat, and thence onward to Agra, is desirable or not, in a political point of view, Government will, of course, be the best judges, and, if necessary, will probably undertake the project; in the meantime, there seems to be no necessity for such interfering with the plans for an entirely different line of railway into Candeish now before Government.

22d. It will, therefore, be as well to narrow the limits of the discussion as much as possible, and with this object I will take the one point of opening up Candeish, one of our richest provinces, by railway communication with Bombay, and compare Major Kennedy's suggestions for doing this with those proposed by the Railway Company.

23d. Major Kennedy in his 31st para. writes, "The same reasoning which overthrows this project as a general trunk line between Bombay and Agra, holds equally against that portion of it intended to open an intercourse between Bombay and the districts of Candeish and Berar. On this portion of it, the aggregate amount of rise and fall would probably exceed considerably 4,000 feet, whilst by the coast we go level to Surat, and branch off by the Taptee Valley, at the slight gradient of the river, without passing any range whatever, nor would the distance by this route exceed that over the Ghats."

24. It will be observed from the Railway Extension Report,† that the proposed line has been surveyed and roughly estimated from Cullion to Munnaur, just within the borders of the Province of Candeish, and the aggregate amount of

* With Letter No. 548, dated 27 September 1852. Copy sent to Government of India, with Letter No. 450, dated 15 October 1852.

† Dated 14 September 1852. Copy sent to Government of India, with Letter dated 15 October 1852, No. 450.

of rise and fall will not be anything like the quantity named by Major Kennedy. It would be unfair to judge of the proposition in the memoir, by bringing Major Kennedy's line after entering Candeish down to Mumnaur, as it would place him at a great disadvantage, by carrying him through the very worst part of the Daung jungle, and making an unnecessary bend to the southward in his line. I shall suppose, therefore, that it is intended by both lines to reach Sowda, which, situated towards the eastern extremity of Candeish and on the grand route for Central India, will admit, I think, of a fair comparison of the two lines.

25. To quote again the conclusion of para. 31, Major Kennedy writes, speaking of the intercourse between Bombay and Candeish, "by the coast we go level to Surat, and branch off by the Taptee Valley at the slight gradient of the river, without passing any range whatever, nor would the distance by this route exceed that even of the Ghats." Perhaps no stronger instance exists, than is contained in the above quotation, of the uselessness of attempting by the mere aid of a map, without personal local knowledge of a country, to set out the course of a railroad. Of the physical nature of the country through which he proposes the line to run, Major Kennedy would appear to be absolutely ignorant, for I am obliged to conclude, from the whole tenor of his Memoir, as regards the western side of India, and the Ghats in particular, that he has never visited it or them.

26. In the first place, if we take the coast road from Bombay to Surat, we find it, it is true, pretty level, but interrupted constantly by the mouths of considerable rivers, two or three of them amounting to arms of the sea, one and two miles wide. Probably, however, the inner route might be chosen, and this, it is true, would avoid the broadest portions of some of these; but even here they would interpose, in some cases, as most serious obstacles. In fact, whether by the immediate coast line or the inner route, the whole line of 190 miles in length to Surat, is open to the serious objection of directly crossing the whole drainage of the country, and that at the lowest, and consequently broadest portions of all the rivers. The line would be interrupted by ferries in certain instances, and in others these could only be avoided by heavy works in the shape of viaducts.

27. From Surat turning eastward, no great difficulty would probably be experienced through the Province of Guzerat, but at the entrance to Candeish, where the Taptee breaks through the line of Ghats, having the Satpoora hills on the north bank, and the end of the western Ghats on the south, the case is very different. At this point, where so much is expected to be gained by turning the range of hills, it will be necessary to give a general description of the country, in order that an idea may be formed of its eligibility for railway purposes.

28. In the first place, I may mention that for 70 or 80 miles along this part of the river's banks, the neighbouring country is for the greatest portion of the year deadly to all but the few scattered tribes, Bheels, dwelling in its dense jungles and ravines. I have made particular inquiries in these matters from those who have, when occasion permitted, passed through these districts; but perhaps I could not put the case in a stronger light, than by quoting a report, now before Government in the General Department, being one made by Mr. Edwards, of his survey during last year of the River Taptee, with a view to the rendering it navigable. As this report was framed with no other view to railway affairs, the incidental notices of the features of the country will have the greater weight, as being unbiassed in any degree.

29. Here then is his description of the break in the hills, through which the Taptee flows from Kandeish into Guzerat. To prevent confusion, it is to be observed that in his survey he is proceeding down the river, and we are now advancing up it; he writes, para. 10, "As we advance into the Daung jungle, the spurs from the Sutpoora hills and the tail of the western Ghats converge towards the river, the banks become very high, as much in some places as 150 to 200 feet." Again in para. 12 he says, "At Purkassa, however, the jungle begins, the villages and the cultivation gradually disappear, until we arrive at Kookurmoonda, beyond which, nothing but a few Bheel huts, in clusters of three or four, and an almost impenetrable jungle, without a vestige of even a bullock track, exists; the surrounding country is also rugged and hilly, and is very much infested

infested with tigers ; this state of the country continues as far as Carranjeah, a distance of 75 miles." If to the above is added the fact, that the climate of this part of the country is to all, but the few savages bred in it, for the greatest portion of the year deadly, little further, I think, need be said to make it clear, that the immediate vicinity of the river must be avoided ; and how far this could be done without becoming entangled in the rough ground of the hills on either side, a special survey only could determine. It will be seen from further quotations, that the river is liable to heavy floods, and that safety from them is to be found only in keeping the general level of the country ; this, in a district intersected in every direction with ravines 150 and 200 feet deep, will admit of some judgment being formed of the probable costly nature of the requisite viaducts and embankments. The above is, I think, quite sufficient to show that the facilities of this route are not so great as Major Kennedy would seem to suppose.

30. But having now reached the province of Candeish, the greater difficulties no longer exist ; still Major Kennedy's route generally must hold to the immediate vicinity of the river. The accompanying map of the province of Candeish will probably give a better idea of the features of the country than can be gained from a smaller one. I have laid down an imaginary route, supposing Major Kennedy to enter the province on the north bank of the river : as this, however, it may be remarked, would have entailed the necessity of crossing the Taptee somewhere within the province of Guzerat, where it is very wide, it is not likely that it would be selected by him. It will be seen that the route crosses the whole drainage of the country ; the line by the north bank, after clearing the teak forest, would probably be found the more preferable ; still it will be seen that it must cross considerable rivers and water-courses. Let us now see what is the character of the river and its immediate vicinity.

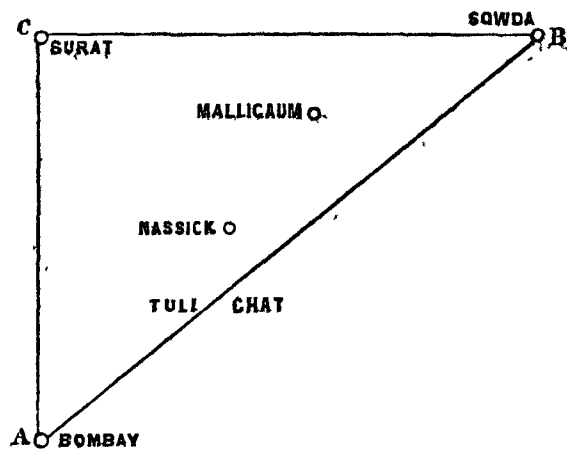
31. Mr. Edwards writes, p. 10 : In the province of Candeish the banks are about 60 feet high, consisting of an upper and lower one ; the upper is composed of black earth, and is on a level with the surrounding country, but the lower bank is of yellow earth, and is very much cut up into ravines. And again, in para. 13 : " I think it was in a flood, 14 years ago, that several of the villages in Khandeish, which were situated on the lower bank of the river were swept away, the devastation of life and property was great, and those that had the good fortune to escape, were left destitute. I have observed, that in no instance had any village that was situated on the black earth suffered injury, whilst, almost without exception, those on the yellow earth suffered more or less, and in fact, the inhabitants have now deserted several of their old villages, and founded newer ones on higher ground " If the above had been written with a sole view to railway matters, it could not have been more to the purpose. It is clear that the railway could only be carried on in the vicinity of the river at the cost of most extensive works ; but under the supposition that the line might be kept at such a distance from it, as to avoid the greatest of these difficulties, still this portion from the entrance to Candeish by the Taptee to Sowda, cannot compare with the portion from Mamnaur to Sowda.

32. The line from Callian to Mamnaur has been surveyed, and the results are now before Government. From Mamnaur I mark down the possible route to Sowda, and a mere inspection will show the very different conditions of this line from that of Major Kennedy, with respect to the crossing of the drainage of the country.

33. It would seem that nearly enough had been said with respect to the route to Candeish *viâ* Surat and the valley of the Taptee. but there is one more point upon which I must meet Major Kennedy. To quote again the conclusion of para. 31 of his memoir : " By the coast we go level to Surat, and branch off by the Taptee valley, and the slight gradient of the river, without passing any range whatever ; nor would the distance by this route exceed that over the Ghats."

34. Major Kennedy evidently here has in view the route first proposed, but now rejected, *viâ* the Malsej Ghat. But even in this case the assertion in the concluding portion of the paragraph would not be strictly true ; for by simple measurement on the map, the route *viâ* Surat and Taptee would be to that *viâ* the Mulsej Ghat, as 16 to 12 nearly, whilst it is still less favourable compared with the present line *viâ* the Tull Ghat. The three points, Bombay, Surat, and

Sowda, or any other town in Candeish, if connected, would constitute very nearly a right-angled triangle, (*vide* accompanying diagram,)



A. C. 190 miles }
 C. B. 200 miles } 390 miles route proposed by Major Kennedy ;
 A. B. 278 miles route selected by Railway Company ;

of which the route *via* the Tull Ghat would be the hypotenuse ; one leg of this triangle from Bombay to Surat measures 190 miles ; the other, from Surat to Sowda, without allowing anything for deviations of the railroad, is in a straight course at least 200 miles, making a total, if Major Kennedy's route were followed, of 390 miles. The distance from Bombay to Callian by the line at present in construction is 32 miles ; from Callian by the Tull Ghat to Munnaur by the line already surveyed, and of which the plans are before Government, is 128 miles ; from Munnaur on to Sowda, may be put down at 115 miles ; making thus a total of 275 miles only, against 370 miles in the route by Surat and the valley of the Taptee.

30 miles at 5,000l.
 75 miles at 5,000l.

35. We will assume that either line is constructed at Major Kennedy's minimum of 5,000 *l.* per mile, not admitting, however, the sufficiency of such a sum ; yet, for the sake of comparison, that amount will do as well as any other. We have, then, the first cost of the one line, 1,950,000 *l.* ; whilst the Tull Ghat route would be only 1,375,000 *l.* But in addition to this, due weight must be given to a further very important point : not only would there be this difference of first cost of construction, but the cost of working and maintaining thenceforward, 115 miles of unnecessary railway.

36. That the traffic would bear this, I think highly problematical, the more so, as in a commercial point of view (I put political questions aside), the line of 190 miles between Bombay and Surat cannot be calculated upon as one that could be worked at a profit. Surat is still a port of considerable importance, and for eight or nine months of the 12, the communication between it and Bombay by boats and steamers is constant and regular ; taking the cost of tonnage between the two ports at 4 *s.* and 8 *s.* per ton for heavy and light goods respectively by the sea route, it is evident that, unless the rates by rail could be reduced to somewhere about a farthing and a halfpenny per ton per mile for these 190 miles, there would be little prospect of any considerable portion of the staple traffic, cotton, being conveyed by its means.

37. I think that I have advanced sufficient to show, that Major Kennedy's proposal for opening the communication between Bombay and Candeish *via* Surat and the valley of the Taptee, is in the first place, under present circumstances of the country, hardly practicable, and that were it otherwise, it could not compete profitably with the route now proposed for adoption by the Great Indian Peninsula Railway Company. On the merits or demerits of this fact I shall not now enter ; it has already been placed before Government in a clear and practicable Report, and the nature of the works required, the probable cost of the undertaking, and all other points of importance, are deduced from close, actual and laborious survey of the country : it is, therefore, deserving of support against any propositions which are not based on equally sure data. And the crowning argument in favour of the Tull Ghat route into Candeish over that by Surat is this, that by it we occupy a line of large present and yearly increasing traffic, the Tull Ghat road, bad as it yet is in many portions, being the great line of communication between Bombay and Central India. By the route of Surat and the valley of the Taptee, we should pass through a line of country on the first 190 miles of which, at present, nothing to be called a traffic exists, that being all

all sea-borne; whilst, through a large portion of the remainder, we should pass through a country in which, at present, not even a foot-track exists. It is a hazardous experiment, even under far more favourable circumstances than that now before us, to attempt to interfere largely with established commercial routes, and no sound reason exists for attempting to disarrange that already adopted by the traffic of the country.

38. If, in what I have now said, I have succeeded in showing that the route by the Tull Ghat to Candeish is preferable in every respect to that proposed in Major Kennedy's Memoir, but one more point remains for me to enter upon, viz., the method suggested by Major Kennedy for ascending the Ghats.

39. I feel the greater difficulty in this matter because I have to argue seriously against a project which I am confident could never have been for a moment entertained by any person who had, I will not say carefully examined this range of mountains, but merely ridden along their base and looked at them. I shall, however, treat the question as shortly as possible, and for this purpose will take up the case of the ascent of the Bhore Ghat under the circumstances that will be most favourable to Major Kennedy, viz., to assume the steepest gradient he admits, 1 in 176, requiring a base of 50 miles in length to overcome the ascent, and suppose it for the present, for the sake of argument, a practicable scheme in an engineering point of view.

40. The present line of railway is now in course of completion up to Cullian, we may therefore take this as the starting point. First, then, as to mere mileage.

From Cullian to a point 15 miles south of the Malsej Ghat, the point selected by Major Kennedy for the commencement of the incline, the distance is about

-	35 miles.
Ghat incline	50 „
From top of Ghat to Bonah	40 „
	125 „
By the route surveyed and mapped, and which is now before Government, the distance from Cullian to Poonah is	81½ „
Difference in favour of Great Indian Peninsula Railway route over that now proposed	43½ „
Valuing this at Major Kennedy's rate of 5,000 <i>l.</i> per mile, his line would cost	£. 625,000
Whilst that now before Government would cost	407,500
	£. 217,500

Although this price of 5,000*l.* per mile is far too low, it serves as well as any other amount for the sake of comparison; for of course the same prices must be applied to both projects. Major Kennedy's rate cannot be assumed for his line, and our higher one, obtained by survey and calculation on the ground, used for the other route.

41. Thus much, then, for the mere first cost of the lines; but what is to be said in favour of that one which so unnecessarily lengthens the distance between two places upwards of 50 per cent.? Or if, to quote Major Kennedy's own words, paragraph 57, "the traffic of India has no broad margin like that of England to cover grave errors," to what are we to look to compensate for the annual maintenance and working of 43½ miles unnecessary line contemplated in laying out that between Cullian and Poonah, with a length of 125 miles, when the same can be accomplished efficiently with 81½ miles of railway? If the traffic of India should prove to be of the character supposed by Major Kennedy, is it likely that it would easily bear an addition of upwards of 50 per cent. to its mileage?

42. But I have now to take up the subject of the feasibility of the scheme proposed by Major Kennedy for the ascent of the Ghat. Major Kennedy commences this part of his case with an estimate of the cost of tunnelling, premising that the Ghats are most favourable for work of this description. Not to take up too much time on this part of the question, I will merely refer to

paras. 11 to 13 of my Report,* No. 126, of the 7th October 1852, and mention that whatever may have been the opinion formed by those engaged in the first examination of the Ghats in 1845-46, actual experience in tunnelling operations on the present line of railway, and a knowledge that the nature of the rocks to be encountered in the Ghats differs in no material degree from that with which we are now engaged, has led us to decide that by every possible means tunnelling operations are to be avoided in India. To say nothing of the expense, there is the element of time, one perhaps of even greater consequence. I need only mention that in our present operations on two comparatively insignificant tunnels the progress in the one, under the most favourable circumstances, has averaged only five yards per month on each face, or ten yards on the two faces, and this working night and day with free labour and skilled European superintendence; in the other tunnel, where greater difficulties have been experienced, so much as 12 weeks were consumed in one instance in completing 15 feet in length. This question of time is, I am confident, quite sufficient to upset any scheme involving the execution of very extensive tunnelling. What then must we conclude with reference to Major Kennedy's plan, which contemplates 50 miles of line on the face of the Ghats, of which, according to his own anticipations, half a mile in every mile would consist of tunnels, or 25 miles length of tunnelling altogether?

43. Of the estimate framed by Major Kennedy of the expense of operations of this nature I shall say little; either some great clerical error has occurred in putting together his memoranda on the subject, or on estimating the expense of tunnelling at 6*d* per cubic yard, or 17*s*. 6*d*. per yard forward for a tunnel for a single line, he has left out of the calculation the cost of convict labour, the feeding and guarding the convicts, the value of the superintendence afforded him from the public service, and other items, to say nothing of the want of any information regarding the nature of the material in which his operations were carried on: all this, I must be permitted to say, renders his estimate of no practical value. It may be very well in an occasional public work, where all circumstances suit, for Government to employ convict labour upon it; but it must be evident that on any very extensive scale, such as a long line of railway, this could not be done either with safety or profit, and I speak from experience, having had charge for a long time of subsidiary jails employed on public works. To attempt to reject from the calculations of the cost of a work, the expense in maintenance, &c. of the convicts employed, is a fallacy and a species of self-deception. I will conclude this part of the subject, viz., the estimated expense of tunnelling, put down by Major Kennedy at 6*d*. per cubic yard, by merely mentioning that this is as near as possible the cost in Bombay of digging foundations in ordinary soil, whilst the cost of excavating rock in ordinary circumstances varies from 2*s*. 6*d*. to 3*s*. per yard.

44. But I have now to consider the actual nature of the scheme proposed. Major Kennedy writes, "The precipitous face of the Syhodree range will probably be found to average about one perpendicular to three horizontal, with an elevation of 1,500 to 1,800 feet at some of the Ghats above the more level country at its base. Its crest for the most part offering a serrated line with alternate salient and re-entering segments of curves of varying radii and cords, which we may assume to average somewhat less than semicircles of about half a mile radius, and occasionally diversified with spurs of considerable projection. The principle upon which these data should be dealt with, in order to procure at the lowest cost a road fitted for a locomotive, followed by a remunerative load, will be to conform as much as possible to the natural contour line of the hills, where the width can be obtained by simple side-cutting, intersecting where necessary such portion of the projecting segments by cuttings or tunnels, and of the re-entering segments by embankments or viaducts, as shall bring the general line within the limits of well-considered radii of curvature." He then goes on to propose, that for the purpose of ascending the Bhoze Ghat for instance, a point for commencing the ascent should be chosen about 15 miles south of the Malsej Ghat, and at the foot of the range, and an incline with a slope of, 1 in 176 formed along the face of the mountains, partly by side-cutting

* Copy sent to Government of India with letter dated 15 October 1852, No. 456.

cutting and tunnelling, and partly by the construction of viaducts, until such slope would come out about the summit of the Bhore Ghat.

45. It is a very difficult thing, requiring a peculiar talent, that of scenic description, to bring by simple writing an ordinary landscape clearly before the mind's eye, and not laying claim to such art, I despair in a great measure of enabling a stranger to the Ghats to realise fully the nature of the district; nothing but plans and sections of the most detailed and accurate description would enable me to do this; but I assert, and that without fear of contradiction from any person acquainted with the Ghats, that the project of Major Kennedy is but one step removed from the impossible.

46. His description in the before-quoted para. of what the "Syhadree range will probably be found," I must be permitted to say, affords anything but a correct idea of the nature of that range. The Ghats have been likened to a wall, and not untruly so; broken this wall is by huge chasms, and in places by projecting spurs. Whether the slope, where there is a slope, would be found, as Major Kennedy anticipates, to average about one perpendicular to three horizontal, I cannot say with precision, but throughout the entire length of the Ghats from north to south, there is one feature which he has overlooked, and that is, that there exists a sheer precipice in the strictest sense of the word, varying from 200 feet, to, in some places, perhaps 500 feet perpendicular height. This precipice is not always the very crest of the range, but is found perhaps generally between the middle and the top; it is broken by huge fissures, and in many places runs out apparently only to recommence a short distance further on. During the monsoon, cascades in all directions pour over the face of this bed of rock; a line of road taken up this, after the fashion proposed by Major Kennedy, would, setting aside all other difficulties, come out upon chasms, the passage of which would require viaducts of a description, I may safely say, hitherto unprecedented for height or magnitude.

47. As to the commencement of such a work, I may observe, that to get even a footing for the workmen, it would be necessary throughout considerable lengths of it to sling the men over precipices, there to commence operations in situations where yet the foot of man never trod. I have said before, that the work is but one remove from the impossible, and in these days it is impossible; it is one of those works that might be attempted, and perhaps carried out, by a ruler of irresponsible power and unlimited command of men and money, and when completed it would rank as one of the most, if not the most, stupendous works of the sort; stupendous, not in the same sense as the Britannia Bridge, where it is the grandeur of the conception and the bold application of an entirely new theory of engineering that excites the wonder of the spectator, but only from the consideration of the vast amount of labour and money that must have been expended in its construction.

48. After what I have now said, it would seem superfluous to advance further objections to the project, but there is one which I would yet mention: it is proposed to construct a line of railway, gradually creeping up the face of a precipitous range of hills for a length of 50 miles. The annual fall of rain varies from 180 to 200 inches at Khandalla, and this falls principally in three months of the year. Of the works necessary for the protection of a line crossing at right angles the whole drainage of such a locality, all must at present be surmise. I will, however, mention, that in 1832, 1833 and 1834, I was employed at Khandalla and its vicinity; this was but shortly after the opening of the New Bhore Ghat road, which, only four miles in length, ascends a spur without any very extensive side cutting; nevertheless, whenever the natural soil had been disturbed by side cutting, though all ordinary precautions had been taken, vast masses during the monsoons would frequently slide down on to the road from above, rendering it almost impassable for days, and requiring the constant labour of a body of men to keep it clear. And although, of course, the frequency of such accidents has diminished by time, and when they do occur they are not of the same extent, still even at this date, after the road has now been open for upwards of 22 years, partial slips do take place. The case of a railroad, subject to such accidents for 50 miles of its length, can be better imagined than described.

49. Major Kennedy estimates the cost of this work at 5,000*l.* per mile. I have already shown that one of the principal data upon which he founds this estimate, viz., the cost of tunnelling, is erroneous. I will not, however, undertake to correct his estimate, by stating what I think the work would cost, as I could not presume to attempt such a thing without the most detailed plans and surveys, though, as far as my own credit goes, I feel that I might safely do so; for the sufficiency or otherwise of such estimate would, I am sure, never be practically tested.

50. There is one more observation which I would be permitted to make: it is, I am aware, strictly speaking, no argument, but is still worthy of some consideration on an occasion like the present. The project for ascending the Ghat, laid down by Major Kennedy, contains no new idea; everybody is aware that a better gradient is found by leading a railroad or an ordinary road along the face of a hill, and gradually surmounting it, than by facing the said hill in a more direct manner. I would ask, therefore, is it just to the numerous parties of all descriptions, well acquainted with the ground, who have given their attention to this subject, to say nothing of the talented and experienced civil engineers who have for the last two years been engaged in a laborious instrumental survey of the whole district, to suppose that the very obvious plan proposed by Major Kennedy, if feasible, should have been so utterly lost sight of by all, and remain to be discovered by one at a distance, and who evidently cannot ever have visited the locality?

51. Before closing, I would beg to apologise for the seeming prolixity of this letter, but I have been placed under the serious disadvantage of having to combat propositions which I am bound to say are, in many instances, advanced on no better grounds than the writer's assumptions. Propositions brought forward in this way, can of course be stated with whatever brevity the writer pleases, whereas objections to them necessarily require that the subject be more fully discussed.

52. One more point I would request permission to mention. It has not anything directly to do with the matter in hand, and may possibly appear somewhat personal. Should the Right honourable the Governor in Council deem what I have advanced of sufficient force to allow of his adhering to his former opinion with respect to the project for the extension of the railway beyond Cullian, and see no reason to propose to the Supreme Government and Honourable Court any modifications of it, consequent on the receipt of Major Kennedy's memoir, it may then happen that that memoir may be recorded without being sent for consideration to the Railway Company. In such case I feel it to be almost an injustice to gentlemen with whom I have now been associated for the last three years, that certain passages of the memoir should be placed on the Government records without notice, especially as those gentlemen will not have the opportunity of protesting against the spirit of them. I allude more particularly to paras. 24, 25, and 26 of the memoir. I shall not enter into a discussion as to what parties were most to blame at home, more especially during the period when what has been well designated as the railway mania prevailed. Possibly there was blame attachable to all sides, but there is nothing whatever to show that it all rested with the engineers. I will only ask permission to state, that from the habits of intimacy upon which I have been with the gentlemen now in the employ of the great Indian Peninsula Railway Company, as well as what I know officially from my association with them on matters of duty for the last three years, I do believe that there are no grounds upon which useless extravagance on their part is to be anticipated, but, on the contrary, I have every reason to know that they are, one and all, most anxious to economise, as far as safety and sufficiency of the works will allow.

53. The capital raised for the line from Bombay to Cullian was 500,000*l.*; of this there are now good grounds for anticipating that there will be a clear saving of 100,000*l.* This is no ordinary circumstance, either in railway affairs or large public works in general, and when the work done comes to be compared with the amount expended upon it, the extremely economical views of even Major Kennedy may possibly be satisfied. From the sum of 400,000*l.*, a deduction must first be made of 30,000*l.*, admitted by the Honourable Court, under the head of previous expenses, and applicable to charges incurred on the examination, &c.,

&c., of the Malsej Ghat scheme, some years ago: that the present scheme has benefited by the examination and surveys then carried on, there can be no doubt, although no part of the said sum of 30,000*l.* was actually expended on the present project.

54. The sum, then, actually expended, it is now pretty clearly seen, will amount to about 370,000*l.*, and we may now inquire what has been done for this money

55. First, then, including the Mahim branch, the contracts now in hand, two of which are approaching a completion, exhibit a total length of railway of somewhat upwards of 33 miles; this divided into 370,000 *l.* will give an average rate of about 11,212 *l.* per mile; but of this 33 miles no less than 20 miles, or nearly two-thirds, is completed as a double line. This 20 miles of double line through the islands of Bombay and Salsette are, from local circumstances, of a much more expensive description than would be the case further inland

56. There are, first of all, two expensive road bridges, carrying the ordinary road over the rail for the two most frequented thoroughfares of Bombay; there are other two also, but in situations where, from the line being in a cutting, they are of a less expensive nature. Again, the level crossings and gates rendered necessary by the greater number of public roads intersected by the line are very numerous, and throughout the vicinity of the town the fencing, either walling or palisade fence, is of a much more expensive character than is required elsewhere.

57. Again, although the country is generally favourable throughout, there is an extensive embankment across a deep marsh, a very large viaduct of 22 arches, and one large opening of 84 feet, with box iron girders. This viaduct, crossing a large arm of the sea, has a headway of 30 feet above high-water mark some distance beyond this there is another viaduct over a salt-water creek, besides two tunnels, which, although of no great length, add considerably to the cost of an otherwise ordinary line. Where the line is laid as a single line, the works, such as bridges, viaducts, tunnels, &c., have all been constructed for a double one.

58. In addition to the above there are, on the islands of Bombay and Salsette alone, consequent on the anticipated requirements of the passenger traffic of a very populous district, no less than five stations, not including the terminal one at Bombay, sufficient for the line when extended to a much greater distance into the interior.

59. There is much here, then, which takes the line out of the category of ordinary lines, but there is this yet further to be considered, that besides the works above alluded to, there has been provided a rolling stock, with all requisites sufficient to work at least 50 miles of railway; and many preliminary expenses, not to be expected in future, have been included in the amount of 370,000 *l.*

60. The above will, I think, be sufficient to show that economy has not been lost sight of.

61. In conclusion, I think it may be granted that the construction of a line of Railway into Candeish, as proposed by the railway company, *viâ* the Tull Ghat, is of direct and immediate consequence to Bombay, whatever great political value there may be in any of those suggested by Major Kennedy. One of our richest provinces on this side of India is approached by the most direct route; it is not sought to direct the traffic of the country, but only to occupy the route it has followed for a long series of years. The country onwards from Candeish appears to offer every facility for the extension of the line to the eastward, so that we may hope to fall in with the Calcutta line in its extension to the north-westward, and thus complete the communication between Bombay and Calcutta by rail; a result looked forward to, I imagine, with much greater anxiety by the mercantile interest in Bombay than a present communication with Agra.

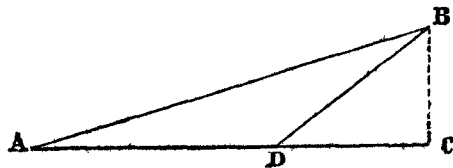
62. If in what I have written I have succeeded in showing that for a communication between Bombay and Candeish the route by the Tull Ghat is far preferable to that proposed by Major Kennedy, *viâ* Surat and the Taptee, and also that Major Kennedy's plan for ascending the Ghats by an incline along their

face for a length of at least 50 miles is not feasible, I trust Government will feel induced to continue the support already afforded to the designs of the Great Indian Peninsula Railway Company. If delay occurs, and the work is not pushed on beyond Cullian at once, so as to meet the general traffic of the country, the portion now completed, or nearly so, will be next to useless. The delay will intimidate capitalists at home, and, as far as the natives of this country are concerned, must destroy any confidence they might otherwise have had in railways in general, when they see a project so energetically commenced, and carried through to a certain point, suddenly stopped for reasons they can never appreciate. I feel confident that if our railway is stopped pending the consideration of Major Kennedy's extensive projects, the delay which must necessarily ensue will paralyse railway progress for years to come.

I have, &c.
(signed) *J. H. G. Crawford*, Captain,
Superintending Engineer, Railway Department.

P. S.—In para. 11 of the above Report, I have alluded very shortly to the fourth proposition in para. 38 of the memoir, relative to what Major Kennedy terms "impulsive planes." I merely said, "the plan may possibly be a good one," and ventured no further on the discussion, seeing that whatever might be its value in a country of a generally uniform slope, it was quite inapplicable to Western India, where the features of the country would obtrude questions of much too great importance relative to gradients and corresponding works to allow of a line being laid out with anything like an approach to the minute uniformity which Major Kennedy apparently desires.

2. On reading over again, however, note (A.) to para. 52 of Major Kennedy's memoir, where he says, "a principle has occurred to me, as given in Appendix No. 4, by which the engine may be enabled to surmount considerable ascents with the load due to a level road," it has struck me that Major Kennedy may mean that he has discovered a plan by which he can move a weight a certain height without a corresponding exercise of power. The note either means this, or there appears to be a want of that precision with which a mathematical proposition requires to be enunciated.



If A B represents a given gradient, it appears to me that in the end just as much power must be exerted to move a given load, say 100 tons, from one point to the other by any other disposition of the rails, as for instance A D, D B, as if the load had been moved along the uniform slope A B.

3. This is not the place for the discussion of a mechanical problem; I merely mention what I have now said, that I may not seem in para. 11 to concur in any mechanical fallacy.

31 January 1853.

(signed) *J. H. G. Crawford*,
Superintending Engineer.

(True Copy.)

(signed) *H. E. Goldsmid*,
Secretary to Government.

ABSTRACT of Major *Kennedy's* Memoir.

Home Cons.
22 Dec. 1852.
No. 24.

THE accompanying Memoir by Major Kennedy, on the subject of railways in India, has been forwarded by the Court of Directors for the consideration of the Governor-General of India in Council. The following is an outline of its contents:

Considering that the Government, when it guarantees a return for capital invested in Indian railways, should not only be convinced of the incalculable benefit of railroads in India, or rest satisfied even with the almost certainty of the

the money so invested, affording ultimately a remunerative return, but is bound and entitled to be assured of a direct and immediate equivalent gain to itself from the establishment of railroads, by which, in the event of being called upon to pay the guarantee, it would be enabled to do so without any additional charge upon the revenues; Major Kennedy endeavours to show whence such an equivalent gain may be looked for, and what measures are necessary for securing it.

The increased efficiency of the army, which would result from a well-arranged system of railways, and the corresponding reduction in its cost, would, in Major Kennedy's opinion, of itself repay the outlay of the whole of the payments guaranteed by Government.

"No one will deny," he observes, "that the efficiency of an army is in some inverse ratio to the time required to concentrate such a preponderating force of well-trained troops on any given point of its lines of defence, as shall secure victory over the largest hostile force that can be expected to attack it."

"What the exact ratio of increased efficiency may be as compared with the increased power and rapidity of concentrating troops, and conveying artillery and commissariat supplies to the first place of assembly for a campaign, as well as in the subsequent supply of reinforcements and provisions, it is difficult to express in precise numbers. But it would probably not be straining the argument, to assume that two-thirds of any given army for the protection of British India, would be much more efficient where a field force of 50,000 or 60,000 men, with ample artillery, stores and provisions, could be congregated on any point of its vast lines of defence in 20, 40 or 60 hours, than the whole of such an army would be under the present system, requiring a mean period of three or four months to bring such a force together."

But although one-third of the numerical strength of the army might thus be dispensed with, Major Kennedy does not calculate on a reduction of the military expenditure in the same proportion. Certain charges are such as would not be diminished by the power of rapid movement and concentration, and for such charges he allows one-fourth of the whole. One-third of the remaining three-fourths, *i. e.* one-fourth of the whole, he assumes as the probable amount of saving that would result from the introduction of railroads, and this amount, therefore, he considers, may be fairly held to be available for investment in railways.

Quoting from the last Parliamentary Returns, Major Kennedy puts down the military expenditure of India as it was in 1848-49, at 9,32,99,356 rupees; and in the annexed Table he shows what might be done with the saving on this amount at different rates of guarantee on capital, and of cost per mile of construction.

Presidency	Present Cost of Military Establishment, as given in Parliamentary Returns for 1848-49. Col. 1.	Annual Saving upon Military Establishment, which would accrue from the Introduction of Railway Intercourse. Col. 2.	Capital which may be raised for Construction of Railways upon Annual Saving in Col. 2.			Number of Miles of Railway which may be constructed by Capital in Col. 4, at per Mile.						Number of Miles which may be constructed by Capital in Col. 5, at £ 5,000 per Mile. Col. 12.
			5 per Cent. per Annum. Col. 3.	4 per Cent. per Annum. Col. 4.	3 per Cent. per Annum. Col. 5.	£. 5,000 Col. 6.	£ 6,000 Col. 7.	£ 7,000 Col. 8.	£. 8,000 Col. 9.	£ 9,000 Col. 10.	£. 10,000 Col. 11.	
	£.	£.	£.	£.	£.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.
Bengal -	4,933,538	1,248,384	24,967,680	31,209,600	41,612,800	6,241	5,210	4,438	3,901	3,467	3,120	8,322
Madras -	2,620,621	655,155	13,103,100	16,378,875	21,838,500	3,275	2,729	2,339	2,047	1,819	1,637	4,367
Bombay -	1,715,775	428,943	9,578,860	10,723,575	14,298,100	2,144	1,787	1,531	1,340	1,191	1,072	2,859
TOTAL, £	9,329,953	2,332,482	47,649,640	58,312,050	77,749,400	11,660	9,716	8,328	7,288	6,377	5,829	15,549

Major Kennedy is convinced that "5,000 *l.* per mile ought amply to suffice for single tracks;" but, nevertheless, proceeds in his calculations on the supposition the cost will be 10,000 *l.*, and asserts that, even at this rate the mileage would

would be quite sufficient to open the main lines of trunk road throughout the several Presidencies: it would give, he says,

For Bengal	-	-	-	-	-	3,120	miles.
For Madras	-	-	-	-	-	1,637	"
For Bombay	-	-	-	-	-	1,072	"
TOTAL						<u>5,829</u>	"

But in order to secure the utmost advantage from railways, it is necessary that every precaution should be observed for their judicious arrangement and management.

"It is" observes Major Kennedy, "imperative to adopt the most arduous and incessant scrutiny of all projects, as well as supervision in the subsequent execution, to eradicate the grave errors in the former and the extravagance in the latter, which will otherwise assuredly emanate from those trained in the practice in England."

With a view "to direct, concentrate and combine with useful effect the efforts of well-intentioned active minds," Major Kennedy proposes for the adoption of the Government of India the following rules:—

1st "That all railways constructed in India shall belong to one of two classes; the first or the second class.

2d. "That the regulating gradient of the first class or trunk railway shall not exceed 1 in 2,000: by regulating gradient is meant the gradient which shall regulate the load of the engine.

3d. "That no regulating gradient of any 2d class or branch railway shall exceed 1 in 330

4th. "That short alternate impulsive plans may be introduced to assist the ascent, not to exceed a length of half a furlong each, and not to be nearer to each other than one and a half furlong.

5th. "That no line shall be undertaken when the estimated cost shall exceed the average rate of 5,000 *l* per mile of single track; but that this rate of cost is not expected to include the bridging of large rivers, as the Soane, Jumna, &c., exceeding half a mile wide at flood level; such rivers are to be considered as breaks, or temporary termini, where goods and passengers are to be carried across on rafts

6th. "That no line shall be sanctioned except for a single track of rails, with masonry, cuttings and embankments to correspond. The ground, however, required for a double track to be in all cases secured.

7th. "That no locomotive engine shall be introduced to India for 10 years, except such as the ratio between the length of stroke of piston and the diameter of the driver wheels shall sanction, with reference to the maximum load. Notwithstanding any sacrifice of velocity on the journey, rule No. 11 contains an exemption from this restriction.

8th. "That when piling for foundations be requisite, the foundations are to be laid to suit a double track, although the superstructure is only carried up for a single track

9th. "That no portion of any line shall be permitted to open for the transport of goods or passengers until the capital account for the construction of such portion shall have been closed.

10th "That no more than one train daily shall run in each direction upon any line until the traffic shall furnish more goods and passengers than one engine can carry; after which a second may start daily each way, and that when the traffic calls for three trains fully loaded per day, then arrangements shall be made for laying down a second track for rails.

11th. "That, notwithstanding the tenor of rule of No. 6, if on any line it shall appear that the profits exceed a dividend of 6 per cent. per annum, it shall then be permitted, if thought advisable by the directors of the company interested, to introduce engines of higher powers of velocity, with a view of running passenger-trains separate from goods-trains.

12. "That the height above the sea of all obligatory points throughout India, having reference to the construction of works, draining, irrigation, &c., such as the highest points or necks of valleys, the low passes in mountain ranges, be obtained, and recorded with all convenient despatch on the maps now in progress of construction by the Surveyor General's department; and that in addition to this, the height of numerous points of inundation level to be taken upon the rivers

rivers of India, and recorded upon the maps at intervals of two or three miles, so as to admit of the protraction of proximate sections of the slope of such rivers; and that any striking peculiarity in the lines of rivers, or of the ground between adjacent rivers, be reported upon to the Surveyor-general by his subordinate officers, such reports to be methodically arranged in his office as records."

In addition to the principles laid down for observance in the above rules, Major Kennedy points out some of the great leading features in the geographical formation of the Peninsula of Hindoostan, which should be borne in mind.

These are described as follows: 1st. The Great Western range of hills parallel to the coast, at a medium distance of about 40 miles from it, and running south from the Taptee Valley, south for 700 or 800 miles.

From the western range a formidable spur projects for about 400 miles to the eastward, reaching near to the centre of the Peninsula from a point in the Ghat, a little to the north-east of Bombay.*

"A feature of much general importance in our present consideration is the Great Amerkuntuc table-land, it sheds its waters in every direction.

1st. "To the north-east by the Soane Valley which falls into the Ganges, and passes Calcutta.

2d. "To the south-west by the Nerbudda and Taptee, which fall into the Gulf of Cambay on the Bombay coast; and, 3d, the south-eastward by the Gango, Godavery, Mohanuddy, &c., which flow towards the Madras coast.

"Keeping these great geographical features in mind,—and they cannot be overlooked in any general project without fatal error—they force upon us the knowledge of what the great arteries of commerce must necessarily be, and with those arteries our trunk roads must correspond. We must remember the valleys of the Ganges and Jumna, whose waters flow from the Hymalaya to the south-eastward for about 1,300 miles, passing by Calcutta, and many of the richest districts in India. If we keep these leading features always in mind, and seek to accomplish the object in view without throwing away our great natural advantages, attempting to outrage scientific axioms, or fruitlessly striving to accomplish what is inadvisable, merely to gratify erroneous local influences which are taken up in total ignorance, or carelessness of first principles, there will be no doubt that singularly profitable trunk lines can be selected throughout India, which shall admit of judicious ramifications to any extent that local interests can possibly demand hereafter."

Major Kennedy then goes on to consider in detail of lines of railway, which, in accordance with the principles thus laid down, "would lead to the most perfect and comprehensive system of intercommunication that can at any future time be looked for in India." "It will be observed," he remarks, "that the direction given to all the railways in this project is as much as possible in the course of the valleys, and that as rarely as may be it is proposed to cross any valleys or ranges of hills transversely."

Supposing, in the first place, that capital was procurable on no lower guarantee than 5 per cent., the following railroads might, he supposes, be constructed by means of the saving on military expenditure above noticed; and they should be constructed, Major Kennedy thinks, in the following order:—

- 1st. From Calcutta *viâ* Rajmahal to Agra.
- 2d. From Bombay *viâ* Surat, Baroda, Ahmedabad and Nemuch to Agra.
- 3d. From Surat through Khandeish and Berar *viâ* Rajamundry, Masulapatam, &c. to Madras.
- 4th. From Madras to Trichinopoly, and thence to Pomany, on the Malabar coast.
- 5th. A branch to Bungalow from Madras.
- 6th. A branch from Bombay to Sholapore.
- 7th. An extension of the main line from Baroda to Tattah and Kurrachee.
- 8th. A branch from Masulapatam to Hydrabad.
- 9th. An extension of the main line from Agra *viâ* Delhie to Lahore.
- 10th. An extension of the main line from Tattah *viâ* Hydrabad, along the banks of the Indus, to Mitton.
- 11th. An extension of the main line from Rajmahal to Saibgunge, through Denagpore, and thence a branch to the foot of the Darjeeling Hills.
- 12th. A branch from Kurnal to Simla.

In

* Since writing the above, a principle has occurred to me as given in Appendix, No. 4, by which the engine may be enabled to surmount considerable with the load due to a level road.

In a second fly sketch additional lines are marked, which might be constructed should it be found possible (as Major Kennedy is sanguine that it would) that capital could be raised with a guarantee of only 3 per cent. It seems scarcely worth while, however, at present to pursue further a scheme of which the completion must, under any circumstances, be delayed to so distant a period. It is of more immediate importance to consider the remarks on the future direction of the Bombay line, to which the attention of the Government is especially directed by the Honourable Court in their despatch, forwarding Major Kennedy's Memoir.

The deed of contract between the East India Company and the Great Peninsular Railway Company is "for the construction of an experimental line of railway from Bombay to or near to Callian, with a view to its extension to the Malsej Ghaut." The portion of this road up to Callian has all been given out to contract, and is in progress of construction; but the Government of Bombay concur with the railway engineer, the superintending engineer, and the committee of Directors, in thinking that "the Malsej Ghaut extension ought to be finally abandoned, and the double Ghaut system, consisting of the north-eastern extension by the Thul Ghaut, and the south-eastern by the Bhoze Ghaut, should be taken as the basis of operations."

Major Kennedy's remarks proceed on the supposition that the Mulsej Ghaut route had been determined upon; but the principle of his objections extends equally to the lines now advocated by the Bombay authorities. Indeed, the possibility of some other similar route being adopted was evidently contemplated by him, and his views appear not to have been in any way changed by what he calls "the smaller question," as to "whether the Malsej or the Bhoze, or any other particular Ghaut, might have been the preferable one, through which to reach the table-land." The following are his observations on the subject:—

"In this view, I apprehend that the project now in progress at Bombay calls for some very important modification of the original design. It is to be hoped, however, that this modification may be effected without the necessity of abandoning for one object or another any of the work done. It was an error to contemplate carrying the Great Northern traffic, including that of Candeish and Berar, over the Syhadree Ghauts. At the same time, the portion of road made from Bombay as far as Tannah, will probably be found suitable, as the commencement of the Great Northern trunk road, whilst from Tannah, on by Callian, &c.; the work done may come into use as a branch towards Sholapore, &c. from the trunk line."

It would appear that the projectors of the works now in progress at Bombay, proposed to cross the Sybadru Range by the Malsej Ghaut, 2,060 feet high. They propose to surmount the precipitous portion of the Ghaut, 1,770 feet high, by a fixed engine incline of about six miles, with a gradient of about 1 in 18, or by an alternative incline of 13 miles long, with a somewhat reduced gradient. They would then proceed through the table-land due east for $20\frac{1}{2}$ miles to Alleh, the maximum incline being so great as 1 in 113. At Alleh they would send off a branch to the south-eastward in the direction of Sholapore; but the principal object appears to be the northern line from Alleh, through Candeish, and crossing the Taptee and Nerbudda rivers; they would take the direction of Agra, after passing by Mow, Indore, &c.; they would also throw off a branch from the Nerbudda, bearing on Allahabad. Here, then, we have gravely proposed a most erroneous project of a grand trunk road, by which the whole northern, north-western and north-eastern traffic is to approach Bombay, the important mercantile capital of Western India. Between Bombay and Agra it appears to be the intention that this great trunk line (second only to that of the Ganges, if even second to it) should pass over no fewer than four unnecessary and fierce ranges of mountain, of which, I imagine, the aggregate amount of rise and fall would not be less than from 8,000 to 9,000 feet, whilst on the natural route by Surat and the valleys of the Enbye and Chumbril there is but one summit to pass, at Neemuch between Bombay and Agra. The height of this summit is 1,356 feet, which, added to the fall from Neemuch to Agra, say 850 feet, would make the total rise and fall by this line only 2,206 feet, whilst the distance would be about 120 miles less than that by the Hilly route through the Ghauts.

"The same reasoning which overthrows this project as a general trunk line between Bombay and Agra, holds equally against that portion of it intended to open an intercourse between Bombay and the districts of Candeish and Berar. On this portion of it the aggregate amount of rise and fall would probably exceed

considerably 4,000 feet, whilst by the coast we go level to Surat, and branch off by the Taptee Valley at the slight gradient of the river, without passing any range whatever, nor would the distance by this route exceed that over the Ghauts."

"The best route harmonizes with every general and local interest of India in their widest extent, whether as regarding the north by the route I propose, with the power of throwing off branches, or as regarding the east by the valleys of Taptee, Nurbudda, Soane, Godavery, Lower Kistna, &c.; or as regarding the west by Guzerat, Kurachee, the Indies, &c."

"Nothing can exceed the eligibility of this mode of opening the communication of all those districts with Bombay; nothing could be more preposterous than to think of carrying the traffic of any of them over the Ghauts."

There is no doubt that the interests of the table-land east and south-east from Bombay call for every exertion to open a passage through the Syhadra range. But it is with this view, and this view only, that the work done to the eastward of Tannah can be made available."

"I shall not here enter into the smaller question of whether the Malsej or the Bhora, or any other particular Ghat, might have been the preferable one through which to reach that table-land."

"But what I most earnestly appeal against is the project which has for its object to approach the district of Candeish or Berar, or any other part of India to the north, the eastward, or the westward of those districts by any line whatever passing over the Ghats. I trust that the East India Directors and the Board of Control will resist every suggestion made to them with this object until they shall have heard from the Governor-general of India upon the subject, and I feel firmly convinced that his Lordship's experience will sustain the view which I take of this most important subject. The nature of the error is precisely similar to, though of much greater magnitude than that which I brought under his consideration in the project of the East Indian Railway Company in Bengal. He did not hesitate in adopting the remedy I recommended in the Bengal case, nor will he now for a moment hesitate in protecting those vast districts which the Bombay project would effect from the unnecessary tax on their transport of Goods that would be the inevitable effect of carrying them over several fierce ranges of hills when a much shorter line can be had, avoiding those hills and combining the broadest interest of Indian traffic generally."

Major Kennedy admits the importance of throwing open communication with the districts of the table-land above the Ghats, and in an Appendix (No. 3.) describes how this might be effected by means of one or more branch roads. The system he advocates is what he designates one of impulsive inclines, and will be found described in the same Appendix.

A detailed description of the two proposed lines of railway *via* the Bhore and Thul Ghats will be found in paras. 79 to 194 of Mr. Berkeley's report, which is among the papers forwarded by the Bombay Government.

Captain Crawford, the superintending engineer at Bombay, has made two suggestions which that Government have referred for the consideration of the home authorities: one of these is, that in a case such as the proposed inclines at the Ghats "the" principle of the atmospheric "railway reversed might be usefully employed." The other is, that in the event of railways in India proving hereafter a source of large and regular profit, the proprietors should be required to contribute to the general revenues of the country.

Possibly the Governor-general in Council will wish to consult the consulting engineers at the several Presidencies on the subjects discussed in these papers, and especially to afford the railway authorities at Bombay an opportunity of considering Major Kennedy's project and remarks. With this view it might be desirable that these voluminous reports should be printed.

23 April.

(signed) A. R. Young.

Since the above was written, the report from Madras, on the line proposed for that Presidency has been received. Major Pears's printed report, and the Minutes of Consultation, which form enclosure No. 1 of the Madras Letter, seem to contain all necessary particulars, and his Lordship in Council may wish to consider this subject in connexion with the above projects.

(signed) A. R. Young.

NOTE by the Secretary, dated 3 November 1852.

INDIAN RAILWAYS.

No. 51, of 1852,
dated 22 Sept.

Dated 15 Oct.
1852, No. 450.

Dated 9 Nov. 1852,
No. 66.

THESE papers consist of a despatch from the Honourable Court, sending out a memoir on Indian Railways, by Major Kennedy, a despatch from Bombay, referring for the orders of the Governor-general of India in Council a proposed line of railway from Kullian (near Tannah), in a north-east direction up the Thul Ghat, by Nassick, towards Kandeish; and a despatch from Madras, referring, for the same purpose, a proposed line of railway from Madras up the Palamanaire Ghat to Bangalore. Mr. Young's memorandum gives an abstract of these papers.

No. 27, of 1851,
dated 23 July.

No. 51, of 1852,
dated 22 Sept.

No. 13, of 1852,
dated 18 Aug.

2. Until now the Bombay Railroad has been managed by the Bombay Government, in direct communication with the Honourable Court; and the preliminary arrangements respecting a railroad in Madras have been managed by the Madras Government in the same manner. But in their despatch, noted on the margin, the Honourable Court intimated to the Government of Bombay that they would defer coming to a determination on the line to be adopted for the Bombay Railway Extension beyond Kullian, until they should receive the opinion of the Government of India, as well as that of the Government of Bombay, on that subject. And in their present despatch they forward Major Kennedy's memoir, with especial reference to his remarks on that line, which is a question on which, they say, they expect the decision of the Governor-general of India in Council. In their despatch, noted on the margin, the Honourable Court intimate to the Madras Government that they leave the precise route for the Madras Railway to the determination of his Lordship the Governor-general in Council, in communication with that Government.

Major Kennedy's Memoir.

3. The object of Major Kennedy's memoir is to impress upon the authorities in England and India, first, the great importance of the speedy completion of such extensive railways in India as will form a grand connected railway system; second, to show the safety with which the Government may construct, or give the necessary guarantee to private companies for the construction of such a grand connected system; trusting securely to reimbursement if the speculation turns out commercially unprofitable, from the vast saving of military charges which a grand connected system of railways will enable it to effect; third, to enforce the absolute necessity, in this view, of guarding against the "incongruous errors of isolated action," by now taking, as from an elevated central point of view, a survey of the Indian empire, and, before money is spent on local projects, forming a matured general design, and laying down correct principles of action, which in no railway to be made or guaranteed by Government shall ever be departed from in practice; and, fourth, to explain the design generally, and the principles, in detail, which, in his opinion, ought to be determined upon. In his memoir he sets forth at length his objections to the line now proposed at Bombay, for the intention of the Bombay Railway beyond Kullian, and to all the alternative lines that have ever been proposed for that railway, all of which, according to his principles, are so fundamentally objectionable as not to seem to him worthy of detailed examination; and the fact that a proposition to make such lines has been made and approved, he treats as a glaring instance of the terrible errors into which want of system and principle must lead. Major Kennedy also criticises the details of the line now in course of construction from Burdwan to the collieries.

4. The reference of the Bombay and Madras projects to the Governor-general of India in Council, now made by the Honourable Court, seems to afford the Government of India the opportunity, or perhaps it should be said, to impose upon it the necessity of coming to a decision on the important principles involved in Major Kennedy's memoir.

5. On the two first of Major Kennedy's propositions as above abstracted, nothing that could be submitted for the consideration of the members of Government, in this note, would facilitate their decision.

6. On

6. On the third it may be mentioned, that the Honourable Court, in writing lately to the Bombay Government, have repeated the instructions conveyed to the Government of India in their despatch, No. 16 of the 15th of May 1850, in the following words; viz. that the objects of a survey of a proposed line of railway should have reference "to the ulterior destination of such a mode of conveyance as forming a part of a general system, the object of which would be to facilitate communication for political as well as commercial purposes, and to effect more ready intercourse with other Presidencies." The determination lately come to by the Honourable Court to refer the projected lines at all the Presidencies to the "decision" of the Most Noble the Governor-general of India in Council, may seem to be nearly equivalent to the authoritative adoption of the principle of working everywhere on one imperial system, under central control, which Major Kennedy advocates.

No. 4, of 7 Jan.
1852.

7. How very much mistaken those are who think that the magnificent design of giving to India the full benefit of railways is advanced by a hasty adoption of every local project for a few miles of railway which can obtain public support, and by the neglect, in a railway case, of that severe examination which all other projects, involving the expenditure of millions, are admitted to require, before they ought to be irrevocably determined upon, is demonstrated by the case of the Malsey Ghat project at Bombay, which has now happened to come under the eyes of the Government of India. The line up the Malsay Ghat was surveyed for two years, was proposed by the Railway Company, was approved by the local Government, and was so far sanctioned at home as to be made a part of a deed of contract between the East India Company and the Railway Company, under which the additional capital has been subscribed. It would be supposed that a locomotive railway, which has to rise some 2,000 feet in a very few miles, is a work that would not have been blindly embarked in; but the fact is, that it has now been discovered that there was an error of no less than 164 feet of vertical height in the survey on which the project was adopted; that is to say, the height to be surmounted was under-measured by three times the whole height which the railway, 200 miles long, from Calcutta to Rajmahal, will have to rise, that the expense in the one item of tunnelling alone was under-estimated by 384,754*l.*, being at the rate of 2,635*l.* a mile for the whole line of railway; that other items were similarly under-estimated, that one tunnel was required which could not be pierced in less than 17 years, until which time no portion of the extension line beyond Tannah could be made useful, and that the line would be carried through a country in which it is now said there is very little traffic, to terminate, in railway parlance, nowhere.

8. On the fourth of the heads above described a few remarks occur to the Secretary as, perhaps, worthy of some consideration.

9. Major Kennedy's grand principle is to connect the several Presidencies by trunk lines, which shall run in every instance along the great valleys, never crossing a ridge of hills, crossing a valley as seldom as possible, and rising over the summit lines (which, of course, must be surmounted somewhere) at their lowest points. He shows how this can be done. From Bombay he runs a trunk line to Surat, whence proceeds one grand branch through Baroda to Agra, and another up the Taptée and down the Godavéry valleys to the Coromandel coast, and thence by Masulipatam to Madras. Thus the line he insists on as the first line to be made from Bombay goes nearly due north to Surat. He allows a second-class line to go easterly up the Ghauts for the local traffic of the high land of the Deccan; but for this, seemingly, he would take the Bhore Ghat to the south east, and not the Thul Ghat to the north-east, which last is the line recommended at Bombay as the first of the two Ghat lines for adoption. If Major Kennedy's views are sound, the extension from Tannah to Kullian, now in progress, which it is reported, cannot become a paying line without much further extension, was overhastily adopted, for it may not be in the best line from Tannah to Surat.

10. Probably, as for grand connecting lines, no one will dispute the excellence in general of Major Kennedy's principle. Apart from the class of arguments which it is more especially in the engineer's province to weigh, the arguments for running in the great valleys are predominant. It may be questioned whether, viewed especially as an imperial object, a line running from one grand point to another,

another, by a great detour alongside of and in competition with a navigable river, such as the Ganges, is preferable to a direct line, which would give a good means of communication to a country now destitute of any such means; but where the river is not navigable, as is the case with all the rivers bearing upon the Bombay system, there can be no question that a general preference is due to a river line, because the valleys of the great rivers constitute very generally the richest and most populous parts* of the country, and in them are the grand marts of trade, and most of the great military stations.

* 1 in 2,000 is something above $2\frac{1}{2}$ feet of rise in a mile.

11. In discussing the Madras project, reasons will be assigned below for thinking Major Kennedy mistaken in his belief that his grand connecting lines can be carried out at gradients even approaching to the *quasi* level of 1 in 2,000.* It will be well to judge, from what is now before Government, if his first-class lines can be carried out universally on his second-class gradient of 1 in 330.

12. It will be seen that Major Kennedy lays extreme stress on the importance of having Indian railroads on all but a dead level; by that means, and by that means only, he thinks they can be profitably worked. Now, an extreme case of a very long and, in its first cost, a very expensive line, with a small amount of traffic, workable at a very cheap rate per mile, on every ton of goods carried, can certainly be put, which would be demonstrably less eligible than a shorter and cheaper line, workable at a dearer mileage rate per ton. Therefore there must be some point, in regard to distance and first cost, beyond which it is waste of money to go, in the desire to avoid a severe gradient. Without knowing, for every gradient that occurs, and for all probable amounts of traffic, where this point is, it is plain that no doubtful question as between distance and first cost on the one hand, and mileage working cost per ton on the other hand, can be solved to demonstration; indeed, without this knowledge, all opinion as to what sacrifices in money and distance ought to be made for better gradients is merely fanciful. Now, although Major Kennedy condemns wholesale all that has ever been done or projected regarding railroads in England and India, merely because the severe gradients adopted must reduce the engine load, and increase the mileage cost of traction, he has made no attempt, either in this memoir, or in his previous report therein referred to, to give a general formula for ascertaining the limiting point, or even to fix it in any one particular case, so as to prove that there will be actual loss by disregarding his principle, and to show what that loss will be. The suggestion which this consideration leads to is, that a reasonably trustworthy table, showing what the extra working mileage cost per ton in India will be at each gradient, should be constructed before positively adopting any such universal rule as Major Kennedy proposes.

13. On the proposal to limit the number of trains to one each way daily, it is to be observed, that if this were done upon the Benares line, either it would be necessary to carry goods at a wasteful rate of speed, or the railroad would not supersede the present mail-cart dak, which travels 10 miles an hour in a direct line.

14. Major Kennedy proposes that a most ingenious plan of "impulsive inclines," which he has invented, should be introduced at once universally in India; but as the plan has not yet been tried anywhere, it is impossible to foresee that it will be free from all practical inconvenience. It would be, however, very easy to try it on one mile of some one railway now in course of construction.

Bombay Project.

15. The objections that occur as worthy of consideration in discussing the Thull Ghat line, now proposed at Bombay, are these:—

16. The line will form no part of any grand connecting line, unless Major Kennedy's principles are found to be altogether unsound.

17. The Ghat inclines seven miles in length, which shows, together with a steep gradient of 1 in 37, sharp reverse or winding curves (the sharpest is of 30 chains radius), must be admitted to be a bold work to begin with. It is a part of the scheme that there shall be a branch to ascend the Bhore Ghat of about the same height, which shows at present one gradient so steep as 1 in 20, requiring a stationary engine. The report of the Government engineer, who recommends the trial of an atmospheric retardation cylinder, by way of avoiding the danger
of

of the descent, may seem hardly equivalent to a positive professional opinion in favour of the safety of the project as it stands.*

* See para 27 of
Capt Crawford's
report of 7 Oct
1852

18. The traffic seems to be estimated upon fair grounds, and is taken as affording an income of 1,224*l.* a mile. This is said to be calculated upon a moderate scale of tolls. This scale appears to be 2 $\frac{1}{2}$ *d.*, or 22 pie a mile per ton generally, and double that upon the Ghat incline upwards. This will not be admitted generally to be a moderate rate. The general opinion of the Madras authorities seems to be, that the rate there should not exceed six or eight pie, and the highest rate proposed there is 12 pie, or one anna. The working expenses at Bombay are taken at 600*l.* a mile, which, at the estimated first cost of the railway, with the above income, would afford a profit of five per cent, but the grounds on which the working expenses are assumed at 600*l.* a mile are not stated; no details are given. No precedent is known from which to estimate the working expenses of such a precipitous and long incline as is projected at the Thull Ghat; and as to the first cost, all who have any experience in great public works, of an entirely novel character, in India, know that the original estimates of costs are always, from one cause or another, in the end, largely exceeded. It seems to the Secretary, therefore, that it cannot be securely anticipated from the present papers that the line will pay, unless a very large new traffic shall be created by it; and there would be a better chance for that, if the line were much longer than the present capital will make it. It does not appear what equivalent the Government will have in the possession of a detached line of railway from the sea coast at Bombay to some spot of no importance above the Ghats, where it stops short, for any deficit in the profit which they will have to make good. For the mere purpose of bringing cotton to the sea coast, it would seem, that lines running into the interior from Surat and Broach, should be the most likely and cheapest means.

19. To Major Kennedy's low country line, the only apparent objection is, that such a portion of it as the present capital will make, which would barely reach Surat, probably would not pay; for from Surat, and all intermediate places, there would be the sea traffic to compete with, except during the south-west monsoon; but if Indian railways were carried on in the spirited manner, and upon the grand principles, Major Kennedy recommends, and the Bombay Railway were carried on at once beyond Surat, either (1) up the Taptee to the Coromandel coast, or (2) up the Nerbudda to the Ganges, or (3) by Baroda to Agra, then it would have its fair chance of paying on the whole; and even if it did not pay, Government, in the possession of such a grand connecting line, would have a full political equivalent for the deficit which, under its guarantee, it would have to make good to the shareholders.

20. The Bombay Government promises to send, as soon as they are prepared, copies of a great many maps and plans, as noted in the margin,† connected with the second lines of railway that have been considered at Bombay. These maps and plans have not yet been received. But no survey of the most cursory sort has been made of any one of Major Kennedy's three grand connecting lines above-mentioned, nor has any survey of the most cursory sort been yet made in extension of the Thull Ghat and Bore Ghat lines, to show that these lines are capable of becoming good connecting lines between Bombay and the West Coast. It is for consideration whether it would be wise to determine finally in favour of any decisive line whatever, until Government is in a position to say that such line is preferable to every other, when viewed as the first stage of a grand connecting line to be completed between Bombay and one of the other Presidencies.

Madras.

† No. 2, a map of the Poonah Collectorate. No. 3, a map of the Ahmednugger Collectorate. No. 4, a map of Shalapoor Collectorate, with the various extension lines drawn upon them. No. 5, a general map of the country, showing all the lines that have been laid out. No. 6, an enlarged section of the Mosij Ghat Deviation Line of 1847. No. 7, a section of the Extension Line from Callian to the top of the Thull Ghat, at Iyutpooia. No. 8, an enlarged plan and section of the Thull Ghat Incline. No. 9, a section from Eyutpocra, *via* Nussick and Munmar. A plan from Nussick to Munmar. No. 10, a plan and section from Callian to the top of the Bore Ghat, at Poongalee. No. 11, an enlarged plan and section of the Bore Ghat Incline. No. 12, a plan and section of the line from Toongalee to Poonah.

Madras.

21. The Madras Government refer several reports of Major Pears, their Railway Commissioner, with their own recommendation, as to the lines to be eventually adopted, and the one line to be first commenced upon.

22. The general formation of the peninsula between Cape Comorin and the Vindya Range, which is very simple, is well known. It consists of a triangular ridge of mountains, namely, the Western Ghats on the south-west, having a narrow belt of low rich land (Malabar, Canara, and the Conkans) between it and the sea: the Eastern Ghats, on the south east, having a wide belt of low land, in which rocks and hills are rather thickly scattered, the Northern Sirkars, the Canatu, and southern districts between it and the sea, and the Vendyah Range on the north-west, having beyond it the plains and valleys of Hindoostan. Between these is the undulating, rocky, table land of our own Deccan Provinces of Nagpore and Hyderabad; of our own ceded districts, Bellary, &c., and of Mysore. (This mountainous triangle is cut through, near its southern apex, by the very remarkable gap in the Western Ghats at Palghatcherry, south of which the Eastern Ghats do not extend, and where they round in and join the Western Ridge. This gap of low country gives an open passage between the eastern and western coast lands; and the richest districts of Madras are in it, or in its parallel. Excepting at the northern verge of the table land, the drainage of the whole of this vast rocky triangle is from the ridge of the high Western Ghats, in view of the Indian Ocean, right through the table land and Eastern Ghats into the Bay of Bengal. But on its northern verge the summit level of the plateau is in the middle of the peninsula, whence the water runs in the Nerbuddah and Taptee to the Indian Ocean; in the Soane, to the valley of the Ganges; and in the Godavery, to the Bay of Bengal.

23. It is plain that to connect, by railway, the western and eastern coasts, one of three systems only must be adopted; either, first, to drive the line up the steep ascent of the ridges of both Ghats, more than 2,000 feet, and down again; or, secondly, to ascend by the long and easy gradients, offered on the one side by the Nerbudda or Taptee valleys, in the northern part of the table land, and on the other side by the valley of the Godavery, and one of its northern feeders; or, thirdly, to turn the whole triangle, by running the line immediately through the great gap at Palghatcherry, and eventually continuing it to Bombay.

24. The second method is the one recommended by Major Kennedy for immediate adoption; whereby the two coasts and the two Presidencies of Madras and Bombay will be connected, immediately towards the north, by a line ascending much, but very gradually. Major Kennedy's line goes up the Taptee, and down one of the northern feeders of the Godavery, and the lower part of the Godavery. Mr. Turnbull has suggested, as worthy of survey, a line up the Nerbudda, and down the Godavery, with another line from the summit level down the Soane. Either way the great table land is pierced through, and connected with both coasts; and the Bombay and Madras Presidencies are connected towards their northern parts by a good line of railway. By Mr. Turnbull's project, if feasible, the great table land would be also connected with the centre of the Bengal Provinces. Major Kennedy proposes to connect the two coasts by a line running from Madras through the gap in the Ghats, described as the third of the above three possible methods; and eventually he projects the extension of that line up the west coast to Bombay. By Major Kennedy's scheme, Bombay and Agra would be connected by a separate line running through Baroda. All these lines would be lines of Major Kennedy's first class; that is to say, of low gradients.

25. It is probable, or rather it is now certain, that Major Kennedy is very much too sanguine in thinking that these grand connecting lines are possible, with gradients never exceeding 1 in 2,000, or even anything like that *quasi* level. The first 48 miles of the trunk railroad in the Carnatic, now proposed, which does not go half way from the coast to the foot of the Ghats, has a maximum gradient of 1 in 309, and if rose unbroken at one angle all the way, its gradient could be no less than about 1 in 700. The ruling gradient ordered upon

upon Major Kennedy's own line from Burdwan to Rajmahal, through the nearly dead flat of Bengal, is 1 in 1,000.*

That gradient is greatly exceeded on the line from Burdwan to the collieries, in which long gradients of 1 in 823, 1 in 625, 1 in 500, and even in 222 are to be found. This, however is certain, that so much of Major Kennedy's line as comes now into question, namely, the low country line, through the gap in the Ghauts at Paulghatcherry is practicable at what are generally considered favourable gradients; whilst the competing line projected by the Madras Government from Madras in a due westerly direction, up the Eastern Ghauts, and through the Mysore country to Bellary, is now seen to be impossible at any but what are generally considered the very extreme of bad gradients.

26. It is true, nevertheless, that Major Kennedy also proposes a line due westerly from Madras to Bangalore, which is the very line now proposed by the Madras Government to be commenced upon. But Major Kennedy proposes this as an isolated line, and as it ascends the Ghauts, he permits it to be one of the second class of lines. Even his second class of lines, however, allows of no gradient above 1 in 330, which is better than the Madras engineer obtains in the country altogether, below the Ghauts. Major Kennedy, no doubt, never saw either the Ghauts to be ascended, or the undulating country above and below them. Major Pears' report will probably put to flight all idea of lines of railway running up the Ghauts at inclines of 1 in 330. But the comparative difference between Major Pears' real low country and Ghaut lines is much more than that between Major Kennedy's imaginary low country and Ghaut lines, the gradient up the Ghaut being hoped by the Madras engineer to be 1 in 37. Therefore all Major Kennedy's general arguments apply with their full force, whatever that is, against the present project of the Madras Government. For his argument put generally is, that the grand connecting or imperial lines should be the first made, and that no line with comparatively bad gradients should be part of any grand connecting line.

27. The Madras scheme is to have two grand lines, one up the Ghauts to Bangalore and thence to Bellary, and beyond it through the table land, by which line it is proposed by them to connect Madras and Bombay; the other through the Carnatic, in a south-west direction, hugging closely the foot of the Eastern Ghauts, and eventually to be continued so as to pass through the gap in the Western Ghauts, and to connect the eastern and western coasts. This last line in its final direction, coincided with Major Kennedy's grand connecting line, but it adopts at its commencement the Bangalore line for 48 miles, as far as a place called Menil, whence it branches off to the south-west. There does not, from the papers, appear to be any object in this beyond the evident object of making one rail do for both lines, for 48 miles. But as it is said of this trunk portion that it will very soon require to be laid as a double line,† and as it prolongs the south-east line of traffic, unless it has other advantages, which however are not noticed, its adoption, in preference to Major Kennedy's first-class line, may be open, perhaps, to question. Major Kennedy's first-class line starts as a separate line from Madras in a much more southerly direction, and runs to Trinchinopoly at the apex of the Delta of the Cooleroon (Cauvery), the most fertile district under the Presidency, whence it turns westerly, and runs straight west through the gap to the western coast at Poniang. But it occurs to the secretary as an objection to terminating this important line even for the present at this obscure spot, that the grand military and political advantages of the line will not be obtained unless it runs to the northward, up the Malabar coast, and passing Calicut and Tellicherry, reaches at least the great military station and commercial town of Cannanore, even if it does not proceed to the great commercial port of Mangalore. Half their troubles in Madras are in Canara.

28. It will be seen, that whilst Major Kennedy's line takes a long detour to the south-east of the direct course, by Salem and Coimbatore to the west coast, the Madras line by Vanicubaddy, at the foot of the Ghauts, takes a detour on the

* The fall of the great highland rivers of Central India must be much more than that of the lowland portion of the Ganges.

† The rails are a large proportion of the whole estimated expense at Madras.

the opposite side of the direct course, whether starting from Madras or from Menil. There are doubtless local circumstances, on account of which the longer line along the foot of the Ghauts is preferred, but what these circumstances are is not mentioned.

29. A line apparently very good, judging only by the map, is what may be called the direct line, starting from Madras and running near Congeveram, Arnee, and Salem to Coimbatour, and thence rounding through the gap up Malabar, Aull, Canara to Cannanore. This would be the shortest line possible, and it only differs from the present Madras proposal in the portion between Madras and Salem. It would be satisfactory to know what are the advantages of the proposed line by Vaniembaddy, hugging the Ghauts, over this or some other more direct line; for the distance in a straight line from Salem to Madras can be little less than that in the proposed line from Salem to Menil only.

30. Thus there are three directions to be considered, which the grand line from coast to coast may take :

1st. Major Kennedy's, which makes a long detour to the south-east to pass Trichinopoly, and which would have to cross the Coleroon and several of its feeders.

2d. The direction now proposed at Madras by Menil, Vaniembaddy and the foot of the Ghats, which makes a long detour to the north-east, for what object is not stated, and which it is admitted goes (some 12 miles apparently) away from the existing main line of traffic, which is through Wallajahnuggur.

3d. The direct line from Madras to Salem and Coimbatour, and so to the western coast, which is the line that a mere inspector of the map would first turn his attention to, and ask to know about. There is nothing in the papers sent up from Madras to enable the Governor-general in Council to determine between these lines, nor to show the grounds which induced the Madras Government to give the preference to their proposed (No. 2) direction over all other directions.

31. The Madras Government recommend that the line due west to Bangalore be first made. They think that the low country line to the south-west would be most remunerative to the shareholders, at least at first; but they think the other line entitled to precedence, as being one of more political and general importance.

32. There is a general consideration in favour of beginning with the line most certainly and immediately remunerative, which the Madras Government has not discussed, namely, that as the capital for railroads is to be subscribed by private persons, it is a public object not to discourage subscriptions. If the line commenced with pays well, there will be plenty of money for the second line, but otherwise a second line may never be commenced at all.

33. There are some considerations regarding the proposed line due west of Madras to Bangalore which the Secretary ventures, with great respect, to submit, as he happens to know that country well. Major Pears' excellent reports will probably be accepted as proof that of the ghauts available for quite a direct line to Bangalore, the ghaut of Palmanaire (up which there is now a good carriage road), which is the one he has selected, is the best; but it involves a gradient of extreme severity, 1 in 37, according to present expectations. The actual survey, plan, and estimates of no part of the line west of Menil, being three-fourths of the distance to Bangalore, and containing the whole of the difficulties, have yet been received; those of the portion to Palmanaire, containing the pass to the Mysore table land, are promised very soon; but the Government of India is asked finally to determine the question without them. The ghaut may, perhaps, be found not quite the only expensive portion. It is suspected that Mysore may be found rather an expensive country to drive a railroad through; it is a rocky country, continuously, highly and confusedly undulating, much intersected with ravines. The only part of the line, that of 48 miles to Menil, yet estimated for, is estimated at a very cheap rate, materially less than 40,000 rupees a mile. There is nothing to show what the Madras Government expect to be the rate of cost for the other three-fourths of the way; yet this is a material consideration, especially in a line expected to be remunerative only in the second degree. Mr. Turnbull,

Turnbull, the engineer of the East Indian Railway Company, estimates the line from Burdwan to Rajmahal, at three times the sum above stated;* and taking the Palmanaire Ghaut as equivalent only to the passage of the Adjai and the Mor, they will do well at Madras if, in fact, they do the remaining 141 miles to Bangalore at the same rate as that of the Rajmahal line, maintaining, exclusively of the ghat, good gradients.

34. It is for consideration whether, in the absence of plans and estimates, any course should be finally determined upon which binds to the adoption of the direct west line to Bangalore, and whether the approval of a trunk line to Menil would not be tantamount to such adoption, inasmuch as it may be assumed, in the absence of all reasons assigned to the contrary, that the grand low country connecting line would not be taken 48 miles due west to Menil, except in order to make use of so much of the Bangalore line.

35. Further, a line running from Madras to Bangalore, and not going west of the meridian of that place, can be regarded only as a military and political line. Now, Bangalore is the highest place of the Mysore table land, uninhabited rocks excepted, and, being 3,000 feet above the sea, it is fully 1,000 feet above the mass of the province, which may be taken as being 2,000 feet above the sea. Palamanair is 2,100 above the sea, and it would seem a preposterous project to take a railroad, having commercial objects, between Palamanair and Bellary 80 miles round by Bangalore, which is at right angles to the line forward, involving a rise and a subsequent fall of nearly 1,000 feet. Accordingly it will be perceived Major Pears proposes a distinct line from near Palamanair to Bellary, which shows plainly that nearly 80 miles, or two-fifths of the line as now projected, is for no other object than to get to the great military station of Bangalore. If there is any foundation at all in Major Kennedy's argument, there must be something gravely objectionable in this project.

36. It will be seen that Major Pears anticipates confidently the possibility of running a railroad from Bangalore in a south south-east direction down the Royacotta Pass, or down his newly-discovered pass near Vanimbaddy, to join the low country railroad, and that he has satisfied himself that in that direction ghats at least as good as that of Palamanair exist. Would not a line running from Bangalore southerly, to join the low country railway, be even a better military line than that to Madras directly? It would be much shorter, and it would run directly towards the body of the Madras country, meeting in the middle a railway connecting the eastern and western coasts, Madras and Mangalore.

37. Accordingly it will be seen that it is a line proposed by Major Pears to be eventually made; but if it is to be made at all, and if, when made, it will be preferable to the east and west line now proposed, and in fact will supersede it, at least for all political objects, why should it not be made now, whereby all necessity of ever making the proposed line of double its length may very probably be done away with altogether.

38. It would be very easy to connect the foot of the Neelgherry Hills by a short line with the low country railroad near Coimbatore. So happily placed are the Madras Hills and healthy table lands, that with any reasonably good railroad system, it is hard to see why a single European soldier in the Madras Presidency out of Fort St. George itself should be cantoned out of them.

39. It is respectfully submitted whether all the above considerations do not lead to the decision, that the line first to be made is one or other of the three low country lines, from coast to coast, above described. The half million now engaged for will not be found to go too far, even if restricted to this one railroad.

40. And it is respectfully submitted whether, if this plan be adopted, the railroad should not be made at once, as fast as possible all the way from Madras to the

* £. 12,000 a mile; but Major Baker estimates it at much less. From Houral to Pundooab the contract is 53,706 rupees a mile; from Pundooab to Rancegunze 30,179 rupees, exclusive of the permanent way, which may be taken at 20,000 rupees a mile. Stations, which may be taken at 4,000 rupees a mile, and fencing, which may be taken at 4,000 rupees. Thus, the cost to Pundooab will be about 81,000 rupees a mile; and from thence, to Rancegunze about 64,000 rupees a mile. To this must be added for rolling stock, to begin with, say 3,000 rupees a mile.

the west coast, because Government will have but a small political equivalent for its financial guarantee until that is done.

3 November 1852.

(signed) *J. P. Grant,*
Secretary to the Government of India.

MEMORANDUM by the Consulting Engineer to Government of *India* in the Railway Department.

THE papers named in the margin* have been communicated for my perusal and comment by the Secretary to the Government of India in the Home Department. They contain matter for much interesting discussion; but in the following observations, I have deemed it proper to confine myself as much as possible to practical questions bearing on the present position of railway enterprise in India.

2. The objects contemplated by Major Kennedy in his memoir are—
 - 1st. To prove that it is alike the duty and the interest of the Government to bestow upon India a perfect system of railway communication.
 - 2d. To define the essential principles of such a system, and to embody them in a series of obligatory rules.
3. I admit the first proposition to its full extent, and am convinced that the more rapidly and energetically this duty is discharged, the more surely and effectually will the interests of the empire be served.
4. I cannot entirely accept Major Kennedy's calculation that the saving on military establishments would alone furnish funds for the extensive system of railway communication which he considers due to the country. For resistance to foreign aggression, or for any other object external to our recognised frontier, the power of concentrating troops by railway would virtually compensate for numerical strength of the army, in a ratio, perhaps, as high as that assumed by Major Kennedy; but I have no reason to believe that the internal condition of the country is, or would be, such as would justify a large reduction, considering that the railways would be in the hands of the people, and would continue efficient only by their sufferance. Without, however, reducing it to a pecuniary standard, it is easy to understand the magnitude of the indirect advantage which the Government of such vast territories will derive from the railway system, in the enhanced efficiency of their military and civil establishments. There is no necessity to strain this or any other argument, in order to justify a liberal encouragement of railway enterprise. There is no reason to doubt that by means of well-selected and economically constructed lines, the blessings of railway communication may be extended throughout the land, at a price within reach of the great mass of the people, with a sufficient margin of profit to the shareholders, and with eventual immunity to the Government who guarantee the dividends.
5. The guiding principle of Major Kennedy's proposed "Rules" is the necessity of reducing to a minimum the cost of railway service, and as a necessary condition, the construction of such lines only as will admit of economical working. There is some room for diversity of opinion as to the means by which this desirable object is to be attained.
6. Major Kennedy's 1st, 2d, and 3d Rules, limiting the gradients in his first or second-class railways to 1 in 2,000 and 1 in 330 respectively, are probably those which will be least palatable, especially at Madras and Bombay.
7. The perfection of gradients is but one element, however important, in the calculation of the cost and value of railway service, the others being generally the interest or capital, the tariff of fares, the amount and nature of traffic, and the ratio of cost of locomotive power to the other items of annual charge. These conditions will constantly vary, and many of them are not susceptible of accurate
previous

* Memoir by Major J. P. Kennedy, on the subject of Railways in India.

MS. papers, detailing projects for railways at Bombay.

Printed papers, chiefly by Major Pears, C. B., connected with railway project at Madras.

previous estimate; in each case the projector solves the problem his own way, and the results are as discordant as under such circumstances might be expected; they have, however, certain fixed relations to each other, and these will indicate the circumstances under which the "perfection of gradients" will attain the most prominent importance; viz.

1st. A very low tariff of fares, and consequent necessity for a minimum rate of working charges.

2d. The cost of locomotive power (being the item most affected by gradients) bearing a high ratio to the other items of working charges.

3d. The greater part of the calculated traffic being in goods, and therefore admitting of more economy of locomotive power than would be possible in the conveyance of passengers.

8. If, as I believe*, these are precisely the conditions under which Indian railways are expected to work, it follows that the quality of gradients demands more attention from the Government of India than would be required in England, and still more than has usually been bestowed upon it in that country.

9. Agreeing so far with the spirit of Major Kennedy's "Rule," I cannot recommend the Government of India to adopt the strict limitation which he has proposed, and which would require considerable relaxation even on the favourable levels of the Gangetic Valley. If it be desirable to fix a maximum ruling gradient for trunk lines, I would recommend that if 1 in 1,000 as more generally attainable, and less likely to call for frequent exceptions; but if Government should object to fetter itself by the adoption of any absolute rule, it would still be very necessary to fix and make known the principles on which railway projects are to be framed, and the standard by which Government will judge them.

10. I would ask permission to defer my remarks on the 4th Rule until I have leisure to examine Appendix No. 4, which I have just received.

11. The 5th Rule appears liable in some measure to the objection I have urged against the second. I believe that a single line, not involving expensive river crossings, or other special heavy works, ought to be constructed for 5,000 l per mile; but justifiable exceptions will occasionally arise, and should not be entirely precluded; nor can I advise the unreserved adoption of the rule by which the bridging of large rivers is to be indefinitely postponed. In this respect also each case must be judged on its own merits. The annual direct and indirect cost of the temporary arrangements for crossing the river must be weighed against the interest of capital required for the construction of the bridge, and the period of time by which the completion of the line would be retarded. What is called "the convenience of the public," should not, in my opinion, materially affect the question. As regards the transit of goods, the delay of a few hours would be of little consequence, and it would not be justifiable to burden the capital account with a heavy expense, merely to gratify the impatience of travellers who would demur to paying a commensurate fare.

12. The 6th, 8th, 9th, and 12th Rules have my entire concurrence

13. The 7th, 10th, and 11th Rules have reference to the conveyance of goods and passengers, together, and not by separate trains. Such a plan, would, in my opinion, be advisable in the infancy of the undertaking and until the working expenses shall be covered by the returns; it has, however, been frustrated, by anticipation, for Bengal. The locomotive engines now under construction for the East Indian Railway, notwithstanding the injunctions of the Government of India, based on Major Kennedy's and my own recommendation, are of two classes, five being intended for goods traffic, and five for the conveyance of passengers.

14. I proceed

* On these grounds, viz.—1st. It is almost self-evident that a low tariff of fares is alone consistent with the low price of human and animal labour in India. 2d. The cost of locomotive power will bear a higher ratio than in England to the total working charges; because, the locomotives, the drivers for some time, and in Bengal much even of the fuel, will be imported, and therefore dearer. The salaries of all subordinate establishments (who would be natives) and the maintenance of permanent way, will be cheaper, and there will be no rates or taxes. 3d. The reliance on goods traffic as the principle source of revenue appears to be general. I believe that passenger traffic will be very large, but chiefly, perhaps, in the lowest and cheapest class, which would be worked with the goods trains.

14. I proceed with great diffidence to offer a few remarks on the comprehensive scheme of railways for India, proposed by Major Kennedy. Being ignorant alike of the productive resources and of the topographical features of many important districts, I am chiefly dependent on the information supplied by maps.

15. Major Kennedy's project follows naturally, from his "Rules," the lines which stand highest in his estimation being those which promise the most favourable gradient. Most of his first-class lines, and those especially which reach the interior of the country by a gradual ascent of the principal valleys, appear to deserve the first consideration. They would bring into communication with the coast and with each other the districts which are presumably the most fertile and populous, and that too by lines which promise the greatest facilities for economical construction and working.

16. The coast lines hold out the prospect of fewer advantages. They must necessarily cross many rivers at the most unfavourable points in or near their deltas, while throughout their length they have to compete with the best and cheapest description of water carriage.

17. However distant may be the complete execution of a scheme so comprehensive as is here proposed, there can be no doubt of the propriety of determining, as soon as sound data may be attainable, precisely what that scheme is to be, and of encouraging no railway enterprise which would not form an essential part of it. I would respectfully urge the adoption of early and energetic measures for reconnoitring and levelling such of the principal lines as have not yet been examined; but as this must occupy some time, and as the machinery is already organized for the construction of one line in each Presidency, it is of primary importance at the present time to decide on the lines to be first adopted.

18. Happily, as regards Bengal, there is little room for hesitation in the choice of a first line. That from Calcutta, through the Gangetic valley by Agra and Delhi, to the Sutlej, combines with a singularly favourable profile the highest degree of political and commercial importance, and a fair basis for extension to the other Presidencies.

19. The numerous rivers and inundations which it must encounter will indeed entail considerable expense, but to these it is indebted for the fertility of soil, the density of population, and the rich abundance of agricultural produce, which cannot fail of rendering it the most important and remunerating line in India.

20. I earnestly hope that the simultaneous construction of this line may be sanctioned at once, and that authority may be given to complete the preliminary survey, which already extends to Allahabad, and may without difficulty be pushed on to the Sutlej during the ensuing cold season. Some of the works involved (including the collection of materials) will probably occupy four or five years, the rest might be completed in two working seasons; but I will reserve the further discussion of this provincial portion of the imperial project for my report on the survey operations now in progress.

21. Without entering into the details of the Bombay projects, a task for which I am disqualified, by the want of local knowledge, and in the absence of maps and drawings, I would still offer a reluctant though decided opinion against either of the lines so fully described by Mr. Berkeley. The least objectionable of the three lines discussed, that passing north-east by the Thull Ghaut, is not such as I could recommend for adoption by the Government of India as part of a general plan. The steepness of the gradients and sharpness of the curves approach the extremest limit of recorded practice, and in their combination would, in my opinion, be condemnatory of the project (as one which under the circumstances of this country could not be worked at a profit), even were the traffic calculated upon not being accessible by another and less difficult route. But I find, from paras. 220 to 224 of Mr. Berkeley's report, that the principal feeders of his north-east line would be those districts of Kandeish and Berar which are watered by the Taptee and its affluents, and Captain Crawford states (para. 13) that "the principal portion of the traffic" (on the proposed north-east line) "appears to come from districts beyond Munmaree." These districts, however, would

would be tapped by Major Kennedy's No. 3 line, on which the distance would be very slightly increased, and the engineering difficulties being incomparably less. If it be considered by the Bombay Government, in concurrence with the engineers, that the traffic of these districts would justify the construction of a railway burdened with such complicated imperfections as that proposed, still more encouraging would be the prospect of a line free from these objections, and capable of being economically worked.

22. I would therefore recommend, as the first for careful examination and eventual construction at Bombay, a portion of Major Kennedy's No. 2 line to Surat, and of his No. 3 line, at least as far as Oomrawuttee, with a view to its eventual extension, by the Godavery to Madras, and by the Soane to Patna, Calcutta, and Agra. By this plan, the provincial objects of the Thull Ghaut line would be secured, while a railway communication would be established and an acceleration of mails attained between all the seats of government.

23. The extension of Major Kennedy's No. 2 line through Baroda, Ahmedabad, and Neemuch, to Agra, would be, politically, more important than the Tapti extension, and, when completed, would share the traffic of the Punjab and North-west Provinces. Intermediately, however, it would chiefly benefit independent states, and would be interrupted near its outset by two important, and, I suppose, unbridged rivers. Besides these considerations, it might seem unjust to the Bombay Presidency not to allow some weight to the local and provincial advantages which the Tapti line appears to possess over that of the Mohye

24. The geographical features of the Madras Presidency would appear to limit its lines of easy gradients, in a great measure, to the coast, under the incidental disadvantages already adverted to; and accordingly, under Major Kennedy's plan, the high table lands would be the last to enjoy the benefits of railway communication.

25. It is evident that the lines advocated by Major Pears and the Madras Government, however advantageous to local interest, would not materially promote a general scheme of intercommunication (unless the Bombay lines were permitted to ascend the ghauts); and it appears to me *prima facie*, that the general object would be best secured by a northerly line from Madras to the head of the Kistna's delta, and thence up the valley of the Godavery, to meet the Bombay line already described, para. 22.

26. A line by Arcot and Salem to Coimbatore and the Western Coast would be a sort of compromise between Major Kennedy's view and those of Major Pears. There is a strong presumption that it would be a valuable commercial line; but it would not possess first-class gradients, nor would it apparently further the connexion of Madras with the other Presidencies. It would, in my opinion, be as much a provincial measure as the proposed line to Bangalore and Bellary.

27. It is my opinion, which, however, I submit with the greatest diffidence, that the northern line claims the first attention, and should that be found liable to insuperable objections, that the South-western line would be, on the whole, preferable to the ascent of the ghauts.

28. Some of the Appendices to Major Kennedy's Report have not yet reached me, and others were received late. Having been unable to examine them properly, I would beg to defer my remarks to a future occasion.

(signed) W. E. Baker, Major,
Consulting Engineer, Government of India.

Calcutta, 1 February 1853.

MINUTE by the Most Noble the Governor-general; dated the 20th April 1853.

RAILWAYS IN INDIA.

THE Honourable Court of Directors has recently made a series of references to the Government of India regarding proposals for the construction of various railways in different parts of India.

They comprise a memorandum by Major Kennedy, lately the consulting engineer of this Government, specially directed to a consideration of the lines already proposed at Bombay, but entering largely also into the question of railways for India generally. A subsequent despatch calls for the opinion of the Government upon a specific proposal for constructing a line from Bombay to Agra, *via* Baroda.

The views of the Governor-general in Council are also required relative to the extension of the railway from Calcutta to the North-west frontier, the proper portions to be constructed, and the most eligible mode of carrying them on.

The opinion of the Government of India has in like manner been called for regarding the lines of railway that have been suggested for the Presidency of Madras.

Lastly, a proposal for the formation of a railway from Calcutta to Diamond Harbour has been transmitted for the consideration of the Governor-general in Council.

Upon these the Honourable Court has required opinions with the least practicable delay

2. The references embrace a variety of questions, whose magnitude and importance can hardly be overstated. The consideration of them involved the necessity of previous reference to the other Presidencies, with whose local projects the Supreme Government had no acquaintance. It demanded the most anxious and careful deliberation, and a closeness of inquiry which was hardly compatible either with the necessity for early reply, or with the due consideration of other questions occurring in the daily course of events, and imperatively demanding immediate decision.

The consulting engineer, who was absent examining the extension of the Bengal Railway, was immediately recalled to the Presidency. The consulting engineer at Madras was requested to repair to Calcutta. Distance did not admit of my requesting the presence of the engineer from Bombay; but full reference was made upon the several matters on which it was necessary that the views entertained in that Presidency should be known.

I have had the advantage of conferring personally with Major Baker and Major Pears; and the reply of Captain Crawford has been received from Bombay.

3. I have given my best and most earnest consideration to these great questions, sensible of the responsibility which attaches to the expression of an opinion upon measures that will affect so many and such vast interests; and I now submit respectfully the conclusions I have formed to the collective judgment of the Honourable Court.

4. It will be convenient to treat the several questions that have been raised in these documents in their natural order. I propose, therefore, to advert,

1st. To the question of a general system of railways for India, on which Major Kennedy has dwelt in the memorandum transmitted by the Court.

2d. To the lines required in the Presidency of Bengal.

3d. To those proposed and required in the Presidency of Bombay.

4th. To those projected or desirable for the Presidency of Madras.

5th. To the agency by which the lines shall severally be constructed.

6th. To the general principle which ought to be observed in the construction of them.

7th. To the particular companies which seek permission to undertake them.

5. It cannot be necessary for me to insist upon the importance of a speedy and wide introduction of railway communication throughout the length and breadth of India. A single glance cast upon the map recalling to mind the vast extent of the Empire we hold; the various classes and interests it includes; the wide distances which separate the several points at which hostile attack may at any time be expected; the perpetual risk of such hostility appearing in quarters where it is the least expected; the expenditure of time, of treasure, and of life, that are involved in even the ordinary routine of military movements over such a tract, and the comparative handful of men scattered over its surface, who have been the conquerors of the country, and now hold it in subjection: a single glance upon these things will suffice to show how immeasurable are the political advantages

advantages to be derived from a system of internal communication which would admit of full intelligence of every event being transmitted to the Government under all circumstances, at a speed exceeding five-fold its present rate; and would enable the Government to bring the main bulk of its military strength to bear upon any given point, in as many days as it would now require months, and to an extent which at present is physically impossible.

6. And if the political interests of the state would be promoted by the power which enlarged means of conveyance would confer upon it of increasing its military strength, even while it diminished the numbers and cost of its army, the commercial and social advantages which India would derive from their establishment are, I truly believe, beyond all present calculation. Great tracts are teeming with produce they cannot dispose of. Others are scantily bearing what they would carry in abundance, if only it could be conveyed whither it is needed. England is calling aloud for the cotton which India does already produce in some degree, and would produce sufficient in quality, and plentiful in quantity, if only there were provided the fitting means of conveyance for it, from distant plains, to the several ports adopted for its shipment. Every increase of facilities for trade has been attended, as we have seen, with an increased demand for articles of European produce in the most distant markets of India, and we have yet to learn the extent and value of the interchange which may be established with people beyond our present frontier, and which is yearly and rapidly increasing.

Ships from every part of the world crowd our ports in search of produce which we have or could obtain in the interior, but which at present we cannot profitably fetch to them, and new markets are opening to us on this side of the globe under circumstances which defy the foresight of the wisest to estimate their probable value, or calculate their future extent.

7. It needs but little reflection on such facts to lead us to the conclusion that the establishment of a system of railways in India, judiciously selected and formed, would surely and rapidly give rise within this Empire to the same encouragement of enterprise, the same multiplication of produce, the same discovery of latent resource, to the same increase of national wealth, and to some similar progress in social improvement, that have marked the introduction of improved and extended communication in various kingdoms of the Western world.

8. If further illustration of these advantages be sought, they will be found in the documents laid before the Honourable Court. "The Court itself has recorded its desire that India may, without unnecessary loss of time, possess the immense advantage of a regular and well-devised system of railway communication."

67. 21 Dec. 1852,
para. 2.

9. I trust, therefore, that it may be considered as a matter determined, that the limited sections of experimental line which have heretofore been sanctioned by the Honourable Court are no longer to form the standard for railway works in India, but that these are to be undertaken upon a scale proportional to the extent of the British dominions in the East, and to the immediate benefits they are calculated to produce. I conceive that experimental lines of small extent are at this day no longer requisite.

The mechanical practicability of constructing railways in India needs no further experiment for its establishment. If there are difficulties in India from which railway works in Europe and America are free, India is exempt, on her part, from many great impediments to which those countries are subject. If there are still doubts and difficulties here, which the soil or season of India create, it may now be assumed with confidence that there are none which the skill and experience of those who are charged with the undertaking will not be able to master.

10. Again, the commercial success of railways in India, which the experimental lines were partly intended to test, is, in my humble judgment, not less certain than the practicability of them as material constructions.

Whatever might have been the result of the commercial experiment upon the short section of line which was commenced at Calcutta, if it had not been extended beyond its original dimensions, there seems to me to be no doubt of it

proving remunerative, if it became, as is now proposed, portion of a substantive line towards the North-west Provinces. The amount of traffic which is passed and met by any one travelling upon the great trunk road; the inability of the limited number of steamers on the Ganges to meet the demand for freight; and the numerous river craft which everywhere cover the stream and crowd the canals near this city, through which they communicate with the port; all betoken an amount of goods requiring conveyance, which must be very great in extent. There is no *prima facie* reason to suppose that the parties interested in the conveyance of this mass of goods will not greatly prefer the rapid, safe, and easy carriage of a railway, to the slow and riskful voyage of a country boat. And all the engineers have distinctly stated in their several reports, up to the most recent which Major Baker has submitted, that their constant communications with the natives, with whom they are brought in contact along the country which is to be traversed by the lines, have satisfied them, not only that the natives will gladly use the railways for the conveyance of their goods, but that they will have no scruple in availing themselves of them as passengers, if only the rate of fare paid shall render the carriages available to them.

If the lines shall be judiciously selected in the first instance; well and economically constructed; safely and thriftily worked; I entertain no doubt that upon the great lines of communication now in the contemplation of the company the returns will be remunerative; and that the Honourable Court will be called upon, after a line shall be in full operation, to pay the interest which it has been obliged to guarantee upon the capital, in order to induce the public to invest its money in railway works in India.

11. Were it otherwise, I should still consider it to be the plain duty of the Honourable Company to concede the assistance which is now required of it for the establishment of Indian railways.

Though the lines should not prove clearly remunerative, they will certainly pay in some degree. If the Honourable Company should thus be left liable for some payment to the railway proprietors, still additional means to meet this liability will be afforded by the reduction of public establishments which the introduction of railways will render feasible, though these may not be practicable to the extent anticipated by Major Kennedy in his memorandum; and even if, contrary to the expectations of those who are best qualified to form a judgment upon the subject, the railways should not prove a profitable investment, and the Honourable Company should be called upon to make good yearly a considerable portion of the interest it has guaranteed, the direct advantage it will derive from railways in the reduction of military force, which they will render practicable, and the many other direct and indirect benefits which will accrue to it politically, commercially, and socially, from their existence, will be so great and so palpable as to render the payment of guaranteed interest a burden which the Honourable Company may cheerfully and contentedly bear; more especially when it calls to mind the peculiar relation in which it stands to the people over whom it has been set to rule.

12. Having stated my opinion that the construction of an extensive system of railways in India ought at once to be commenced, and having further expressed my conviction that the lines when fully established will, if prudently and well constructed, be remunerative to those by whom they may have been constructed, and will be productive of infinite advantage to the Government as well as to the community; I have now to suggest the lines which it appears desirable to establish in the first instance.

13. In the memorandum to which the Honourable Court has directed our attention, Major Kennedy has observed, after stating various general principles:

“The first object must be, to lay down the great trunk lines, with a view to the broadest future ramification, and on a principle that shall ensure the most profitable permanent working of the lines generally, bearing at once upon the internal intercourse of India itself, as well as upon the intercourse of India with Europe.”

In fulfilment of this object, he proceeds to consider the lines of railway “which would lead to the most perfect and comprehensive system of intercommunication that can at any future time be looked to for India.” These he has marked in successive maps in the order in which he considers they should be undertaken, according to the funds that may be available under circumstances which he supposes.

I apprehend that any attempt to lay down this time a perfect and comprehensive system of railways covering the surface of India is premature, and can lead to no practical result. I conceive that my present business is to advise the Honourable Court as to those great trunk lines which are of primary importance, not only as being most immediately required, but as forming the main channels which future lines shall be able to take advantage of, as the best and readiest means of communication with other portions of the Indian Empire.

14. That some such general outline of a system should be described at the commencement, is of essential importance, in order that whatever capital may now be made available for the construction of railways in India may not be frittered away upon local and inconsiderable schemes, but may as far as possible be made to conduce to the establishment of those great lines by which the general interests of India would best be served.

15. The main considerations which should determine the selection of a great trunk line of railway in India must be,

1st, The extent of political and commercial advantages which it is calculated to afford: 2dly, the engineering facilities which it presents; and, 3dly, its adaptation to serve as a main channel for the reception of such subordinate lines as may hereafter be found necessary for special public purposes, or for affording the means of conveyance to particular districts.

16. Tried by these tests, I apprehend that the line from Calcutta by the valley of the Ganges to the North-west Provinces, which is referred by the Honourable Court in the Despatch 67, (1852), will stand the first in order of importance and value, and ought to command the earliest and best attention of the Government of India.

The first portion of the line from Calcutta to Burdwan and Runeegunge was sanctioned some time ago. Its extension from Burdwan to Rajmahl has already been approved.

The engineers of the railway company and the consulting engineer have been engaged during the past season in closely examining the line proposed from Rajmahl to Allahabad.

Their report, which has lately been submitted, is fully satisfactory. Beyond Allahabad the country is known in its general character to be eminently favourable for the formation of a railway, although it has not been minutely surveyed.

With the exception of the rivers which intervene, there is nothing to prevent the prolongation of this line to Lahore and to the river Jhelum, whenever it may be thought desirable so to do; and although the country between the river Jhelum and Attock, in whichever direction it may be approached, will present greater engineering difficulties than the other portions of the line, there is, in my opinion, nothing whatever to prevent the railway being carried to the banks of the Indus at Attock, within 40 miles of our extremest western frontier, whenever it shall seem good to the Honourable Court to order its construction.

17. The line I have sketched, even though it should not be carried at present beyond the river Jhelum, will constitute a very noble work, replete with the highest advantages to the Government and to the public.

18. Viewing it first with especial reference to the interests of the state, I have to observe that it would infinitely diminish the risks, if risks there be, which are involved in the extension of our frontier to a distance of 1,500 miles from the capital of the country. The points on which hostile attacks are the most probable are the Caubul frontier and the borders of Nepal.

19. The hostility of Maharajah Golab Singh, which has sometimes been anticipated, will most assuredly never be exhibited so long as he has life in himself and strength to prevent its exhibition by others. The interest of future rulers of Cashmere will hardly be less urgent than his to induce them to cultivate friendly relations with the Government of India. If they should not be friendly, neither the wealth and power they hold, nor the character of the people they rule, are sufficient to make them formidable to us.

I regard, therefore, the states of Caubul and of Nepal as the only powers from which hostilities are likely to proceed.

20. The probability of an European invasion by way of Caubul, and by an European force, is so remote as to be hardly more than a bare possibility.

But the probability of an attack from Caubul under European instigation, if circumstances should arise elsewhere to recommend it, especially if either foreign war or internal disorder should, concurrently with such circumstances, compel us to weaken our force in the Western Provinces, is by no means to be disregarded.

21. The state of Nepal is, I believe, at the present time sincerely friendly; but its prince is a nonentity. Its minister, Jung Bahadur, whose personal knowledge of the real power and resources of the British Government forms our best guarantee for the friendliness of Nepal, is, I fear, too far in advance of the public feeling of his countrymen to admit of our regarding his tenure of power or of life as at all secure. Events have already shown that he stands in a perilous position, and if the attempts to destroy him should succeed, trouble upon the frontier of Nepal is not altogether improbable.

22. The distance between the frontiers, which I have indicated as the points of risk, is very great. The European force in the Eastern portion of this Presidency has been for many years past weaker, perhaps, than prudence would altogether warrant.

The recent addition of Pegu, however unwelcome, must be provided for; and while we have only our present force, must proportionably increase the risks of the Nepalese frontier, whatever those may be held to be.

23. Whether, then, hostility shall come from Caubul or from Nepal, the line of railway to which I have referred would be of incalculable value.

Touching every important military station from Calcutta, to the Sutlej, connecting every depôt, Allahabad, Agra, Delhi, Ferozepore, with the arsenal in Fort William, it would enable the Government of India to assemble upon either threatened frontier, or, if it were necessary, upon both, an amount of men and materials of war amply sufficient to deal with any such emergency, and within a period which would be measured by days; whereas months must elapse, with our present means, before we could provide the same extent of military defence.

24. Inasmuch as the consciousness of our power thus to concentrate our means wherever we might desire would deter native states from resorting to combined attacks, which they have hitherto happily neglected to attempt, it is probable that the army we now maintain might be numerically reduced without unduly diminishing our military strength.

The weary reliefs of corps periodically traversing long distances, at heavy expense to the state, with grievous loss of time, and occasionally with loss of life, would in a great measure be obviated. The heavy tax upon the people of districts, which is often unavoidably inflicted by reason of the necessity of carriage for the troops, would be removed.

European stores, tending to benefit the health and affect the conduct of our troops, would be easily obtained, quickly and cheaply; and in many various ways, which it is unnecessary to follow in detail, the power of the state would be increased, and its interests materially promoted.

25. The course which the railway would follow for these political purposes is at the same time the very best which it would be possible to select for the interests of trade, and for the local advantage of the whole of this portion of India. The sections that have been already sanctioned open the only coal-field which has yet been brought into extensive operation in Bengal, and afford means of conveyance for the great mass of traffic which, excluded from direct communication with the port of Calcutta by the imperfect navigation of the Nuddea rivers, is compelled, during a great portion of the year, to find its way by the circuitous and inconvenient channel of the Soonderbunds.

The construction of the line to Rajmahl will at the same time afford new and great facilities of carriage for the rich produce of districts that lie upon the left bank of the River Ganges.

Proceeding onwards to Allahabad, the line will skirt the hilly tracts that are now under examination with reference to the mineral wealth they are said to contain; it will open out the opium districts, and will meet the trade of the Nerbudda Valley at Mirzapore, its chief emporium.

Beyond

Beyond Allahabad it will run along the entire Dooab, skirting the frontiers of Oude, whose great fertility and natural resources will one day contribute largely to the traffic of the line. It will traverse the country beyond Cawnpore, which, fruitful already, will shortly become more so under the influence of the Ganges Canal, whose opening is looked for in 1854. It may receive, whenever it is desired, a branch by Furruckabad for the conveyance of the produce of Rohilkund; and it will be equally accessible to such other branches as either the Honourable Company or native princes may desire to lead from it into their districts on the other side.

And although the country beyond Delhi is at the present time less productive and less populous than the districts below, no man who has noted the effect which even four years of peace have had upon the face of the country beyond the Sutlej, or who is aware of the vast results which the providing of the means of irrigation produces upon the cultivation and the peopling of similar districts in India, will entertain a doubt of the certain success of those great irrigation works which are already commenced in the Baree Dooab, and are contemplated in the Cis-Sutlej province; or of their rendering the districts beyond the Dooab, at no distant date, as populous and as productive as those within it

26. With the prospect of so many and such various benefits to be derived from its construction, I have to recommend that the line of railway by way of the Ganges Valley to the North-west should be completed as far as Delhi with all practicable speed, and that it should thereafter be carried across the Punjab as soon as may be found feasible and expedient.

27. The only local line which is at present contemplated within the Presidency of Bengal is the line from Calcutta to Diamond Harbour.

The object which it is intended to secure by the construction of this line is indicated in the first para. of the despatch from the Honourable Court.

The despatch observes, "Adverting to the difficulties and dangers which attend the navigation of the river between Calcutta and its mouths, it appears to us that these evils would in a great measure, if not altogether, be avoided by means of railway communication, and that such a work would in other respects be productive of much public benefit, and would materially promote the shipping and mercantile interests connected with your Presidency."

In order to enable this Government to give an opinion as to the dangers incurred by trade and shipping in the navigation of the Hooghly, and as to the sufficiency of a railway to Diamond Harbour as a remedy for the evils adverted to, I caused a reference to be made to the Superintendent of Marine.

That officer has submitted a return, showing all the vessels that have been lost in the navigation of the Hooghly during the last 20 years.

They amount to 51 in number. Of these, only nine were lost above Diamond Harbour, all of which were weak and interior ships.

It further appears that among such ships as have taken the now common precaution of being towed by a tug-steamer, only one has ever been lost below Diamond Harbour, and not a single one above it.

These facts, briefly stated, afford the means of effectually testing the value of the present project.

They show that a railway to Diamond Harbour, far from averting "in a great measure, if not altogether," the dangers of the navigation of the Hooghly, would exercise a very small influence over them, for they lie chiefly below Diamond Harbour. They further show that whenever ships have recourse to the usual easy and accessible precaution of steam-towage, the dangers of the navigation are reduced to nothing above Diamond Harbour, and as nearly as possible to nothing below it.

Apprehensions have been entertained that the navigation of the river might be closed altogether by the silting up of the channels near the James and Mary Sand.

No information has ever been before me to show that this is a probable event, or that it has of late years become more probable. Until it does actually occur, or until the probability thereof becomes imminent, or until those huge arks which have been spoken of, and to which Captain Rogers alludes, shall really be the vehicles for the commerce of India, I am unable to advise the construction of a railway from Calcutta to Diamond Harbour.

Fleets of magnificent merchant ships annually come and go uninjured, and even

even unimpeded. The fine steam-ships of the Peninsular and Oriental Company habitually run up and down the river safely and at a very high rate of speed. The large mail steamers of the Screw Company, and the heavily armed steam frigates of the Indian navy, perpetually traverse the channel without difficulty or danger.

I do not believe that the formation of a railway to Diamond Harbour would be of the slightest benefit to anyone of these, or that, if it were opened for traffic to-morrow, it would induce any one of them to anchor there, or to depart from their usual plan of proceeding direct to this city, with the advantages of proximity to their cargo and agents, of accessibility to their passengers, and manifold other conveniences, both for those who belong to the ships and for those who are on shore.

I am aware of no benefit whatever which would be derived by the Government from the existence of such a line of railway; nor is it apparent to me in what other respects it would be productive of benefit to the shipping and mercantile interests of this Presidency.

If, however, those interests are of opinion that a railway to Diamond Harbour would be advantageous to them, I respectfully submit that the proper course is that their own enterprise should provide the line for their own advantage. It would be a line of limited extent, of very easy construction, for there does not appear to be any formidable engineering difficulty in its course, and cheap, excepting where it would be necessary to purchase land in the immediate vicinity of Calcutta. The project, therefore, would be easily accomplished by a very small exertion of enterprise and a comparatively small amount of capital.

As the dangers of the navigation do not loudly call for this line, as the interests of the Government would in no respect be promoted by it, and as it is quite within the ordinary compass of joint-stock undertakings, I beg leave to express very strongly my opinion, that it should not be taken in hand by the Government of India, and that, if private parties should engage in it, the Honourable Court should not come under the obligation of guaranteeing interest upon the capital raised for it in any amount whatever.

With reference to the observations of the Superintendent of Marine upon Chilka Lake, I have only to remark, that it is so little of a practical question at the present moment, that I do not think it necessary to occupy the time of the Honourable Court by entering upon a consideration of it.

28. The next important point for consideration, is the desirableness of connecting the several Presidencies by means of railways, and the best mode of effecting the communication. I attach no great value to the connexion by railway of the several capitals and seats of Government, considered merely as such. But it appears to be of the first importance to connect the several Presidencies by a line of rail, each with the other, and to unite Hindostan and the districts to the north-west with the western ports in the Peninsula.

29. The memorial of the directors of a proposed company for constructing a line from Bombay *via* Baroda to Agra, which has been transmitted for the opinion of this Government by the Honourable Court, communicates very fully the several political and commercial purposes which would be served by their project. Although their case seems to be somewhat overstated, and although I do not concur with them in thinking that Simla must ere long become "the permanent residence of the general Government of India," or recommend that it should be so, I am strongly of opinion that the formation of some line uniting Hindostan with Bombay is immediately desirable.

Para. 2.

30. Whatever strength there may be in the arguments by which a general line through Hindostan has been urged on political grounds, they bear as strongly in favour of a junction line with the Presidency of Bombay. The military power of the Government of India would be incalculably advanced thereby.

The Presidency of Bombay may be said to have no foreign frontier, except in Scinde.

The Nizam is a foreign potentate, but wholly helpless in our hands.

Of the Rajpoot States, none are hostile, or in the least likely to become so.

Most

Most of them furnish a contingent force in some form, officered and controlled by the British Government, which is stationed within their bounds, and forms an effectual check upon them. Even if they should become hostile, the experience of a century has shown us that the danger of combination need not be anticipated; while, if it should unexpectedly take place, the force in the Presidency would be amply sufficient to meet it, even though a considerable portion of the army should be detached elsewhere. In taking this view, I assume, of course, that all risk of simultaneous foreign invasion upon the coast will be fully provided against by our fleets upon the sea.

Such being the political situation of the Presidency of Bombay, it would be able to afford with safety to itself extensive and valuable aid to the Government of India, in the event of the Bengal army being suddenly and heavily threatened by any of those very possible events to which I have pointed in previous paragraphs; if only the means of movement for its troops were afforded to it, and a railway were in existence, annihilating the vast distance which separates the two armies, and which deprives them, in a great measure, of all the advantages of mutual co-operation. Paras. 20, 21.

31. Nor is it in time of war alone that such a communication would be valuable. Heretofore, and until very recently, every recruit that joined his corps from England, every invalid that was sent back shattered to his home, was obliged to travel the long, slow, weary track to Calcutta, however distant the station at which he was placed. Within the last two years, the establishment of steam communication regularly on the Indus has enabled the Government greatly to lessen this evil. The despatch of recruits by Bombay to Kurrachee for that large portion of the Bengal army that is stationed to the westward of the Jumna, and the conveyance of the invalids of the same portion of the army from Ferozepore to the sea, have been a vast improvement. But a railway to Bombay would afford infinitely greater relief to the class returning home, and far greater facilities in favour of those for the first time arriving in a tropical climate.

32. Its advantages might be still further extended, with great economy of time and money, and probably with great benefit to the health of the troops, and consequently increase to the efficiency of the Bengal army. If a line were in full operation, regiments in relief, instead of landing at Calcutta, and having their first introduction to an Indian climate in those districts where its character is the worst, or, instead of landing at Kurrachee, which can only be done at certain seasons of the year, might be shipped for the shorter voyage to Bombay, and, being landed there, might at once be transported by rail to such station in the Upper Provinces as might be thought best adapted for ensuring the health of the corps.

33. Furthermore, I hope before long to see the cost of the conveyance of troops to India reduced by still another step, and the time occupied upon the voyage equally curtailed, by obtaining permission to convey them across the Isthmus of Suez.

At the present time nothing would be gained by such a change.

But when the railway in Egypt shall be completed from Alexandria to Suez, as it undoubtedly will, and if a railway shall be formed from Bombay to Upper India, as I trust it may, a regiment may be carried in steam transports from England to Alexandria, conveyed in 24 hours from thence to Suez, thence landed by the ships of the Honourable Company at Bombay, and moved up to their station in Hindostan by rail, in less time, and with infinitely less trouble, than they now could march from Calcutta to Benares.

The conveyance by rail across Egypt will, I venture to hope, remove any objection which might be felt there to the passage of foreign troops; while, if the permission should be granted, a corps might leave England after the heat of summer was over, and might be quartered before Christmas upon the banks of the Sutlej, without any exposure in its way, and with four months before it of the finest climate under the sun; so that the men would enter upon the first heats of India with constitutions vigorous and unimpaired by the accident of voyage or march.

34. There can be little doubt that, viewed commercially, this line would supersede all present modes of communication for passengers between Hindostan and the sea. Large numbers of persons already take advantage of the steamers upon the Indus; but the port of Kurrachee is closed during the monsoon. A railway would be available at all times. The Indus passage, though better than the state of things that preceded it, is at best a tedious one, occupying some weeks: the railway would place travellers at Bombay in as many days. These steamers on the Indus bring up European stores and goods far faster and safer than the native boats that preceded them. The bullock-train in the Upper Province, now extended to Calcutta, is a great advance on the hackeries before it. But in either case months elapse before either traders or individuals can obtain the articles on which they are dependent for their business or their comfort. Here, again, the time in which they would be supplied by railway would be measured only by days. And although, of course, the construction of a line from Calcutta would in like manner afford the conveyance for goods which they require, the line from Bombay, communicating through Egypt with England, would be shorter and speedier, and, by virtue of competition, probably as cheap as that through Bengal, while European goods conveyed direct to Bombay by sea would, I apprehend, be able to enter the markets in Hindostan at an advantage as compared with similar goods by way of Calcutta.

35. On these grounds, I consider that a line of railway connecting Upper India with the Western Ports and with the Presidency of Bombay, would be of great political and commercial value, and I beg leave strongly to advocate its construction.

36. The specific course which such a line should follow, it is hardly possible as yet to decide.

The Company, whose memorial has been addressed to the Honourable Court, projects a line by way of Baroda and Neemuch to Agra, commencing for the present at Surat, and leaving the link between that city and Bombay to be constructed the last in order.

There can be no doubt, I think, that on political grounds such a line would be the best, as it would be also the most direct. But it would doubtless be contended by many, that the commercial advantages of a line which, commencing at a point near to that contemplated by the memorialists, should be carried up the valley of the Nerbudda, and, joining the Bengal Railway somewhere near Mirzapore, should thus follow the natural course of the present trade, while it opened up the coal fields known to exist, and the productive resources of that extensive and fertile valley would be so superior to the line by Neemuch, as to recommend it as the first to which capital should be applied.

I entertain little doubt that one day both of these lines will be formed. If one only can be obtained, then, although the line by the Nerbudda would open a communication with Hindostan circuitously, I am of opinion that the line by Baroda and Neemuch would be preferable, so far as we are at present able to judge, and should be selected for construction, if it should be found on examination a practicable and eligible line.

37. This condition is necessarily attached to my recommendation, because at this moment the Government of India has no knowledge of the character of the line, excepting that which it can obtain by looking at the map. The memorial of the Company which proposes to undertake it, gives no information whatever. It proposes, indeed, that the maximum cost per mile shall not exceed 5,000*l.*, exclusive of the crossing of great rivers; but it quotes no survey, adduces no facts, and, in short, supplies no evidence whatever to show that the line can be constructed for that, or for any other sum.

I repeat, therefore, that I advise the construction of a line from Surat, by Baroda and Neemuch, to Agra, as being calculated to afford the greatest amount of general advantage, if, on survey, it should be found that the work can be executed upon any such terms as those contemplated in the memorial of the Director of the Baroda and Central India Railway Company.

38. I would further observe, that the omission or the postponement of the link between Surat and Thanna (or Bombay) appears to me to be a great imperfection

imperfection in the proposed scheme. No doubt the connexion of the line at Agra with Surat on the coast would of itself be a great gain ; but the work would be very incomplete until it were extended so as to communicate uninterruptedly with the harbour of Bombay.

39. The memorial does not state whether the Company has taken, or intends to take, any measures for the survey of this line during the ensuing season. A knowledge of the engineering character of the different channels by which Bombay might be approached from Hindostan, is very urgently required, and I would propose that arrangements should be made during the summer to commence a general survey of these two lines in the autumn, if the Railway Company should not have taken measures for that purpose, or unless the Honourable Court should instruct us otherwise.

40. I have now to enter upon the consideration of those lines in the Bombay Presidency upon which the Honourable Court has required the opinion of the Government of India, with especial reference to the remarks contained in the memorandum by Major Kennedy.

A line has already been constructed from Bombay to Thanna, 24 miles in length. This point must be common to all lines entering the island of Bombay, whatever may be their direction. An extension of this line to Callian, to the eastward of Thanna, has been sanctioned. From Callian three lines of railway have been submitted for consideration.

1st. The Thull Ghat line, carried in a north-easterly direction by Nassik into Kandeish, with a view to future prolongation onwards.

2d. The Bhore Ghat line, carried in a south-easterly direction to Poona, with anticipated extension to Ahmednuggur, &c., and as the probable course of a junction line with Madras.

3d. The Malsej line, carried in an easterly direction between the two others to the table land.

All of these, as their names imply, mount the Ghauts of the Syhidree Range, 1846-1847. The Thull Ghaut and Bhore Ghaut lines were proposed a few months ago.

Upon closer examination of it, all parties concerned, the Great Indian Peninsula Railway Company, the Government Engineer, and the Government of Bombay, concur in recommending the total abandonment of the Malsej Ghaut line.

When I observe that, at the lowest calculation, it could not be opened for through traffic for 17 years to come, it will be thought that I have stated sufficient ground for concurring in its abandonment, without entering further into the many good reasons which are given for that course in the very full reports of the railway and the superintending engineers.

The question, then, for consideration relates only to the Thull Ghāt and Bhore Ghat lines.

41. The superintending engineer, in his observations upon the memorandums of Major Kennedy, writes thus :—

“ 20. It will be seen from para. 30, and also from the opening of Appendix No. 3, that Major Kennedy is not aware that the whole project for reaching the table land of Candeish by the Malsej Ghaut route has, after a most careful reconsideration and survey of other routes, been rejected for that by the Thull Ghaut, and there is no intention now of attempting the ascent by a fixed engine incline of about six miles, with a gradient of about 1 in 18, or by an alternative incline of 13 miles long, with a somewhat reduced gradient.” All exceptions, therefore, taken by Major Kennedy to these points, or to the branches north from Alleh to Kandeish, and south-eastward to Sholapoor, are now of no force. Neither is it the intention that the grand trunk line between Bombay and Agra “ should pass over no fewer than four unnecessary and fierce ranges of mountains ;” indeed it is no object, at any rate at present, with those in Bombay interested in railways to look towards Agra at all. Our object is to reach the table land of the Deccan and Candeish as speedily as possible ; and this I am fully persuaded is provided

Report engineer
Great Indian Pen-
insula Railway
Company, p. 226

for in the project now before Government in the report forwarded by the Railway Company.*

42. In these remarks it does not appear to me that the superintending engineer has fairly met the main objections to the Bombay lines set forth by Major Kennedy.

That objection, broadly stated, is, that it was a grave error to propose that "the grand trunk road by which the whole northern, north-western, and north-eastern traffic is to approach Bombay, the important mercantile capital of Western India, should be carried over the Syhadree Ghats."

Letter, para. 21,
31 January 1853.

The remarks of Captain Crawford, which I have quoted, would appear to imply that the lines now projected have no other object than "to reach the table land of the Deccan and Candeish as speedily as possible." It appears, however, from other passages in the documents communicated from Bombay, that their views regarding the Thull Ghat line are not limited to this local object.

Para. 61.

Later in the same letter, Captain Crawford remarks, "The country onwards from Candeish appears to offer every facility for the extension of the line to the eastward, so that we may hope to fall in with the Calcutta line in its extension to the north-westward, and thus complete the communication between Bombay and Calcutta by rail—a result looked forward to, I imagine, with much greater anxiety by the mercantile interests in Bombay than a present communication with Agra."

Report, 7 October
1852, para. 23.

Again, in his Report to the Government of Bombay, the superintending engineer gives it as his opinion, that, "looking at the subject in every point of view, there can be no doubt that, as a grand trunk line for India, the route by the Thull Ghat is to be preferred to all others."

This view is advocated also by the engineer of the Railway Company: he says—

Mr. Barker's report,
14 September
1852, para. 223.

"It would be a part of the most practicable and convenient line for Oujein, and the Province of Malwa, with its opium trade, and for the North Western Provinces of Bengal: it would be the shortest route for the produce of the Nerbudda Valley, with its coal-fields of Baitool and Bewas, and lie, in my opinion, in the proper direction for the trunk line to cross the Peninsula."

These passages demonstrate, that, in laying out the Thull Ghat line, both the Railway Company and the Government engineer at Bombay contemplate it as the great trunk line for India, which shall open Malwa, the Nerbudda Valley, the North Western Provinces of Bengal, cross the Peninsula, and connect Bombay with Calcutta.

Whether, then, the lines now proposed at Bombay are or are not directed precisely to the point mentioned by Major Kennedy, namely, Agra, they are recommended as great trunk lines to traverse India, and convey the "northern, north-western, and north-eastern traffic" to Bombay.

Whether they do or do not literally "pass over no fewer than four unnecessary and fierce ranges of mountains," they cross the Syhadree range, and other ranges and valleys in the route anticipated for them.

Wherefore the lines now proposed are substantially liable to the main objection advanced against them in the memorandum in like manner as the Malsej Ghat line, to which it appears that Major Kennedy referred.

43. The practical question for determination is this: is the Thull Ghat line so strongly urged by the Great Peninsula Railway Company and the Government of Bombay well fitted to be a great trunk line connecting that city with Hindostan and Bengal, and serving as the channel for conveying the trade of Northern and Central India to the western port?

I have no hesitation in expressing a decided opinion that the Thull Ghat line, as at present before this Government, is in many respects highly objectionable, and ought by no means to be adopted by the Honourable Court as a great trunk line for communication with the rest of India, unless it should appear that nature has denied us the possibility of finding a better, which I do not believe to be the case.

44 In

* With letter, No. 548, dated 27 September 1852; copy sent to Government of India, with letter No. 450, dated 15 October 1852.

44. In support of this opinion, it is necessary to advert shortly to the character of the line as shown in the engineer's report, and in the tables of gradients and curves appended.

Leaving Callian, it runs straight at the Ghaut in the Syhadree range, which it is intended to surmount by a steep incline.

For 18 miles out of 28, before it reaches the foot of the incline, it rises at a gradient of 1 in 100.

It mounts the incline at a continuous gradient of 1 in 37, for nearly seven miles. This, however, is not its most objectionable feature, which is to be found, as the engineer points out, in the concurrence with this steep gradient of "sharp reverse curves" of 32, and even 30 chains radius.

The railway engineer admits this feature to be objectionable; but he affirms, from the experience upon inclined planes of a similar character in England, "that this one may be worked efficiently by locomotive power."

Report, para. 168

The superintending engineer, quoting the opinion of the engineer as to working a train up this plane by locomotive power, observes, "I must confess, however, that the working the down line on such an incline appears to me almost as difficult a problem as getting the traffic up it."

Report, para. 27

The railway engineer proposes to effect this solely by the use of ordinary breaks, and he refers largely to the Lickey incline, in proof that it can be safely done. Both planes are at 1 in 37; but the Lickey incline is two and a quarter miles in length; the Thull Ghat incline nearly seven miles; and moreover, as the superintending engineer justly observes, the Lickey incline "has not curves of 30 chains radius upon it."

Para 27

The superintending engineer proposes to meet this difficulty by "the principle of the atmospheric railway reversed." I am not sure whether I understand this proposal correctly, when I assume it to mean, that the speed of the descending train is to be checked by the repelling pressure in the atmospheric tube, in the same manner as the pressure has usually been employed for propulsion. If so, with complete deference to opinions better than mine, I must needs say, that, according to existing experience of atmospheric railways, this seems to me to be a desperate nostrum.

It is now a good many years since an opinion unfavourable to the atmospheric lines was expressed by the Railway Department at the Board of Trade. Like many other opinions which proceeded from the department, this one was overruled by Parliament. Atmospheric lines were constructed; one to Croydon, one, I think, in Devonshire. The result of the Croydon line (and I believe of both) was a total failure. Those who were to travel the South Eastern Railway will remember the very common spectacle of the carriages standing on the atmospheric line motionless, for want of power to move them. And all who do so, will feel, as I do, some consternation at the thought of what would be the consequence of a similar failure of power in the Bombay atmospheric line, when a train should be descending the Thull Ghat, in a gradient of 1 in 37, with curves of 30 chains radius, for seven miles together. On the Croydon line, in such a case the train simply stood still; on the Thull Ghat it would be, I apprehend, in a vastly less secure position.

45. Such is the character of a line over which all the goods and passengers traffic from Calcutta and the North Western Provinces of Bengal, the corn and coal of the Nerbudda Valley, the opium of Malwa, and the cotton of Kandeish are to pass; and which the superintending engineer at Bombay considers, "there is no doubt," in every point of view, "is," as a grand trunk line for India, "to be preferred to all other routes."

I am unable to concur in this view.

It may be, that full and searching examination of the country may prove that its nature will not admit of any better approach to Bombay being found than this which is recommended by the Thull Ghat. It may turn out that a trunk line to Hindostan and to Bengal by Baroda, or by the Nerbudda Valley, can only be constructed at such great additional cost, or with such great increase of extent, as to render it less profitable than the Thull Ghat line would be, notwithstanding the objections that may be stated to the latter. In such case it would doubtless be advisable to sanction a "grand trunk for India" by the Thull Ghat. But unless this should be shown, which I do not believe to be probable, I respectfully advise the Honourable Court not to give their sanction to the Thull

Ghat line in the character of a main trunk communication between the western coast of Bombay and Hindostan, or Bengal.

46. It does not necessarily follow from the rejection of the Thull Ghat as a great trunk line, that its construction as a local line should be prohibited.

Even the memorandum by Major Kennedy (whose doctrines regarding gradients go beyond the opinion I hold, and will be considered in another part of this minute) fully admits that "there is no doubt the interests of the table land east and south-east from Bombay call for every exertion to open a passage through the Syhadree range."

Mem. para. 33.

The report of the railway engineer, confirmed by that of the superintending engineer, appears to me to establish the great commercial importance of opening as soon as possible a channel for trade into the table land above the Ghats. The practicability of it is established. Its remunerativeness seems, at least, to be highly probable.

Of the two lines proposed, that in the direction of Kandeish appears to be of the greater commercial value. That in the direction of the Poona has considerable political value, and it is not without commercial value; but in this latter respect it appears to be inferior to the Thull Ghat line.

The value of both, however, upon political and commercial considerations, seems to me to be so satisfactorily established, that I venture to submit to the Honourable Court a recommendation that both should be undertaken on such favourable terms as it is probable may be obtained.

An extension in one direction or the other is clearly necessary, if the portion already sanctioned as far as Callian is expected to pay. If only one project meets with favour from the Honourable Court, I am bound to say, notwithstanding the advantage politically of connecting Poona with Bombay, that I think the Kandeish line is, upon the whole, entitled to the preference.

47. Although I conceive that the Kandeish line is the more valuable of the two, and have recommended it for preference, I cannot recommend that it should at once be sanctioned by the Honourable Court as it now stands.

Concurring with Major Kennedy in the general principle which he lays down (as I shall elsewhere more fully explain), I cannot go with him through the whole extent to which he has carried them. Guided by the information I have obtained from the able and experienced officers who have been appointed to advise the Government on railway questions, in each of the three Presidencies, I must express my conviction that such gradients as 1 in 2,000 for first-class, 1 in 330 for second-class lines, on which he inflexibly insists, are physically unattainable in the Presidency of Bombay, as well as of Madras.

Neither can I give my assent to the whole views he has expressed regarding the Bombay lines. The superintending engineer has shown, I think very clearly, that in the general rules which he has thought capable of observance upon Bombay lines, and in his scheme for surmounting the Ghats by lines free from the objections that are applicable to those proposed, Major Kennedy has written without sufficient practical and personal knowledge of the facts, and has fallen into error. The discussion is a professional one; and I venture only with great distrust of myself to give an opinion at all upon the question at issue. So far, however, as I may venture to do so, I must say that I think Captain Crawford has shown that the Ghats of the Syhadree range cannot be ascended in the manner or at the cost asserted by Major Kennedy.

Again, I conceive that Captain Crawford has built up a very strong presumptive case against the practical correctness of Major Kennedy's opinion, that Candeish ought to be opened up by a railway, taking the line of the Taptee river. The length of such a river line is shown to be very much greater; the difficulties of construction would apparently be very serious, and the sources of traffic along it few and scanty.

But although I consider that the Ghats, if ascended at all, must be ascended at gradients far less favourable than those which Major Kennedy's views regard as the worst admissible, and although I think that, as the case stands at present, the Thull Ghat line, faulty as it is, may perhaps prove to be a more profitable line whereby to connect Candeish with Bombay than the line of Taptee River, still I am of opinion that the Honourable Court ought not to jump to a conclusion, and to sanction the Thull Ghat even as a local line, until further examination

nation

nation shall have been made, and an authoritative comparison instituted between the Ghat line and the river line.

Both parties are at present proceeding on assumption; neither have examined the line which they respectively commend and condemn.

I recommend, therefore, that before the Honourable Court shall sanction the Thull Ghat line at all, they should require an accurate survey of the Taptee line, with a view to determine which of the two will be the more profitable and the more generally valuable to the interests of India.

48. Though the decision were already given in favour of the Ghat line as against the river line, I should further recommend the Honourable Court not to sanction the Thull Ghat Railway, over which it is probable that a very large commercial and passenger traffic will be conveyed, until further examination of the Syhadree range shall have shown that the Ghaut actually selected is the most favourable one in an engineering point of view by which a railway could reach the table land towards Kandeish. I apprehend that it is in no way essential that the railway, in mounting the Ghauts, should closely follow the road over which the traffic now travels. If the line shall penetrate anywhere by the Ghats, the country from which the produce comes, I conceive it will readily draw the traffic to itself.

These observations apply equally to the Thull Ghat and Booree Ghat lines

The engineering character of the former has already been adverted to.

The latter presents also some startling characteristics.

Nearly six miles of its length are upon a gradient of 1 in 37, of which nearly two miles are at no more than 1 foot in 20; and curves of 30 chains radius occur in this incline, as upon the other.

49. I repeat again, nature may have decreed that we must scale this gradient, or be excluded from the table land. If so, doubtless such obstructions to ascent must be submitted to; but they ought not to be submitted to until submission shall have been proved to be inevitable. A gradient of 1 in 20 for two miles should not be sanctioned, unless the engineers are in a condition to affirm that the Syhadree range nowhere affords a Ghaut more easy of access in the direction required. That the engineers are not in a condition to say this, we know upon their own authority with respect to both of the lines they now recommend.

Mr. Berkeley says, regarding the Bhoore Ghaut, "It would be unreasonable to conclude that in one short season of four months, and with very limited assistance, I have been able to select a line up this Ghaut which would not admit of considerable alterations and improvements. On the contrary, the minute study of the country which Mr. Sandum has made in obtaining the present section, led us to discover the means of improving the objectionable parts of that section as soon as its completion made us aware of them."

Report, para 120.

With reference to the Thull Ghat line, he in like manner remarks, "In the case of this, as well as of the Bhoore Ghaut, it cannot be expected that in the course of the last short season we should have been able to select the best line in all its details that the ground admits of."

Report, para. 171.

A reference to the context will show that in both cases the engineer feels confident that better inclines will be found. The superintending engineer, commenting on these passages, expresses an expectation that a further examination will get rid of many of the heaviest works, and especially of the incline of 1 in 20.

There is no reason to doubt that the engineers did the utmost that men could do within the time allowed. But I submit to the Honourable Court that when the engineers themselves plead insufficiency of time for examination, and when they express confident belief that better access to the table land can be found, the immediate sanction that is asked for schemes which are thus avowedly crude, ought not to be given. I submit that the sanction should be withheld, not only till a more perfect examination shall have been made of the particular Ghauts selected, but until that full examination of the general range, which is not shown to have been made, shall have been completed, and until the engineers are in a condition to certify that the Ghauts selected are the best available for the object in view.

50. I advise this course the more, that on the other side of India, where approaches are being sought for railways to the same table land, Major Pears, the consulting engineer to the Government, has found both the Ghauts that are best fitted for the purpose in view after separate examination, and away from the immediate course of traffic as it flows at present.

51. The record before me shows, I think, the necessity of these precautions.

The Malsej Ghaut line was examined in 1846-47 by Mr. Chapman, surveyed, recommended, and adopted by the Court. It is now very properly rejected, a few years after, as it has been found, on further examination, that it would take at least 17 years to complete it, and that it is, as Captain Crawford succinctly describes it, "not only ineligible, but economically impossible."

52. I beg leave to represent the expediency with respect to the Thull Ghaut and Bhore Ghaut lines of that complete examination of the lines, and of the rest of the range, which does not appear as yet to have been given to them, and which, if it had been afforded to the Malsej Ghaut line formerly, would have prevented such facts appearing upon record regarding railway schemes as are contained in the papers before me.

53. I am aware that the course I respectfully recommend involves delay, and I am aware that the superintending engineer, and the Government of Bombay, strongly deprecate delay. Captain Crawford urges that "the work should be pushed on beyond Callian at once," lest capitalists at home should be intimidated, and natives should lose confidence in railways in general, and the Government of Bombay endorses the sentiment.

I humbly conceive that, in dealing with so large a matter as railways for India, it is our duty to look beyond the interests and the impressions of the moment. I apprehend that capitalists at home are more likely to be intimidated, and natives to be discouraged, by discovering some years hence that we have adopted, as was done in the Malsej Ghaut Railway, a costly and a bad line, when a more deliberate inquiry would have improved the actual line, or would have guided us to one altogether better, than they are likely to be alarmed by a prudent delay, incurred for the purpose of testing the soundness of the undertaking we are engaging in, and of taking reasonable care to ensure that it shall ultimately prove a profitable one. Such a delay need not be a prolonged one, and most certainly is not a superfluous precaution.

54. The sum, therefore, of the recommendations which I have the honour to submit regarding the lines projected in the Presidency of Bombay, and on which the opinion of the Supreme Government was required by the Honourable Court, with especial reference to the remarks of Major Kennedy upon them, is:—

1st. That the Malsej Ghat line should be wholly and finally abandoned.

2dly. That the Thull Ghat line should not be adopted as one of the great trunk lines for India, unless the examination I have already advised shall show that a better and more profitable line is unattainable.

3dly. That line opening a way from Bombay to Candeish and to Poona respectively shall be sanctioned.

4thly. That the Thull Ghat line to Candeish shall not be sanctioned until a survey shall have been made of the line recommended by the Taptee, and the Honourable Court shall have decided between the Ghât and river lines.

5thly. That neither the Bhore Ghat line to Poona, nor the Thull Ghat line (if it should ultimately be decided that Candeish should be reached by a Ghat line) shall be finally sanctioned, until it shall have been ascertained by full survey that no better entrance to the table land north-east and south-east of Bombay can be found than those two Ghats respectively, and until further survey of the Thull Ghat and Bhore Ghat lines shall have been made, with a view to determining specifically those modifications of the objectionable features of both lines which the engineers appear to be confident of effecting.

55. It is now to be considered whether the Presidency of Madras can be included in any general system of continuous railways in India, and what lines should be constructed therein.

The connexion of the capital of the Madras Presidency with the seat of the Supreme Government, is of even less importance than a direct connexion between Bombay and Calcutta.

Madras does not, like Bombay, receive earlier intelligence from Europe, and it is considerable only so far as regards the Presidency itself. Any intelligence of moment will be communicable from Madras by the general line of electric telegraph now about to be formed, and will be conveyed to the Supreme Government within a very short space of time, even though the wires should not be carried direct between the two cities.

56. The line of railway which is laid down in Sketch No. 3 of the scheme transmitted to us, and which runs along the coast during its whole course, would, I apprehend, be very inexpedient at present, or until the circumstances of the country through which it would pass shall have become very different from what they now are.

This line would be of great length, and costly in construction. It passes through a country having little produce and little trade, bordered in many parts by jungles, which are even now unexplored. Along its whole course, from Madras to Calcutta, it would be worked in competition with the sea; a highway which, in this case would be so comparatively easy, speedy, and cheap, as to be sufficient for all public purposes, and to render it preferable for all present commercial ends.

I therefore do not recommend that a line from Calcutta to Madras should be taken into consideration.

57. The junction of Madras, however, with the main line already recommended for Bombay, and thereby with the main line in Hindoostan, would be of value.

The Presidency of Madras is even more unembarrassed with foreign frontier than the Presidency of Bombay. It contains seven regiments of European troops, and a numerous native army. At present this large force is in a great measure isolated, so far as the other portions of the continent of India are concerned. If, however, Madras were brought into direct communication with Bombay by means of a line of railway, the military power of the British Government throughout India would be thereby still farther enhanced, and its means of prompt and concentrated action most materially increased.

I apprehend also that the formation of this line direct to the great port on the western coast would be of much value to Madras in its communications with Europe, and probably in its general commerce.

58. The junction of Madras and Bombay is contemplated in the scheme to which I have referred. Major Kennedy proposes to effect it by a line carried along the coast as far as Rajahmundry, and thence following the course of the Godavery through the territories of the Nizam, and through Candeish to Surat.

With reference to this line it is observed, "a feature of much general importance in our present consideration is the great central Omerkuntur table land It sheds its waters in every direction to the south-eastward by the Gunga, Godavery, Mahanuddy, &c., which flow to the Madras coast."

Para. 53, 54-

"Keeping these great geographical features in mind, and they cannot be overlooked in any general project without fatal error, they force upon us the knowledge of what the great arteries of commerce must necessarily be, and with those great arteries our trunk roads must correspond."

59. Upon these questions I have endeavoured to aid my judgment by conference with the consulting engineer of the Presidency of Madras. Upon the principle above enunciated in the memorandum, and upon the junction line between Madras and Bombay proposed in accordance with it, Major Pears has observed as follows:

"Now the rivers in the south are not, and never have been, the great arteries of commerce; all those rivers upon which Major Kennedy has marked lines. The Godavery, the Kistnah, the Pennaar, the Palaar, and the Cavery, exhibit in different degrees the same characteristic features. They rise on the table land (some at the crest of the Western Ghauts); they pass over it, by a course more or less circuitous, till they reach the eastern limit of that table, and they then plunge on to the Coromandel plain, either falling over abrupt Ghauts, or by a hurried and very tortuous course among an uninhabited or very thinly-peopled range of rugged hills, covered with forests. Some of these rivers are dry during

Para. 22, 23, 24-27.

a great portion of the year, and all are subject to very great variations in their volume of water."

" 23. It is manifest that such streams as these cannot affect the condition of the people, or the country, as do the Ganges, the Indus, and the Nile. In the Ganges we see a large volume of water all the year round, serving as a great highway for the people. A broad and fertile valley, subject annually to the fertilising influence of this noble stream; and the people clustering in large numbers on its banks, exhibiting, in every possible way, their appreciation of the benefits they receive from it. Here, then, we have a great artery of commerce, and we must recollect it has become so, not merely because the country drains down the valley, but because that valley, and the stream which flows down it, are favourable to the ordinary commercial, manufacturing, and agricultural pursuit of mankind. The traffic to which the Railway Company look for their dividend is greatly due to the river in its operations as a highway. We may take encouragement from this in other parts of the country where the traffic is now less, and trust that, denied as they have hitherto been, the great advantages of cheap transport, the railways may do for them what the Ganges has done for Bengal."

" 24. The Mahanuddy, the Godavery, the Kistnah, are rivers, as I have above shown, of a different character. Instead of being the great arteries of commerce, no populous or busy towns are found on their banks during their whole length. Instead of passing through a dense and industrious population, their course for several hundred miles lies through a region of mountain and forest, where the sound of man's voice is never heard."

" 27. One more observation may be made upon this point, viz., that these streams do not necessarily give as good gradients, unless by a sacrifice in length and straightness. If we take any plain, such as that of Coromandel, inclined generally to the sea, at such an angle that a direct line drawn across it perpendicular to the coast would fall 10 feet in a mile, the general course of a river will have precisely the same fall, and it is only by following the numerous sharp sinuosities of the river, and so proportionately increasing our distance, that we could reduce the fall to that of the river's bed."

Major Pears, para. 37-
60. Having regard to the information thus afforded regarding the physical character and present condition of the country through which this line would pass; considering that it would extend to not less than 1,200 or 1,300 miles; and that in a great portion of its course it must traverse the territories of his Highness the Nizam, who, not improbably, might object to it altogether, or, if he did not, would certainly be a great impediment to the undertaking, I am of opinion that, as at present advised, the Honourable Court should not entertain any project for a railway between Madras and Bombay by the line of the River Godavery. I have the less hesitation in offering this opinion, because there seems every reason to believe that a junction line may be found free from the objections to which the Godavery line appears subject, of much less extent, and well calculated to promote the political and commercial purposes which, in deciding upon general lines, are to be steadily kept in view.

61. The several reports of Major Pears to the Government of Madras give a full, clear, and well-weighed statement of the subject, as connected with that Presidency, whose peculiar physical character introduces important elements into the consideration of the question of railways in India.

Having studied it with the advantage of personal communication with that officer, and to the best of my ability, I venture to express an opinion that the main lines immediately required in Madras may be indicated in general terms with safety.

62. It appears to be established with certainty, that there are two great lines of commerce towards the city and port of Madras. The one approaches from the northward, bringing down the rich produce of the ceded districts, and of the country by Cuddapah, and beyond it. The other comes in from the westward and southward, by way of Arcot, Vellore, Vaniembady, Salem, and so on towards Coimbatore, &c.

The Government of Madras have already selected the first portion of the second of these as their experimental line. On a reference directed by the Honourable

Honourable Court, the Government of India has seen cause to concur with the Government of Madras in their selection of this portion, and it is already in progress.

I have the honour to advise that this line should be one of those selected for construction in the Presidency of Madras, and that it should be prolonged by Salem to Coimbatore, and through the gap in the Ghats at Paulgautcherry, to the opposite coast. A branch should be thrown off to Bangalore, which Major Pears entertained a hope of being able to effect satisfactorily, by way of a Ghaut beyond Vaniembudy. A branch might be carried with advantage to the foot of the Neilgherries, near to Ootacamund, and ultimately, perhaps, Cannanore might be included by means of a short extension.

The reports of Major Pears afford the means of forming a judgment upon this, as a commercial line, so fully, that I should waste time in repeating his facts in this paper. In a political point of view its advantages are obvious. A large military force is habitually stationed at Bangalore, to which it is proposed to run a branch. Another European regiment is stationed at Cannanore, and one is likely to be placed at the sanitarium in the hills. The proposed line of rail would touch all of these points, and would enable the Government of Madras to collect its main force rapidly at the capital, either for its own purposes, or for the assistance of the Supreme Government, by embarking and despatching troops to Calcutta, or to the Eastern Provinces across the Bay, as occasion might require.

63. Since his return to Madras, Major Pears, at my suggestion, has made a rapid survey of the line by Cuddapah, towards Bellary, upon which, it has already been stated, that the main stream of traffic flows to Madras from the northward, and on which cotton, especially, is largely grown. It is satisfactory to learn, that he has found much less engineering difficulty upon this line than his general local knowledge had previously led him to anticipate, and that he now sees reason to believe that a good line may be found by Cuddapah onwards.

Further examination is being made. If it should confirm Major Pears' present view, I advise that this line also should be undertaken.

Its commercial properties have already been pointed out, and it will bring the military station of Bellary into direct communication with the capital, still further strengthening the political considerations that have been urged in para. 62 on behalf of railways in Madras.

64. It still remains to determine whether a junction line with Bombay can be found, that by the Godavery having been rejected.

It has been suggested that the line by Vellore and Coimbatore to Calicut might be carried thence along the coast of Malabar, and Canara to Bombay, and would be eligible as a main line, by reason of its escaping the necessity of rising up the Eastern Ghats, and again descending upon the west, by passing through the gap at Palghautcherry.

I have been able to obtain no accurate knowledge of the character of this line along the western coast. But it will be circuitous; foreign territory must apparently be crossed or avoided at Goa; and the general nature of the country upon that side of India, and a consideration of its features as they appear even upon an ordinary map, induce me to think that this course ought not to be selected for a junction line with Bombay.

If Major Pears' examination of the Cuddapah country should lead to the discovery of an admissible line as far as Bellary, it will be seen that he contemplates its prolongation from thence up the valley of the Beema to Poonah, where it would join any line which may have been brought to this very important station up the Western Ghats from Bombay. No survey has been made as yet of this line; and it is so far objectionable that it crosses a portion of the Nizam's territory: it does not do so, however, to any great extent, and so far as it is possible to form an opinion, with the very general knowledge of the country which alone has been obtained at present, it appears to be admissible.

I advise that means should immediately be taken in connexion with, and in continuation of the survey of the line from Madras by Cuddapah to Bellary, for the purpose of surveying the country beyond towards Poonah and Bombay. If present anticipations should be at all fulfilled, I conceive that this line would form the best trunk line that can be found for uniting Madras with Bombay, and

with the general system of railway communication throughout the British territories in India.

65. It is very true, that this or any other direct line of junction across the Peninsula, must scale the Ghauts, in order to cross the table land which lies between, and consequently must be inadmissible if the primary principle for trunk lines in India, which has been laid down in Major Kennedy's memorandum, and has been referred for the opinion of this Government, shall be adopted and insisted upon. This general principle shall be presently considered.

In the meantime it must be observed, that it is very doubtful whether any junction line between Madras and Bombay could be found which does not wholly violate, not merely the principle laid down for trunk lines, but also that laid down for second class or branch lines in the memorandum above mentioned.

If such a line can be found and formed, it certainly will only be done at the expense of greatly increased distances, and in all probability of very heavy additional cost.

66. In the preceding paragraphs a general system of railways for India, together with the particular lines immediately required in the several Presidencies, has been discussed.

The agency by which the several lines should be constructed is now to be considered.

I have bestowed upon this portion of the subject my best and closest attention, and have given to it most earnest and anxious thought, for it is a question of the very deepest importance to the Honourable Company, and one upon which differing views are entertained by many, whose knowledge and judgment are entitled to great respect.

67. It is contended by some, that railways in India should be constructed on behalf of the Government by its own officers, who, it is alleged, would execute the works with greater economy, efficiency, and speed, than can be done by the agents of a Railway Company formed in and directed from England.

Others argue that the plan which has already been adopted, of entrusting the execution of railways to incorporated bodies, under the control of the Court, and of the local Governments, should be adhered to in future railway undertakings.

68. With deference to those from whose views I dissent, I have to express a decided opinion that the construction of the works by a Railway Company, under the supervision and control of the Government, is the best system which is open for the adoption of the Honourable Court.

69. Railway works in India will probably consist for the most part of embankments and bridges of various descriptions. These are works with which the engineers in the several armies of the Honourable Company are thoroughly conversant. There can be no doubt, therefore, that railways could be executed by the local Governments with as full efficiency as by the engineers of private companies. Again, the engineers of the Government have had long practice in the construction of such works as form the component parts of a railway, though not in the formation of continuous railway lines. They are familiar with the people and their ways, acquainted with their language, inured to the climate, versed in the machinery of agency, and on their guard against its abuses. Great works exist to testify to their professional ability, and I am not aware of any well-founded allegations of reckless or unthrifty expenditure in the execution of them.

Officers so highly qualified undoubtedly are likely to carry on the works of an extensive undertaking upon the plains of India with greater economy and greater speed than can be possible now, or for some time to come, in the case of men freshly arrived from England, ignorant of everything connected with this country, and sometimes not altogether inclined to learn. And although I have some hesitation in believing that the Government of India is any exception to the general rule which holds good elsewhere, that a Government always works at greater expense than anybody else, and although I am not prepared to say that, during the five years I have passed in India, the execution of the Grand Trunk Road, or even of the Ganges Canal (noble work though it be), has in any respect been characterized by speed, as compared with the execution of corresponding works in other countries; still I do not wish to dispute that
railway.

railway works may be executed here with greater economy and speed by the Government than by railway companies.

70. But admitting unreservedly that engineer officers would make a railway, as well, and admitting, for the sake of argument, that they would make it as cheaply and as quickly as private companies, I am still of opinion that the Government ought not to undertake the making of railways.

71. The Government in these Presidencies is at present deficient in the agency they would require for the purpose. The number of engineer officers is so wholly inadequate for the duties they have to perform, that other officers have been numerous employed in the Department of Works. The Honourable Court has declared its readiness to augment the corps of Engineers; but that measure would not for many years to come diminish the difficulty to which I have referred. Even if the duty of the Government engineer on a railway were solely that of superintendence, a few would not suffice for the work. Many must be withdrawn from the duties on which they are now employed, and it is my opinion that this could not be done without detriment to the general interests of the State. I think it far better that railway works should be entrusted to parties ready to execute them by professional engineers of undoubted competency, under the control of the Government, than that public works in other parts of the country should be starved through the withdrawal of the engineers, for whom no adequate substitute can be furnished, merely in order that the railway works may be executed at something less cost, and in something less time, than European agency would spend upon them.

72. This consideration, however, does not form the strongest objection in my mind to the execution of railway works by the Government of India.

I hold that the creation of great public works, which, although they serve important purposes of State, are mainly intended to be used in those multifarious operations which the enterprise, the trade, and the interests of the community, for ever keep in motion, is no part of the proper business of a Government.

It is very proper that the Government of India should undertake the formation of the Ganges Canal, of irrigation channels, and of tanks in various parts of India. These are works which affect the general well-being of the community, or that of particular districts, and which, producing no immediate return, must be executed by the Government, if they are to be formed at all.

It is very right that the Government of India should have constructed the Great Trunk Road, and would be very right that it should greatly extend the principle on which it has charged itself with that work, because there is nobody else to do such things, and because the Government of India stands in various relations to local interests in India, beyond what it fills as the Executive Government, and beyond what is filled by the Executive Government in our own land.

But the conduct of an enterprise which is undertaken mainly for commercial purposes, and which private parties are willing to engage for, does not fall within the proper functions of any Government.

73. Least of all should it be taken as any part of the business of the Government of India. One of the greatest drawbacks to the advance of this country in material prosperity, has been the total dependence upon the Government in which the community has placed itself, and its apparent utter helplessness to do anything for itself.

Until very recently, the only regular carrier in the country has been the Government; and no man could make a journey but with Government establishments, and by the agency of a Government officer.

It was but the other day that the agent for Lloyd's in the port of Moulmein, where there is a considerable community of European merchants, formally complained that the Government of India did not keep a steam tug to tow their ships to sea for them.

Even in these instances in which something like enterprise has been attempted by means of joint stock companies, the effect has been feeble, and the results insignificant.

For years the Steam Company on the Ganges have complained of the competition of Government steamers; during the last year fully one-half of the Government steamers has been withdrawn; nevertheless, one of the two Steam Companies

Companies has ceased to run; it is so in every thing else; no one seems to have activity enough in connexion with a company even to look after his own interests, and of the few enterprising movements that have been made, fewer still can be quoted as having obtained even a moderate success.

Those cases in which the scheme has been connected with English management, and has been founded on English capital, have made their way, and are prospering. The Peninsular and Oriental Steam Company is an instance of this kind; and its great past prosperity, and the spirit and success with which it is pushing its undertakings with India, and all over the east, are a conspicuous proof of the efficacy of private enterprise, directed by the vigorous control of parties holding an interest in England.

74. When the spirit of enterprise still shows so feebly in India, when the employment of the English capital on a great scale within the interior of this country is so rare, and when there is such good reason to anticipate the best effects from its profitable investment in any one branch of Indian undertakings, by the encouragement that would thereby be given to its introduction through many other and various channels, I submit that it would be impolitic for the Honourable Court to put aside the several associations that are now presenting themselves to compete for the advantage of supplying India with that which she so much needs; in order that it may itself undertake these vast works, on no stronger ground than the assumption (which, after all, is only an assumption), that some little time and money would be saved, I submit, on the contrary, that all the money and time which the Honourable Court may contemplate, being able to save thereby, would be well expended in securing the introduction at this time, of a large amount of English capital and English energy, so as to encourage, by the successful issue which I anticipate for these railway undertakings, a more extensive employment of similar capital, and similar efforts hereafter in connexion with the products and the trade of India.

75. Having explained the grounds on which I formed my opinion, that the construction of railways in India should be entrusted to private companies incorporated for that purpose, a few remarks are necessary respecting the union of private enterprise with Government control, which I have ventured to recommend as the best system which it is open to the Court to adopt.

76. The enlistment of private enterprise for the formation of these great works, directly, but not vexatiously controlled by the Government of the country, acting for the interests of the public, was a principle for which I contended several years ago, when closely connected with that branch of public works. I may venture, without arrogance to say, that if that principle had been then more fully recognised, the proprietors of railway property in England, and the suffering public, would have been in a better condition now than they appear to be.

The principle is a sound one, and I therefore propose to uphold it in the formation of the several lines of railway in India, in the same form in which it has been introduced, and acted upon in the operations of the East Indian Railway Company, in the Presidency of Bengal.

77. It has been objected to the system actually in existence, that by guaranteeing the payment of a fixed interest upon the capital expended, all inducement to economy and exertion upon the part of the Railway Company is destroyed, and that by admitting the direct interference of Government, the Railway Company is obstructed and delayed.

These objections do not appear to be well founded.

It is to be presumed that interest will not be guaranteed by the Honourable Court upon any sum to be expended until it has satisfied itself that this sum which it is proposed to raise for the construction of any fixed extent of railway is not more than is sufficient for the work well and economically carried on, or without some secure provision for the completion of the line within a period to be named. If these conditions be observed, I apprehend it cannot be correctly said that all inducement to economy and exertion is lost. These will be requisite to enable the Railway Company to construct the line within the sum and the time allotted for it. Nor will inducements to the utmost economy and exertion ever be wanting, unless it be supposed that the company would be wholly indifferent

ferent to any prospect of gaining a higher return upon their capital than the rate of interest guaranteed, which an economical construction and working of the line might probably enable them to realise.

78. On the other hand, it does not necessarily follow that because the Government has become a party to the undertaking, by guaranteeing a certain interest upon the capital expended, and has thus gained a right to closer interference with the operation of the Railway Company than usually or properly is allowed to a government, that it will therefore interfere vexatiously or obstructively. It is not difficult to conceive that the Government, by its officers, may exercise a close and vigilant check upon the proceedings of the company, without giving any just cause of complaint.

Experience of the working of this system in the Presidency of Bengal justifies the opinion I have expressed. The consulting engineer is placed in direct communication with the Railway Company, and has authority to settle all matters of detail, or professional questions, unless they should be of great magnitude, without previous reference to the Government. Every precaution is taken to obviate delay in those cases in which the action of the Governor-general in Council is needed. I have every reason to believe that these measures have been successful, and that while the consulting engineer directly and indirectly exercises upon behalf of the Government a very wholesome control indeed over the proceedings of the Railway Company, neither obstruction, nor vexation, nor delay, can be justly attributed to the existence of a power of control in the hands of the Government.

79. Having advised the Honourable Court to entrust to private companies, under the control of Government, the construction of the lines of railway at present required for India, I have to submit the opinion that has been called for on the general principles of action regarding railways proposed in the memorandum before me for the adoption of the Government of India. They are as follows:

“ 1st. That all railways constructed in India shall belong to one of two classes. The first or the second class.

“ 2d. That the regulating gradient of the first class or trunk railway shall not exceed 1 in 2,000. By regulating gradient, is meant the gradient which regulates the load of the engine.

“ 3d. That no regulating gradient of any second class or branch railway shall exceed 1 in 330.

“ 4th. That short alternate impulsive planes may be introduced to assist the ascent, not to exceed a length of half a furlong each, and not to be nearer to each other than one and a half furlongs.

“ 5th. That no line shall be undertaken when the estimated cost shall exceed the average rate of 5,000 *l.* per mile of single road; but that this rate of cost is not to include the bridging of large rivers, as the Soane, Jumna, &c., exceeding half a mile wide at flood level. Such rivers are to be considered as breaks or temporary termini, where goods and passengers are to be carried across in rafts.

“ 6th. That no line shall be sanctioned, except for a single track of rails, with masonry. Cuttings and embankments to correspond. The ground, however, required for a double track to be in all cases secured.

“ 7th. That no locomotive engine shall be introduced to India for 10 years, except such as the ratio between the length of stroke of piston and the diameter of the driver-wheels shall sanction with reference to the maximum load, notwithstanding any sacrifice of velocity on the journey. (Rule, No. 11 contains an exception from this restriction.)

“ 8th. That when piling for foundations be requisite, the foundations are to be laid in to suit a double track, although the superstruction is only carried up for a single track.

“ 9th. That no portion of any line shall be permitted to open for the transport of goods or passengers until the capital account for the construction of such portion shall have been closed.

“ 10th. That no more than one train daily shall run in each direction upon any line, until the traffic shall furnish more goods and passengers than one engine can convey. After which, a second may start daily each way; and that when the traffic calls for three trains fully loaded daily, then arrangements shall be made for laying down a second track of rails.

“ 11th. That, notwithstanding the tenor of Rule No. 6, if in any line it shall appear that the profits exceed a dividend of 6 per cent. per annum, it shall then be permitted, if thought advisable by the directors of the company interested, to introduce engines of higher powers of velocity, with a view of running passenger trains separate from goods trains.”

80. In the first, second, and third Rules, it is proposed that all railways in India shall belong to one of two classes. That the gradient of trunk railways shall not exceed 1 in 2,000, and that the gradient of branch lines, or second-class lines, shall not exceed 1 in 330.

Upon a professional question of this nature I naturally feel some diffidence in giving an opinion contrary to that of an engineer officer of ability and practical experience. Nevertheless, having carefully examined this point, and informed myself through others very capable of informing me upon facts, I have come to the conclusion that I cannot advise the Honourable Court to adopt these three rules in the broad terms in which they stand.

81. In the general principle they are intended to assert I entirely concur. That the engineer by whom a railway may be constructed in India should give his first attention to obtaining such favourable gradients as will leave the greatest possible amount of tractive power in the engine available for moving its load of traffic along the line, and thus secure the utmost profit on its working, no one will deny, and it may as readily be admitted that the engineer in many parts of India will be able to obtain such favourable gradient much more cheaply and easily than could be done in England.

That it is expedient in India to submit lines of easy gradients, though somewhat less direct, in preference to direct lines, where the gradients are adverse, may be fully conceded. Major Kennedy correctly states that I have already publicly recognised this principle in regard to Indian railways, by condemning the hill line to Mirzapore, and adopting the alternative line which he suggested to the Government. In so doing I gave effect to opinions formed and expressed by me in 1848, within a few months after my arrival, and while the railway was still at a stand-still. I think the decision was a sound and good one, upon the ground on which it is put, though it was recommended by other considerations also; and I am quite of opinion that a similar attention to gradients ought to enter largely into the direction of the lines that are hereafter to be constructed.

82. But I am not prepared to assent to the rules while they require an inflexible adherence to this principle carried to an extreme degree. A line constructed at 1 in 2,000 will of course be more cheaply worked than a line with unfavourable gradients, and if the former can be obtained without great increase of extent of line, or vast expenditure of money, every effort should be made to obtain it. But I humbly conceive that it would not be difficult to show that there are but very few cases in India in which such a gradient as 1 in 2,000 could be obtained without such an excessive increase of length of line, or such heavy outlay of capital, as would make it more profitable to work the line with comparatively adverse gradient, however undesirable that course may be in theory.

83. I have further to observe, that the gradients here laid down as indispensable for trunk lines, is practically unattainable as a general gradient for India. The Honourable Court will perceive the opinions of the consulting engineers of Bengal and Madras, to whom I referred this point. Major Pears distinctly states, “the word trunk is, in common language, generally applied to those roads or lines of railway which lie in the direction of greatest traffic and importance. No trunk line so understood could be constructed within the Madras Presidency with such a ruling gradient as this, unless by increasing the line to an extravagant extent. In many cases even this would fail to obtain it.” I believe that the same statement would be correct if applied to the Presidency of Bombay.

Bombay. It will be seen also that in this Presidency, and even in the valley of the Gauges, the surveys that have now been made hold out no prospect of a gradient of one in two thousand being attainable in practice. The consulting engineer names a gradient less favourable by half, namely, one in one thousand, as being the best that is practically available upon that line. If a better gradient should be sought, it can be got only by following closely the course of the stream through all its sinuosities, a measure which could not be adopted without exposing the line to the objection that it would be immediately increased in extent, and would be brought, moreover, within the influence of the river to a degree which would be dangerous to its existence. In the face of these facts and opinions I cannot recommend to the Honourable Court to adopt entirely the rules, that no trunk-line should have a worse ruling gradient than one in two thousand, and no branch line worse than one in three hundred and thirty. The principle of easy gradients is, I think, sound, and ought to be enforced in Indian railways. Its observance should be circulated by the Honourable Court, whose officers should be enjoined to pay vigilant attention to it in connexion with the plans of railway companies. But I think it will be better that the Honourable Court should restrict itself to laying down the principle that in every railway the closest attention should be paid to obtain the gradient which will admit of the most profitable working (in fact, that the best should be made of each case), than that it should attempt vainly to insist upon the particular gradients that have been suggested for its adoption.

84. The Rules, numbered 4, 7, and 11, which relate to the introduction of alternate impulsive planes, and to the size of the engines to be employed, are purely engineering questions on which I cannot undertake to give an opinion, and on which the Honourable Court has the means of obtaining authoritative judgment in England.

85. Rule No. 5, which lays down that no line shall be undertaken in India, of which the estimated cost shall exceed the average rate of 5,000 *l.* per mile of single road, will be governed, I think, by the same considerations as those which were applied to the rules regarding gradients.

The importance of a cheap construction of the works to the success of an undertaking is obvious. There is every reason to believe that in India the cost of railway per mile will probably, on the average, be less than the cheapest of the lines constructed in England, and it is very expedient to lay down such principles as are involved in Rule 5, and explicitly stated in Rules 6 and 8, in order to ensure that railway engineers shall consult the utmost economy in their works consistent with security and efficiency, and shall swell the cost neither by useless ornament nor by superfluous solidity.

I entirely concur, therefore, in the recommendation that all lines shall be formed for a single track of rails, with masonry, cuttings and embankments to correspond, excepting only in the case of piling or difficult foundations, which shall be formed at once to suit a double track, land in all cases being taken for a double line.

In like manner all buildings, stations, and appliances of every kind should be built only for use, and all heavy expenditure upon architectural decoration should be rigidly proscribed.

86. But I am not prepared to advise that 5,000 *l.* should be fixed as the highest average rate of cost per mile that shall be admissible. The Honourable Court and this Government, and the railway engineers themselves, have not yet acquired sufficient experience in the formation of railways in India to enable them to specify with exactness what ought to be the average cost of construction.

In Madras the consulting engineer estimates the short line in preparation there at less than 5,000 *l.* per mile, but experience has not yet tested the accuracy of his estimate in any respect.

In Bengal some experience has been obtained.

The first section, of 120 miles, it may now be calculated will not exceed 7,500 *l.* per mile, and this section includes the main terminus and works at Calcutta.

The next section, of 120 miles, from Rundooah to Rajmahl, is estimated to cost about 8,500 *l.* per mile.

The section of 440 miles, from Rajmahl, at Allahabad, which has just been surveyed, is estimated at about 8,700*l.* per mile.

Although the plain of Bengal is flat, and so far favourable to railway works, it is crossed by numerous rivers, and liable annually to heavy inundations, which tend greatly to increase the cost of construction, and the estimates I have quoted above include the expense of bridging all the rivers (except the Soane and the Jumna), many of which are of great size during the rainy season. Still, after making allowance for these considerations, and having regard to the statement of Mr Stephenson, that his estimates are avowedly made high in order to be on the safe side, it does not appear probable, according to our present experience, that we can rely with certainty on constructing an ordinary mile of road for 5,000*l.*

Para. 11.

Upon this point, Major Baker has stated it as his opinion, that this sum cannot, as yet, be safely fixed as the average rate. He says, "I believe that a single line, not involving expensive river crossings, or other special heavy works, ought to be constructed for 5,000*l.* per mile, but justifiable exceptions will occasionally arise, and should not be entirely precluded."

Under these circumstances I would advise, that while the principle of economical construction should be jealously insisted upon, and an approximation to the sum of 5,000*l.* per mile of ordinary way should be aimed at, no specific sum should be fixed by the Honourable Court as the highest average rate of cost per mile for railways throughout India.

87. The 9th rule, which declares that no portion of any line shall be permitted to open until the capital account for the construction of such portion has been closed, may advantageously be adopted on principle, but modified in its stringency, so as to bring it into accordance with the practice sanctioned by the Honourable Court in 1849.

88. The Rule No. 10, which limits the running of trains to one and two on each day, under certain specified circumstances, appears to me to be a matter of detail which had better not be introduced as universally applicable to every future line.

89. It only now remains that I should submit to the Honourable Court, in obedience to its instructions, my opinion whether railway works in India should be carried on simultaneously, and by what companies they should be undertaken.

I have no hesitation in recommending, in the strongest terms, that the several trunk lines throughout India which have now been suggested, and especially the great line from Calcutta to the north-west frontier, should be completed as speedily as may be practicable; and to that end that the several portions of the works should be commenced and carried on simultaneously.

90. In reply to the question whether it will be advisable that the Honourable Court should enter into several distinct contracts with different companies of British capitalists, I would submit that it is not advisable that too large an extent of railway should be placed in the hands of any one company, while at the same time economy and public convenience are undoubtedly promoted by as close an approach to uniformity of management as may be consistent with the exercise of a vigilant and effective control over the entire line.

91. The Honourable Court has already sanctioned the establishment of the East Indian Railway Company, in the Presidency of Bengal. It is constructing 120 miles of line, has obtained a concession of the extension of 120 miles further to Rajmahl, and now applies by its managing director, Mr. Stephenson, for permission to execute the line which it has surveyed onwards to Allahabad, and ultimately to construct a line to Delhi; with, if it is wished, an extension to Lahore and a junction with Bombay, by way of the Soane Valley. It undertakes to execute completely these lines within seven years, or before the close of the year 1860.

A memorial has been addressed to the Governor-general in Council, by Mr. H. Borradaile, on the part of a company styled the Upper India Company; and subsequently letters have been received from the chairman of the company, and from its solicitors, in which they state that the company has proposed to the Honourable Court to construct a line from Allahabad to Agra and Delhi.

92. The East Indian Railway Company has had a difficult task to perform. It entered on an entirely novel undertaking, and, as might have been expected, has had much to contend with. It is therefore entitled to some consideration in the judgment that may be formed on its first operations.

Although I am inclined to believe that more rapid progress might have been made in the execution of the works that have been in hand during the last two years, I am not disposed to condemn the proceedings of the company.

Mr. Stephenson, in his recent report, has stated that "the first section will be completed by the latter part of next year (1854), portions of it being opened, and locomotives, with carrying stock, provided and placed upon the line within the next few months."

This section of 120, equal in extent to the Great Western, and exceeding the London and Birmingham, will be opened, if Mr. Stephenson's anticipations be fulfilled, in about four years from its commencement. People in this country, accustomed to deal with great distances, are disposed to think lightly of four years being required for what seems to them so small a length of line. For my own part, adverting to the fact that this has been a first attempt, and that the works upon the line are considerable, though the country over which it is carried is level, I am not prepared to say that further confidence should be withheld from this company.

It has already received the sanction of the Honourable Court to extend its line to Rajmahl. It declares itself ready and anxious to continue the line to Allahabad. No other company has appeared to compete with it for this portion of the trunk line. If there had been any, I should still have recommended, as I have now the honour to do, that the East Indian Railway Company should be permitted to undertake the construction of the line from Calcutta to Allahabad, carrying it on in different portions simultaneously and with all practicable speed.

93 It would not be expedient to admit a second management within so manageable a length of line as that between Calcutta and Allahabad.

Moreover, it is for the interest of the Honourable Court to concede the whole of this distance to the same company. The Honourable Court has guaranteed to the East Indian Railway Company 5 per cent on the first section to the Collieries, and 4½ per cent. on the second section to Rajmahl. It will greatly diminish the risk and liability of the Honourable Court, if its concession to the East Indian Railway Company include the upper and profitable portion of the line as well as the lower, which appears likely to be less profitable.

For this purpose, and in order to avoid the inconvenience which certainly will result from different rates of interest being guaranteed upon the capital employed in the construction of different portions of the same line, I would suggest that the agreement to be formed with the East Indian Railway Company shall guarantee one rate of interest upon the whole capital employed.

94. The Honourable Court has quoted an opinion I expressed two years ago, that future bargains with railway companies in India might be made on easier terms than they had hitherto been. Everything that has since occurred goes to confirm the opinion which I took the liberty of expressing, and still hold. The East Indian Railway Company has itself undertaken the extension to Rajmahl at the lower guarantee of 4½ per cent. The Baroda and Central India Company, in their memorial, ask only for 3½ per cent.; and the Upper India Company offer to make their proposed line on terms more moderate than those hitherto granted.

These offers actually made, taken in connexion with the present abundance of money, justify me in expressing a confident expectation, that the East India Railway Company will be glad to undertake the line to Allahabad on more favourable terms than those they have previously accepted, and as favourable as any that will be offered by any other company.

It would be expedient that, if possible, the company should be bound to complete the line to Allahabad within a period of time to be named, under the penalty of a reduction of the guaranteed interest by a certain proportion for every half year by which the railway company delays the completion of its work beyond the period named.

95. In recommending these conditions, I beg leave to advise that the terms to be granted should be liberal both in respect of money and time.

96. It is more difficult to advise the Honourable Court upon the course which it will be best for the public interest to pursue above Allahabad.

I am not at all disposed to undervalue the benefit of competition, and I would therefore by no means exclude the Upper India Company from making specific proposals for the line, which the papers before me do not show them to have done.

If that company should be allowed to form their line, Allahabad will probably not prove an inconvenient break, while Delhi would be an equally eligible point for all companies. And I assume, as a matter of course, that the Upper India Company would be subjected to the same control in the hands of the Government as the existing company.

On the other hand, I do not conceive that the substantive line from Calcutta to Delhi would be more than a single management could safely and effectively control; and that being so, there would undoubtedly be great convenience and advantage, both to the Honourable Court and to the public, as well as considerable economy, in one uniform management extending over the whole of this great trunk line.

The East Indian Railway Company has already acquired some experience; its managing director, Mr. Stephenson, has knowledge and practice in Indian railway affairs; and these circumstances would entitle us to expect from them a speedier execution of the work than from parties entirely new to the country and the people.

97. The Honourable Court too may possibly feel that those who have been the pioneers of railway enterprise in India are entitled to be received with some favour when competing for the privilege to extend the works they have commenced over other districts directly connected with that on which they first began, under the directions of the Honourable Court.

These considerations would not induce me to recommend that the East Indian Railway Company should be permitted to make the entire line from Calcutta to Delhi on a monopoly footing, or without giving other parties already in the field a right of bidding for the preference.

But if the East Indian Railway Company should offer to construct the line onwards from Allahabad to Delhi on terms as favourable, or even nearly as favourable as its competitor, the Upper India Company. I conceive that the public interests would be served by the line being allotted to the East Indian Railway Company, and I would advise the Honourable Court to grant it accordingly.

98. The capital which it would be necessary for the company to raise in order to the execution of these works would be very large. The great companies existing in England, however, have raised capital as large; and I am not aware of any reason why one formed for similar purposes in India should not be invested with the same power, or be able to use it successfully.

In these remarks, I assume of course the sufficiency and stability of the railway company, matter of which we can have no knowledge here, but of which the Honourable Court of Directors has the ready means of satisfying itself.

99. Before concluding this Minute, it may be convenient to recapitulate the recommendations regarding railways in India, which I beg to offer to the Honourable Court:—

1st. That a general system of railways connecting the several Presidencies, and constituting the great trunk lines within them, should be sanctioned and executed without further delay.

2d. That the trunk line in the Presidency of Bengal should be carried up the Valley of the Ganges to Allahabad, and thence up the Doab to Agra and Delhi, with a view to its being extended through the Punjaub westward as soon as its construction may be found practicable, and that the line to Diamond Harbour should be rejected.

3d. That a junction line should be formed between the above-mentioned trunk line and the Presidency of Bombay, either by the Valley of the Nerbudda or by way of Baroda and Neemuch, but preferably by the latter in the first instance, if further examination should recommend it.

4th. That

4th. That in Bombay the Malsej Ghaut lines should be abandoned.
That the Thull Ghaut line should not be sanctioned as a great trunk line of communication between Bombay and other parts of India.

That a line to Candeish and a line to Poonah should both be undertaken.

That if one only can be chosen the line to Candeish should be preferred.

That it should not be resolved to carry such line to Candeish up the Ghauts, unless a survey of a line by the Taptee River should show the Ghaut line to be less objectionable than the river line.

That if the Ghaut line should prove the better, it should not be sanctioned, as now proposed, by the Thull Ghaut, unless further survey shall establish that no better access to the table land can be found on the Syhadree range, and that the present objectionable features in the Thull Ghaut line cannot be avoided.

Lastly. That the same rule should be applied to the line by the Bhore Ghaut.

5th. That a line should be formed in the Presidency of Madras by Menil (to which point it has already been sanctioned), by Vellor, Vaniembuddy, Combatoie, and thence to the Western Coast, with a branch to Bangalore, and a branch also to the foot of the hills towards Ootacamund.

That another line should be constructed in the Presidency of Madras, from that city, by Cuddapah to Bellary, and that surveys, &c., should be made with a view to its extension across the table land to Poonah, in the Presidency of Bombay, in order thereby to form a junction with the Western Coast.

6th. That the construction of these lines should be committed to incorporated railway companies, under the control of the Government, in the manner in which it has been agreed upon with the East Indian Railway Company, and on such terms as may be fixed.

7th. That if it be necessary to guarantee a certain interest on the capital of the company, means should be taken to ascertain approximately the probable amount required for the construction of the line, and that the amount of requisite capital on which interest is to be guaranteed should be strictly defined, and that the completion of the line should be required within a certain fixed period, under the penalty of a diminution of a certain proportion of the guaranteed interest for every half-year in which the line shall remain incomplete after the expiry of the period fixed.

8th. That all lines for the present shall be formed with a single track, with bridges, embankments, &c., for the same, land being in all cases taken, and the foundations of extensive works laid to suit a double track.

9th. That the officers of the Honourable Company should be required to exact the utmost economy consistent with perfect security and efficiency in the original construction of the line, and in all buildings and works of every description connected with it.

10th. That no portion of a line should be opened for traffic until the capital account for that portion of the line shall have been closed, in such manner as shall be to the satisfaction of the Government of India.

11th. That the line, when opened for the conveyance of passengers and goods, shall, in like manner, be managed with the closest attention to economy in the working expenses, rather than with a regard to the high rate of speed and frequency of despatch which are the practice on the English lines.

12th. That the construction of lines to be managed upon the foregoing principles should be conceded to the East Indian Railway Company, from Calcutta to Allahabad, one uniform rate of interest being guaranteed upon the capital required for the whole line, if a guarantee be indispensable.

13th. That the construction of the line from Allahabad to Delhi should be granted to the East Indian Railway Company, or to the Upper India Company, but preferably to the former, if it will undertake the works on terms as favourable, or nearly as favourable, as those offered by the latter company.

100. I have the honour respectfully to submit these several recommendations to the Honourable Court of Directors, and to express my earnest hope that it will resolve at once to engage in the introduction of a system of railways into the Indian empire upon a scale commensurate with the magnitude of the interests

that are involved, and with the vast and various benefits, political, commercial, and social, which that great measure of public improvement would unquestionably produce.

(signed) *Dalhousie.*

MINUTE by the Honourable Sir *F. Currie*, Bart., dated the 2d May 1853.

THESE very voluminous papers came to me on Friday. I have studied with great attention the Governor-General's Minute, and I have given the best consideration which I am able, under the pressure of preparation for departure from India in a few days, to the immeasurably important subjects discussed therein, many of which have necessarily been for some time familiar to me, and have been, more or less, subjects of thought and deliberation. I entirely concur with the Most Noble the Governor-General in his opinions regarding the vast importance of Railways in India, in every point of view, and regarding the lines which should be first attempted in the several Presidencies, and the means by which these comprehensive operations should be carried on.

(signed) *F. Currie.*

MINUTE by the Honourable *J. Lewis*, dated 2d May 1853.

RAILWAYS.

I FULLY concur in the views of the Most Noble the Governor-General on this most important subject, and in the earnest hope expressed by his Lordship that a system for the introduction of Railways over the whole Indian Empire may be at once organised.

The more specific recommendations contained in his Lordship's Minute appear to me to be highly practical and judicious, and calculated to secure the great end in view economically and within a reasonable time.

In my opinion there is nothing which will give so immediate an impulse to the moral, social, and commercial improvement of this country as these Railways.

(signed) *J. Lewis.*

RAILWAYS (INDIA).

COPIES or **EXTRACTS** of **CORRESPONDENCE**
received by the last Mail from the Governor-
General in Council in *India*, relative to **RAILWAY**
UNDERTAKINGS in that Country.

(Sir Herbert Maddock.)

Ordered, by The House of Commons, to be Printed,
19 July 1853.

[*Price 1 s. 6 d.*]

RAILWAYS (INDIA).

RETURN to an Order of the Honourable The House of Commons,
dated 20 August 1853;—*for*,

COPY “ of MEMORANDUM by Major *Kennedy*, late Consulting Engineer
of the Government of *India*, on the Question of a general System of
RAILWAYS for *India*, referred to in the MINUTE by the Governor-General
in Council of the 20th day of April 1853, relative to Railway Undertakings
in that Country.”

East India House, }
31 January 1854. }

JAMES C. MELVILL.

(*Mr. French.*)

Ordered, by The House of Commons, to be Printed,
27 March 1854.

C O N T E N T S.

	Paragraphs.
Saving which Railways would produce in the Military Establishment of India, 2,332,482 <i>l.</i> per annum - - - - -	1 to 22.
Saving would produce a capital of 77,749,400 <i>l.</i> , which would construct 15,549 miles of Railway, at a cost of 5,000 <i>l.</i> per mile - - - - -	23 to 28.
Erroneous project now in progress in the Presidency of Bombay - - - - -	29 to 35.
General Rules proposed for construction, &c., of Railways, to prevent error - - - - -	36 to 38.
Indian Government occupies the position of General Land Proprietor as well as Government, and is therefore the only source from which the development of the country resources can emanate - - - - -	39 to 50.
Peculiarities in the physical structure of India affecting Railway projects - - - - -	51 to 54.
General project for construction of Railways in India - - - - -	55 to 58.

A P P E N D I X.

	Page.
No. I.—Maps of Projects, recommended by Major Kennedy - - - - -	14 to 16
No. II.—Proximate Sections, showing errors in progress in Bombay Presidency.	
No. III.—Suggestions by Major Kennedy, for opening Railway intercourse between Bombay and the Table-land, passing over the Syhadree Ghats, on a principle to admit of locomotive engines carrying loads due to a level road - - - - -	17
No. IV.—Table and Section of Impulsive Inclines, explanatory of new method proposed by Major Kennedy, to enable locomotive engines to convey loads due to a level up ascents - - - - -	19
No. V.—Sketch Plan and Sections to illustrate errors in project sent home by East India Railway Company's Engineer, in reference to that portion of the Bengal line between the Colliery Junction and Rajmahal; with some general suggestions on principles for laying out Railway Lines - - - - -	20

COPY of MEMORANDUM by Major *Kennedy*, late Consulting Engineer of the Government of *India*, on the Question of a general System of RAILWAYS for *India*, referred to in the MINUTE by the Governor-General in Council of the 20th day of April 1853, relative to Railway Undertakings in that Country."

MEMORANDUM ON INDIAN RAILWAYS.

Torrington-square, 14 September 1852.

1. It is not sufficient to be convinced, as I am, that the establishment of Railways in India is an essential preliminary to the attainment of the highest degree of efficiency of which our military and civil administrations are capable; to the prevention of local famine, and to the uniform dispersion of food, to any vigour and activity in manufacture or commerce; to the increased consumption of English goods; to the power of competing with America in furnishing to England raw cotton and other important articles; in short, to the growth of everything connected with the extension of British interests in India, as well as with the industry, the wealth, and the comfort of its vast population.

2. It is still requisite, in addition to this conviction, to be able to see how the risk of the Government guarantee which the money market requires for capital invested in Indian Railways shall be borne under the worst aspect that that risk can assume.

3. I believe that upon the Great North-western Line of Bengal, which I know better than any other, the risk would be absolutely nothing; but at the same time, when Government, or when an individual, gives a guarantee, it is a correct precaution to assume the possibility of being called upon to pay the whole amount of such guarantee, and to examine how that amount, if required, shall be forthcoming.

4. The question then is, Whether there be any direct and immediate equivalent which the Government of India can calculate upon, from the establishment of railways, which would enable them, if so called upon, to disburse the amount of the guarantee required, without any additional charge upon the revenues?

5. I feel certain that such an equivalent would be the result, at least as far as regards the one great line of railway from Calcutta to the North-west, by the enormously increased efficiency that it would produce upon the operations of the Bengal army, in facilitating the concentration of troops on any required point, and by the consequent numerical reduction of that army which it would justify. If I can show this, I am persuaded that nothing more will be required to induce the Government to adopt that immediate and vigorous activity in pressing forward the construction of railroads which they are so well aware that every interest of India demands.

6. On referring to the last Revenue Accounts furnished to Parliament by the East India Company, we find the military expenditure incurred for the last year of the return, 1848-49, to be as follows:

		<i>Co.'s Rs.</i>
Bengal	- - - - -	4,99,35,384
Madras	- - - - -	2,62,06,214
Bombay	- - - - -	1,71,57,759
TOTAL	- - - <i>Co.'s Rs.</i>	9,32,99,356

7. We may assume that of this expenditure a certain proportion, say one-fourth, would be of a nature that would not, under any circumstances, bear reduction, such as staff-pensions, officers' pay, &c. ; but that increased efficiency would enable a reduction with safety to be applied to a portion of the remaining three-fourths of that expenditure.

8. To judge as to the effect which the contemplated line of railway from Calcutta to the North-west would have upon the efficiency of the Bengal army, it must be kept in mind that a regiment marching from Calcutta to Peshawar (about 1,446 miles) would occupy a period of six months, or the whole temperate or active season of one entire year, on the way ; whilst by railway it could be carried the same distance in from 70 to 100 hours, and shorter distances in corresponding comparative periods respectively.

9. When the Sikhs crossed the Sutlej, on the 15th of December 1845, it was six days before the nearest troops could be congregated to meet them ; and that could only be effected by leaving the adjacent stations of Loodiana, Umballa, and Meerut comparatively unprotected, whilst the small force at Ferozepore was for several days exposed to the risk of an attack from the whole Sikh army.

10. The British Commander-in-chief, Lord Gough, aided by the whole power and military experience of Lord Hardinge as Governor-general, having marched from Umballa on the 11th of December, by the utmost exertions and forced marches, met the enemy on the 18th, the greatest amount of concentration that could be effected during those seven days, by denuding the nearest stations, being under 13,000 men, and with this comparative handful of troops he was obliged to fight at Moodkee a most hazardous battle with a well-equipped army of 30,000 men, having a reserve of 30,000.

Three days later, on the 21st of December, when the British force had been increased by only 5,000 men more, making in all about 17,000, they were forced to fight at Ferozishah for two consecutive days. Thus, after ten days of concentration, only 17,000 men could be brought together from the nearest stations, leaving those stations exposed, and this out of the large and magnificent force forming the Bengal army, or I should say rather out of the united armies of British India.

11. This gallant little band was obliged to take the risk of three battles, opposed to a well-organised and well-equipped army of 60,000 men, with the enormous disadvantage of an inadequate supply of ammunition ; a combination of circumstances which placed in extreme peril the British empire in India.

12. Had the proposed railway from Calcutta to the North-west been in existence, 24 hours would have enabled the Commander-in-chief to concentrate on the point attacked 60,000 men, amply furnished with artillery and stores of every kind, drafted proportionately from all the main stations, and without leaving any point or cantonment in the rear unprotected.

13. To be convinced of this, it is only requisite to refer to the Plan, showing that the line of railway would pass centrally through the great line of important military stations between Calcutta and the Sutlej ; and, if we conceive a well-combined extension of the principle of trunk railways completed throughout the three Presidencies, the draft for any large field force required might with proportional facility and rapidity be concentrated from the main stations of the three armies, thereby producing a proportionably slight withdrawal of the force from any particular locality.

14. We have at this moment conflicts going on at the North-western and North-eastern extremities of our Indian frontier, points about 2,000 miles apart ; either or both of which conflicts may grow into serious wars, requiring immediate and extensive reinforcements of troops and stores. The very nature of our empire in India must at all times expose us to similar conflicts, without much warning ; and our stability, or even existence there, must depend on our being able to meet such conflicts with energy and rapidity, without dangerously diminishing the garrisons of other important districts, particularly of those that are nearest to the seat of war, and therefore most exposed.

15. No one will deny that the efficiency of an army is in some inverse ratio
to

to the time required to concentrate such a preponderating force of well-trained troops on any given point of its lines of defence as shall secure victory over the largest hostile force that can be expected to attack it.

16. When the movements are slow, as must be the case when the troops have to concentrate by marching, each limited district must be copiously armed for its own defence and protection ; (but when the power of concentration is rapid, as is the case when troops can be brought together to any given point by railway from very distant stations, then a comparatively small force will suffice for each particular district.)

17. What the exact ratio of increased efficiency may be, as compared with the increased power and rapidity of concentrating troops and conveying artillery and commissariat supplies to the first place of assembly for a campaign, as well as in the subsequent supply of reinforcements and provisions, it is difficult to express in precise numbers ; but it would probably not be straining the argument to assume that two-thirds of any given army for the protection of British India would be much more efficient where a field force of 50,000 or 60,000 men, with ample artillery, stores, and provisions, could be congregated on any point of its vast lines of defence in 20, 40, or 60 hours, than the whole of such an army would be under the present system, requiring a mean period of three or four months to bring such a force together.

18. It is not for a moment implied, that in the subsequent manœuvres of a campaign the general can be aided by the existence of railways ; their advantages, in a military point, are only assumed to apply to the first concentration of a force, and to its after reinforcement with troops, provisions, and stores. But all those acquainted with the Indian climate and practices will understand how much greater those advantages would be as applied to India, than if our consideration had reference to Europe. In India, marching or campaigning in summer is out of the question, unless at a fearful expense of life and health to our troops, whilst, from the vast extent of territory we occupy there, the ordinary dispersion of our forces may be nearly in the ratio of 1,000 miles as compared to 100 miles at home.

19. Under the foregoing views, I shall deal with the present military expenditure of Bengal as follows, that amount being - - - *Co.'s Rs.* 4,99,35,384 :

From this sum I take one-third of three-fourths, or one-fourth of the whole, as a reduction of expenditure due to the increased efficiency of the army, to be produced by railways - 1,24,83,846

Subsequent military charge for Bengal - - - - 3,74,51,538

20. The reduction of expenditure in the military establishment of Bengal, which, I maintain, the construction of the railway from Calcutta to the North-west would justify, and still leave the army a much more powerful engine than it is at present, would be *Co.'s Rs.* 1,24,83,846 per annum, or taking the rupee at 2s., it would be, in British money, 1,248,384 l., which at five per cent. would enable the East India Company to raise a capital of 24,967,690 l., or at four per cent., 31,209,600 l., or at three per cent., 41,812,800 l., with which to construct railways in Bengal on Government account ; or if it be considered preferable to work the railways through private companies, the Indian Government can venture to guarantee to such an amount of capital, without increasing the public charges of Bengal, even supposing the whole amount of the guaranteed-interest to be annually paid by Government to the companies.

21. But if, as I firmly believe, an economically and judiciously constructed line to the North-west of India would be ample remuneration from its own resources, then the whole reduction of 1,248,384 l. annually on the Bengal military establishment, would be a clear saving upon the present expenditure ; and in addition to this large saving must be considered the saving that would occur on the transport of troops in the annual reliefs ; the saving upon transport of treasure and treasure parties ; and, above all, the abolition of that most oppressive practice which the movement of troops now entails by the necessity of pressing the carts and animals of the country people, and carrying them hundreds of miles from their homes, in order to furnish the requisite means of military conveyance. Yet the advantages, in a military point of view,

6 MEMORANDUM BY MAJOR KENNEDY RESPECTING

would form only one of the numerous classes of benefits which such an undertaking would confer upon the country; nor is it easy to estimate the annually increasing prejudice to Indian produce, which the delay of applying this principle is producing, or how it is to recover the start which energy, wisdom, and activity in this respect are giving to American produce, even in our own markets.

22. Adopting the foregoing principle, as generally applicable to the three Presidencies, I shall now offer a Table, showing the annual saving on the military establishments of India generally which a well-arranged system of railways would produce; showing also the capital which that saving would enable the Government to command, either as a guarantee fund, in the event of private companies doing the work, or as a fund for actual construction by the Government itself; and, further, showing the number of miles of railway that can be made out of such capital, at different rates of cost per mile, omitting fractional parts —

Presidency	Col. 1. Present Cost of Military Establishment, as given in Parliamentary Return for 1848-49.	Col. 2 Annual Saving upon Military Establishment which would accrue from the introduction of Railway Intercourse.	Capital which may be raised for Construction of Railways upon annual Saving in Col. 2, at			Number of Miles of Railway which may be constructed by Capital in Col. 4, at per Mile,						Col. 12. Number of Miles which may be constructed by Capital in Col. 5, at 5,000 l. per Mile.
			Col. 3	Col. 4.	Col. 5.	Col. 6.	Col. 7.	Col. 8.	Col. 9.	Col. 10.	Col. 11.	
			5 per Cent. per Annum.	4 per Cent. per Annum.	3 per Cent. per Annum.	£. 5,000	£. 6,000	£. 7,000	£. 8,000	£. 9,000	£. 10,000	
	£	£.	£.	£.	£.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.	Miles.
Bengal - -	4,933,538	1,248,384	24,967,680	31,209,600	41,612,800	6,241	5,210	4,438	3,901	3,467	3,120	8,322
Madras - -	2,620,621	655,155	13,103,100	16,378,875	21,838,500	3,275	2,729	2,339	2,047	1,819	1,637	4,307
Bombay - -	1,715,775	428,943	9,578,860	10,723,575	14,208,100	2,144	1,787	1,531	1,340	1,191	1,072	2,859
TOTAL - -	9,329,953	2,332,482	47,649,640	58,312,050	77,749,400	11,660	9,726	8,398	7,288	6,477	5,829	16,548

23. In a report which I addressed to the Government of India on the 29th of January 1851, I dwell at some length on the principles which appeared to me indispensable to ensure success and profit in this class of undertakings, and to avoid those errors, that waste, and that ruin to shareholders which have characterised similar works in England.

24. Those principles were at once approved and adopted by the Government, and one important result which may be anticipated from them is that of forcing those charged with the construction of the works in India, to adopt the most essential of all rules in engineering, which has, unfortunately, been generally disregarded in English railway practice, that of the engineer feeling his character responsible, not only for the eligible nature of his project, and the efficiency of his works, but likewise for the funds invested bringing back a remunerative return to his employers, unless he shall have clearly expressed his written opinion that such a return is not to be expected, even under the most economical system of construction that can possibly be applied. This assuredly should have been the first consideration with engineers employed by companies whose sole object was to obtain a profitable return for their investment. And had they been guided by such a consideration, they would never have allowed their works to cost 183,000 l. per mile, nor 178,000 l., nor 70,000 l., nor 60,000 l., nor 50,000 l., nor 40,000 l., nor even 30,000 l. per mile. Nor would they have constructed their lines with such defective gradients as must necessarily limit the loads of their powerful engines to a degree that must consume the profits otherwise attainable in the permanent working of the lines.

25. Had engineers kept the interests of their employers in view, they would have

have individually and collectively remonstrated against the extravagance and fraud attending the preliminary investigation of the merits of projects prior to their sanction and adoption; the frauds in valuation of property, law costs, &c.; and had they done so, Parliament would have listened to their remonstrance, and would have granted reasonable protection to the most useful class of speculators who have ever shown themselves in the British empire, and who, as matters now stand, have been pillaged by the inexcusable negligence of those in whom they confided to the extent of so many millions of pounds sterling. Happily for India, its Government have not overlooked the justice and wisdom of protecting this class of investment from the futile processes and scandalous frauds which attended the preliminary investigation, the legal chicanery, and the acquirement of the land in England.

26. But it is still imperative to adopt the most arduous and incessant scrutiny of all projects, as well as supervision in the subsequent execution, to eradicate the grave errors in the former, and the extravagance in the latter, which will otherwise assuredly emanate from those trained in the practice of England.

27. For greater security, I have given, in the above Table to para. 22, a scale showing the number of miles which might be made at different rates of cost to the amount of the capital which I assume the annual saving on the military establishment would produce in each of the Presidencies. But although, for facility of calculation and precaution sake, I have extended this scale from an average of 5,000 *l.* per mile to that of 10,000 *l.*, I am nevertheless convinced that the lower average of 5,000 *l.* per mile ought amply to suffice for single tracks, if the engineers in charge can be forced to keep constantly in mind that the one thing needful is a remunerative return for the capital confided to them. My own experience, the results obtained on the continents of Europe and America, some few cases, even in our own country, as well as the comparative low price of labour in India, all tend to confirm this conviction. It will be safe, however, even holding this opinion, to limit, in the first instance, the authority for construction to one half of the mileage which could be at that rate; a quantity quite sufficient to open the main lines of trunk road throughout the several Presidencies. It would give—

For Bengal	-	-	-	-	-	-	-	3,120 Miles.
For Madras	-	-	-	-	-	-	-	1,637 „
For Bombay	-	-	-	-	-	-	-	1,072 „
								5,829 „

28. I have no doubt that the saving upon the military establishments may be fairly calculated to cover the risk of railway guarantee in the Presidencies of Madras and Bombay, as well as in Bengal. The natural formation and fall of the land, the commercial requirements as regard lines of railway, and the military points of occupation in those Presidencies sustain this view. In Bengal it must be allowed that all these matters have a singularly concurrent coincidence; whilst some peculiarities of the Bombay Presidency call for the most cautious and judicious consideration in order to secure to it the full measure of advantage of which it is susceptible.

29. In this view, I apprehend that the project now in progress at Bombay calls for some very important modification of the original design. It is to be hoped, however, that this modification may be effected without the necessity of abandoning for one object or another any of the work done. (It was an error to contemplate carrying the great Northern traffic, including that of Candeish and Berar, over the Syhadree Ghats.) At the same time, the portion of road made from Bombay, as far as Tannah, will probably be found suitable as the commencement of the great Northern trunk road; whilst from Tannah, on by Callian, &c., the work done may come into use as a branch towards Sholapore, &c., from the trunk line.

30. It would appear that the projectors of the works now in progress at Bombay, proposed to cross the Syhadree range by the Malsej Ghat, 2,060 feet high. They propose to surmount the precipitous portion of the Ghat, 1,170

See Appendixes,
Nos. II. and III.

feet high, by a fixed engine incline of about six miles, with a gradient of about one in 18, or by an alternative incline 13 miles long, with a somewhat reduced gradient. They would then proceed through the table land due east for 20 ½ miles to Alleh, the maximum incline being so great as one in 113; at Alleh they would send off a branch to the south-eastward, in the direction of Sholapore; but the principal object appears to be the northern line from Alleh through Candeish, and crossing the Taptee and Nerbudda rivers, they would take the direction of Agra, after passing by Mow Indore, &c.; they would also throw off a branch from the Nerbudda, bearing on Allahabad. (Here, then, we have gravely proposed a most erroneous project of a grand trunk road, by which the whole northern, north-western and north-eastern traffic is to approach Bombay, the important mercantile capital of Western India. Between Bombay and Agra it appears to be the intention that this great trunk line (second only to that of the Ganges, if even second to it,) should pass over no fewer than four *unnecessary* and fierce ranges of mountain, of which I imagine the aggregate amount of rise and fall would not be less than from 8,000 to 9,000 feet; whilst on the natural route by Surat and the valleys of the Mhye and Chumbul, there is but one summit to pass, at Neermuch, between Bombay and Agra; the height of this summit is 1,356 feet, which added to the fall from Neermuch to Agra, say 850 feet, would make the total rise and fall by this line only 2,206 feet, whilst the distance would be about 120 miles less than that by the hilly route through the Ghats.)

See Appendix,
No. II.

31. (The same reasoning which overthrows this project, as a general trunk line between Bombay and Agra, holds equally against that portion of it intended to open an intercourse between Bombay and the districts of Candeish and Berar. On this portion of it the aggregate amount of rise and fall would probably exceed considerably 4,000 feet, whilst by the coast we go level to Surat and branch off by the Taptee Valley at the slight gradient of the river, without passing any range whatever; nor would the distance by this route exceed that over the Ghats.)

32. The best route harmonises with every general and local interest of India in their widest extent, whether as regarding the north, by the route I propose, with the power of throwing off branches, or as regarding the east by the valleys of Taptee, Nerbudda, Soane, Godavery, Lower Kistna, &c., or as regarding the west, by Guzerat, Kurachee, the Indus, &c. Nothing can exceed the eligibility of this mode of opening the communication of all those districts with Bombay. (Nothing could be more preposterous than to think of carrying the traffic of any of them over the Ghats.)

33. There is no doubt that the interests of the table-land east and south-east from Bombay call for every exertion to open a passage through the Syhadree range. But it is with this view, and this view only, that the work done to the eastward of Tannah can be made available.

See Appendix,
No. III.

34. I shall not here enter into the smaller question of, whether the Malsej or the Bhore, or any other particular Ghat, might have been the preferable one through which to reach that table-land.

35. But what I most earnestly appeal against, is the project which has for its object to approach the district of Candeish or Berar, or any other part of India, to the north, the eastward or the westward of those districts, by any line whatever passing over the Ghats. I trust that the East India Directors and the Board of Control will resist every suggestion made to them with this object, until they shall have heard from the Governor-General of India upon the subject. And I feel firmly convinced that his Lordship's experience will sustain the view which I take of this most important subject. The nature of the error is precisely similar to, though of much greater magnitude than, that which I brought under his consideration in the project of the East Indian Railway Company in Bengal. He did not hesitate in adopting the remedy I recommended in the Bengal case, nor will he now for a moment hesitate in protecting those vast districts which the Bombay project would effect from the unnecessary tax on their transport of goods that would be the inevitable effect of carrying them over several fierce ranges of hills, when a much shorter line can be had, avoiding those hills, and combining the broadest interests of Indian traffic generally.

36. (The project above referred to proves, at least, the pressing necessity of laying down without delay some general and well-defined principles of action on the subject, as a protection against similar errors in future, and with a view to direct, concentrate, and combine with useful effect the efforts of well-intentioned active minds. With this object I would propose the following broad rules in respect to railways, for the adoption of the Government of India. They may somewhat startle European engineers, as aiming at a degree of perfection of which our section of the world might scarcely admit; but the more they examine the physical formation and circumstances of India, the more they will be convinced that what I propose is in strict harmony with those natural advantages which Providence has placed within our reach there, if we can but appreciate them, and exert the requisite degree of judgment in their application.

37. I propose,—

1st. That all railways constructed in India shall belong to one of two classes,—the first or the second class.

2d. That the regulating gradient of the first class or trunk railway, shall not exceed one in 2,000. By “regulating gradient” is meant the gradient which shall regulate the load of the engine.

3d. That no regulating gradient of any second class or branch railway shall exceed one in 330.

4th. That short alternate impulsive planes may be introduced to assist the ascent, not to exceed a length of half a furlong each, and not to be nearer to each other than $1\frac{1}{2}$ furlongs.

5th. That no line shall be undertaken when the estimated cost shall exceed the average rate of 5,000 *l.* per mile of single track; but that this rate of cost is not expected to include the bridging of large rivers, as the Soane, Jumna, &c., exceeding half a mile wide at flood level; such rivers are to be considered as breaks, or temporary termini, when goods and passengers are to be carried across on rafts.

6th. That no line shall be sanctioned except for a single track of rails, with masonry, cuttings and embankments to correspond; the ground, however, required for a double track to be in all cases secured.

7th. That no locomotive engine shall be introduced to India for 10 years, except such as the ratio between the length of stroke of piston and the diameter of the driver wheels shall sanction, with reference to the maximum load, notwithstanding any sacrifice of velocity on the journey; Rule No. 11 contains an exception from this restriction.

8th. That when piling for foundations be requisite, the foundations are to be laid to suit a double track, although the superstructure is only carried up for a single track.

9th. That no portion of any line shall be permitted to open for the transport of goods or passengers until the capital account for the construction of such portion shall have been closed.

10th. That no more than one train daily shall run in each direction upon any line until the traffic shall furnish more goods and passengers than one engine can carry, after which a second may start daily each way; and that when the traffic calls for three trains fully loaded per day, then arrangements shall be made for laying down a second track of rails.

11th. That, notwithstanding the tenor of Rule No. 6, if on any line it shall appear that the profits exceed a dividend of six per cent. per annum, it shall then be permitted, if thought advisable by the directors of the company interested, to introduce engines of higher powers of velocity, with a view of running passenger trains separate from goods trains.

12th. That the height above the sea of all obligatory points throughout India, having reference to the construction of works, draining, irrigation, &c., such as the highest points or necks of valleys, the low passes in mountain ranges, be obtained and recorded with all convenient despatch on the maps now in progress of construction by the Surveyor-general's department; and that, in addition to this, the height of numerous points of inundation level be taken upon the rivers of India, and recorded upon the maps at intervals of two or

See Appendix,
No. IV

three miles, so as to admit of the protraction of proximate sections of the slope of such rivers; and that any striking peculiarity in the lines of rivers, or of the ground between adjacent rivers, be reported upon to the Surveyor-general by his subordinate officers; such reports to be methodically arranged in his office as records.

38. Although the object of the foregoing rules is sufficiently obvious, still a few observations upon them may not be considered superfluous. They seek to unite all considerations in the grand object of securing a remunerative return for the capital employed, without which it is clear that the progressive expansion of the principle involved cannot possibly be carried to the extent required by the interests of the Indian people. They keep in view the first principle of advantage possessed by railway traction over all other kinds, that of enabling the smallest power to produce the greatest result; and they tend to secure that that result, so absorbing the power, shall be as much as possible applied to the movement of effective load, and that the power shall not be absorbed either in the mere luxury of a superfluous velocity, or in contending with gravity or unnecessarily steep inclines. They seek to secure the principle of economy both in the permanent working of the lines, and in their original construction. With regard to this last consideration, there is no question that if engineers are forced to work with economy they can do so. I am about to inspect a line of single-track road that has been lately constructed at home, at an outlay of 5,000 *l.* per mile: if I find the result of any importance, I shall not fail to report it for the benefit of the Indian Government; and if a work can be produced here at that cost, there can be no question as to its sufficiency in India, where labour can be had at one-seventh of our rate.

39. It is necessary now to refer once more to the general Finance Account already alluded to. In it we find that the land revenue, or government rents of the land in India, for the year 1848-49, amounted to about 14,274,272 *l.*, whilst the charge for buildings, roads, and other public works, exclusive of repairs, was in the same year, 1848-49—

	£.
In Bengal Presidency - - - - -	53,568
In North-western Provinces - - - - -	192,780
In Madras Presidency - - - - -	23,801
In Bombay Presidency - - - - -	24,811
	<hr/>
TOTAL - - - - -	£. 294,962
	<hr/>

40. From this statement it would appear that nearly two-thirds of the total expenditure in public works in India for the year 1848-49 was incurred in the North-west Provinces, and probably the greater part of it for that magnificent undertaking, the Ganges Irrigation Canal, a work highly creditable to the British Administration, and one which, when completed, must prove largely remunerative in a financial point of view. The balance expended on public works, exclusive of repairs, in all other portions of India, appears to have been 102,182 *l.* for that year.

41. In considering this part of the subject, it must be kept in mind that the Government of India occupy not only the position of the Government, but likewise that of the most influential class of subjects in England, the land proprietors, a class second only in importance to the Government itself; and, therefore, as the Indian Government derive the revenues of these two classes, they will naturally feel disposed to meet the charges borne by the corresponding classes in England, without which the improvement of the country cannot proceed, nor can India compete with other countries in the general markets of the world.

42. That is to say, the Government will feel the wisdom of executing the requisite public works which should emanate from an ordinary Government, as well as the territorial improvements pertaining to the class of landed proprietors.

43. What the right proportions of revenue may be that are due to these two heads,

heads, can only be estimated by the legitimate requirements of the country; laying down, as a general maxim, that all such legitimate requirements should bring back, directly or indirectly, a corresponding return for the investments.

44. The just claims of the Indian people upon their Government, as above described, will be better understood when it is considered that the monopoly of the proprietorship of land there reserved by the Government must, to a great extent, have prevented the gradual growth of the monied and speculating classes, which in England produce the vast variety of enterprising individuals, associations, and companies who have effected such marvellous results in drawing forth the industrial resources of the country.

45. It is difficult to say what may be the ordinary average charge for the improving operations of a well-managed English estate upon its annual rental; but if we assume it to be 20 per cent., we shall not probably be guilty of exaggeration. This proportion of the Indian rental would amount to an annual outlay of 2,854,854 *l.* by the Government in its position of general land proprietor, irrespective of such further sum as it may be prudent to expend in its position of Government for public works.

46. The wisdom of the Indian Government in retaining in its own hands the rents of the land as a public revenue, cannot be overrated, and it only remains to follow up this wise principle by a liberal fulfilment of its duties as general landed capitalists in fostering the industrial resources of the country, in order to exhibit the most perfect financial administration of any government in the world. It must rapidly lead to the abolition of every existing tax or duty, for rent is not a tax; and the rent or land revenue would soon be found amply sufficient to meet all the cost of government.

47. The outlay of the Government on account of railways, or their guarantee to companies for such outlay, as well as the expenditure for construction of irrigation canals, and all other works beneficial to the occupiers of land, must be looked upon as so much money invested by Government in liquidation of the claim upon them as land proprietors of India. And the operation of those improving investments would rapidly stimulate every branch of industry, and promote the consequent accumulation of wealth in the hands of individuals.

It would, in fact, call into existence the class of private capitalists so much wanting in India, that class which in Europe originated in the first instance in the principle of the Government having given away to private persons the proprietorship of land which in India has been so wisely retained as state revenue.

48. No one, then, will deny the broad nature of the claims in this respect which the people of India have upon their Government. Nor can any one deny the broad interest which the Government must have in liquidating these claims, secured, as has been shown they are, by the certainty of deriving an immediate and ample direct as well as numerous indirect profits for all such judicious expenditure.

49. I take for granted, then, that as India has so far escaped from the errors that have attended the introduction of railways, the Indian Government will follow up their recent judicious commencement in Bengal by every possible precaution against the occurrence of the English errors. I likewise may assume that as much time has already been lost in giving to India the advantages of railways, the utmost exertions will now be used for their judicious introduction, in order that her productions may be stimulated and enabled to compete with those of other countries, and particularly of America, in the general markets. My own experience whilst employed in this department in India, has convinced me that the Government is fully impressed with the urgent necessity of these two principles; and that it is only necessary clearly to point out the precautions required, and the mode by which immediate execution can be safely accomplished, in order to ensure the utmost activity in the adoption of all these measures which shall lead to the fulfilment of what they know to be of such vital importance to their territories.

50. The first object must be to lay down the great trunk lines, with a view to the broadest future ramification, and on a principle that shall ensure the most profitable

profitable permanent working of the lines generally, bearing at once upon the internal intercourse of India itself, as well as upon the intercourse of India with Europe, &c.

51. Here we must keep in mind a few great leading features in the geographical formation of the peninsula of Hindostan; first, the great western range of hills parallel to the coast, at a medium distance of about 40 miles from it, and running south from the Taptee Valley, for 700 or 800 miles.

52. From the western range a formidable spur projects for about 400 miles to the eastward, reaching near to the centre of the peninsula from a point in the Ghat, a little to the north-east of Bombay. (a)

53. A feature of much general importance in our present consideration, is the Great Central Omrawuttee table-land. It sheds its waters in every direction; first, to the north-east by the Soane Valley, which falls into the Ganges, and passes Calcutta; second, to the south-west by the Nerbudda and Taptee, which falls into the Gulf of Cambay, on the Bombay coast; and third, to the south-eastward, by the Gunga, Godavery, Mahanuddy, &c., which flow towards the Madras coast.

54. Keeping these great geographical features in mind, (and they cannot be overlooked in any general project without fatal error), they force upon us the knowledge of what the great arteries of commerce must necessarily be; and with those arteries our trunk roads must correspond. We must remember the valleys of the Ganges and Jumna, whose waters flow from the Himalaya to the south-eastward for about 1,300 miles, passing by Calcutta and many of the richest districts in India. If we keep these leading features always in mind, and seek to accomplish the object in view without throwing away our great natural advantages, attempting to outrage scientific axioms, or fruitlessly striving to accomplish what is unadvisable merely to gratify erroneous local influences, which are taken up in total ignorance or carelessness of first principles, there will be no doubt that singularly profitable trunk lines can be selected throughout India, which shall admit of judicious ramifications to any extent that local interests can possibly demand hereafter.

55. In accordance with the principles contained in the foregoing paragraphs, as well as with those advocated in my reports, dated 29th January and 27th February 1851, I shall now proceed to consider the lines of railway, in detail, which would lead to the most perfect and comprehensive system of intercommunication that can at any future time be looked forward to for India, as exhibited in the accompanying Sketch Map.* On this map the lines coloured *Red* represent the main or trunk lines, and those marked *Yellow* represent the secondary or branch lines. (It will be observed that the direction given to all railways in this project is as much as possible in the course of the valleys, and that as rarely as may be is it proposed to cross any valleys or ranges of hills transversely.) Attached to this map are two Fly Sketches, marked Nos. 1 and 2; No. 1 contains the most important portions of the lines which should be first constructed, supposing the capital only procurable under a guarantee of five per cent., as set forth in column 3 of the table attached to paragraph 22, and therefore limited to about one-half of 47 millions sterling, reserving the other half as a margin to meet contingent events until extensive experience shall have given practical and certain data. Fly No. 2, contains an extension of No. 1, supposing the capital procurable on a guarantee of three per cent., which I believe it could be, as calculated in column 5, and consequently extended to about one-half of 77 millions.

56. I shall now close these memoranda, and whilst acknowledging with thanks the assistance which the Secretary to the Court of Directors of the East India Company has afforded me by free access to the maps, &c., at the India House, it will be understood that I only seek to point out a general principle, which shall be a protection against the incongruous errors of isolated action. I believe the

(a) Since writing the above, a principle has occurred to me, as given in Appendix* No. 4, by which the engine may be enabled to surmount considerable ascents with the load due to a level road.

* See App No. I.

the sketches of projects which I offer in my plans and schedules will be found to have this effect, as the basis upon which they rest and their relative bearing with each other are strictly mathematical; nor do I believe that the principle can be superseded by any other that should not have an injurious effect.

57. I should have hesitated at this distance to put forward so large a subject, necessarily connected with the minute physical structure and wants of the various particular localities of the vast continent of India, had not the evil consequences that must arise from the deficiency of some sound general plan of operations been illustrated strongly in my mind by the erroneous project now in progress at Bombay, as well as by the Bengal project, in the state in which I found it on taking charge of the Railway department under the Government of India. These are the only (cases where the introduction of railways has been practically attempted in India, and they were so crude and unfitting, that had they been persevered in under the original intention, they must have not only failed as individual cases, but their failure would have blighted the principle of such works.) I earnestly hope that their correction may lead to a very different conclusion. The traffic of India has no broad margin like that of England to cover grave errors. The capabilities, however, of India are numerous, and her traffic, such as it is, will suffice, provided those capabilities are turned to the best possible account, but not otherwise.

58. I shall only venture further to suggest, with a view to prevent unnecessary delay, that the Governor-General should be furnished with a power, if he does not already possess it, without reference home, to incur the requisite expenditure to investigate by reconnoissance or survey, or by reports from special officers, the merits of such railway projects as his Lordship may think fit to order. If this be conceded, much indispensable preliminary knowledge may be obtained at a small cost during the ensuing cool season. I would earnestly press the advantage of having as many projects of this nature as possible now brought up, as there is no chance of any one hereafter being placed at the head of the local Government of India, whose experience on the subject of railways could attach such value to their recommendations or decisions as that of the present Governor-General.

(signed) *J. P. Kennedy,*
Major.

A P P E N D I X.

- No. I.—Sketch Map of India, containing Projects for Railways, by Major J. P. Kennedy.
Table, with Fly Sketch, No. 1.
Table, with Fly Sketch, No. 2.
- No. II.—Proximate Sections, to illustrate the errors in progress under the Project of the Great India Peninsula Railway Company, in the Presidency of Bombay, &c.
- No. III.—Suggestions by Major Kennedy for opening Railway Intercourse between Bombay and the Table Land, passing over the Syhadree Ghats; with Sketch Map illustrating same.
- No. IV.—Table and Section of Impulsive Inclines, explanatory of new method proposed by Major Kennedy, to enable Locomotive Engines to convey Loads due to a Level up ascents.
- No. V.—Sketch, Plan, and Section of the Proposed Line of Railway between the Colliery Junction and Rajmahal, in Bengal, to illustrate the Method of “laying out,” with a view to avoid unnecessary Gradients, and to obtain the most perfect Line with the smallest Amount of Cuttings and Embankments; with explanatory Note and References.

Appendix, No. I—*continued.*

TABLE referring to FLY SKETCH No. 1, showing the Number of Miles of Railway in that Sketch passing through each Presidency, with the corresponding Cost, at 5,000 l. per Mile.

LINES OF RAILWAY.	BENGAL.		MADRAS.		BOMBAY.		TOTAL.	
	Miles.	£.	Miles.	£.	Miles.	£.	Miles.	£.
1. Calcutta to Agra, by Ganges and Jumna Valleys - -	900	4,500,000	-	-	-	-	900	4,500,000
2. Bombay to Agra, by Surat, Broach, and Valleys of Myhe and Chumbul -	409	2,045,000	-	-	309	1,545,000	718	3,590,000
3. Madras to Surat Junction, by Coasts and Valleys of Godavery and Taptee - -	-	-	820	4,100,000	160	800,000	980	4,900,000
4. Madras to Malabar Coast, at Ponnany, by Chingleput, Trichinopoly, and Valleys of Coleroon and Ponnany -	-	-	394	1,970,000	-	-	394	1,970,000
5. Madras to Bangalore, Arcot and Tallar Valley - -	-	-	200	1,000,000	-	-	200	1,000,000
6. Bombay to Sholapore - -	-	-	-	-	350	1,750,000	350	1,750,000
7. Baroda to Kurachee, through Guzerat - - - -	230	1,150,000	115	575,000	115	575,000	460	2,300,000
8. Madras Junction to Hyderabad (in Deccan), by Kistnah Valley - - - -	-	-	200	1,000,000	-	-	200	1,000,000
9. Agra to Lahore, by Delhi -	385	1,925,000	-	-	-	-	385	1,925,000
10. Kurachee to Mittonkote, Indus Valley - - -	-	-	-	-	350	1,750,000	350	1,750,000
11. Rajmahal to near Darjeeling	140	700,000	-	-	-	-	140	700,000
12. From near Simla to Junction with Ganges Line, near Kurnal, by Jumna and Ghree Valleys - -	100	500,000	-	-	-	-	100	500,000
	2,164	10,820,000	1,729	8,645,000	1,284	6,420,000	5,177	25,885,000

Appendix, No. I—*continued.*TABLE referring to FLY SKETCH No. 2, showing the Number of Miles of Railway in that Sketch passing through each Presidency, with the corresponding Cost, at 5,000*l.* per Mile.

LINES OF RAILWAY.	BENGAL.		MADRAS.		BOMBAY.		TOTAL.	
	Miles.	£.	Miles.	£.	Miles.	£.	Miles.	£.
Brought forward from Fly Sketch No. 1 - - -	2,164	10,820,000	1,729	8,645,000	1,284	6,420,000	5,177	25,885,000
13. Burrampooter Valley - -	650	3,250,000	-	-	-	-	650	3,250,000
14. Bombay (Ghat Junction) to Nandar, Godavery Valley	-	-	-	-	245	1,225,000	245	1,225,000
15. Poonah to Meuritch, by Satara - - - -	-	-	-	-	135	675,000	135	675,000
16. Assim to Chittigong and Arracan - - - -	540	2,700,000	-	-	-	-	540	2,700,000
17. Nerbudda Valley - -	450	2,250,000	-	-	-	-	450	2,250,000
18. Nagpore to Junction with Bombay, Surat and Madras Line - - - -	135	675,000	-	-	-	-	135	675,000
19. Mittonkote to Lahore - -	300	1,500,000	-	-	-	-	300	1,500,000
20. Lahore to Attock - -	200	1,000,000	-	-	-	-	200	1,000,000
	4,439	22,195,000	1,729	8,645,000	1,664	8,320,000	7,832	39,160,000

Appendix, No. III.

On Opening a RAILWAY from *Bombay* into the Table Land, across the *Syhadree* Range.

In the foregoing Memorandum (paragraphs 28 to 36), I have stated the objections to any trunk line being carried over the Ghats, having for its object the northern, north-eastern, or north-western intercourse of India with Bombay. I have also stated that the interests of the extensive districts of the table land would call for the construction of one or more branch roads being made over this great range of precipitous mountain. And I now have to request the most earnest consideration as to the mode in which such an undertaking shall be effected. It is an enterprise of which the project and execution will test the resources of the railway engineers of India, and I trust that the Government will not sanction any of the objectionable schemes hitherto brought before them.

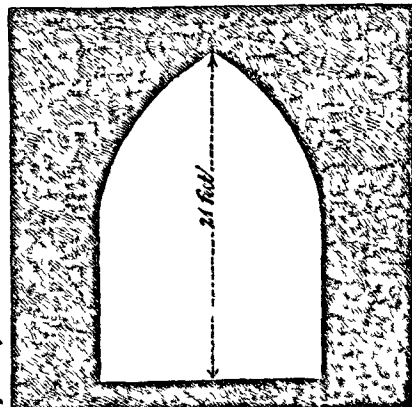
The idea of a fixed engine incline of 6 miles at 1 in 18, or of 13 miles at 1 in 40, as well as every other makeshift contrivance, should be rejected. An admirable road for a locomotive, with an ample and justifiable load, can be obtained along the face of the range. In fact the ascent can be surmounted at any required gradient, as the power exists of lengthening the base to any required extent.

This is a work in which the character of the British engineering profession is not more interested than that of the British policy and interests in India. It will prove to the nations of that country, if properly done, that their rulers are capable of overcoming every difficulty opposed to Indian progress.

Those who have already reported upon the structure of the district state, that it is most favourable for tunnelling. If this be so, it is only requisite to establish a judicious and economical principle for driving the tunnels, as well as for executing the side cutting and viaducts between adjacent tunnels; and the engineer may boldly select a first-class gradient for reaching the table land without any apprehension of an exorbitant rate of cost.

When I commenced the first tunnel in the Himalaya Mountains, on the Hindostan and Thibet road, I was influenced much more by anticipation of its effect upon the dawning subject of railway construction in India, than even of its utility as an integral portion of that particular road. It was specially important to prove that that class of work could be executed at a small cost; with that view I obtained from Mr. Edwards, the superintendent of the Hill states, the allocation to this work of a small party of convicts, who were a constant charge to the public, and had previously given very little in the way of a remunerative return for the cost of their maintenance. The party of convicts was divided into two sections, one for each opening of the tunnel, each section being divided again into sub-sections or squads, relieving each other every six hours. As the law did not authorise us to employ the convicts in the night reliefs, I was obliged to get hired labourers for that duty; so that one-half of the work was executed by convict labour, and one-half by hired labour. The overseeing of the work was done by privates of a Sapper company, which was placed under my orders, and which furnished me with all the overseers I required along the whole line of road; nor were those Sappers employed on any work except as overseers. There was a Sapper overseer for each relief of the working parties at each tunnel opening, and they were particularly useful in the boring, loading, and firing off the mines. There was likewise a blacksmith's shop established for the repair of mining tools at the tunnel. Thus the work was carried on day and night. The overseers were not any additional cost to Government, as they were permanently paid military men. And one-half of the labour, exclusive of the repair of tools, was likewise without cost, as the convicts must have been maintained at the same rate of outlay, whether they had been thus employed or not. The outlay by this method, up to the time that I gave over charge of the work, was far within 6*d.* per cubic yard of excavation, exclusive of the cost of powder, which I obtained from the Government stores of captured ammunition, and was no cost to the Government, as had already been proved by large quantities of it having been blown up as useless or superfluous.

It will be observed here that I could not bring down the rate to the minimum of cost at which it may be effected, because I could not employ the convicts in the night reliefs. This, however, can be easily obviated in future works of this class by a Government rule on the subject; and no one can object that the employment of convicts for 6 hours out of 24 at this labour is a hardship, whether by night or by day. In fact, the night work is the preferable of the two, particularly in summer; and tunnel work is preferable to any other in the Indian climate. The tunnel itself, too, forms the safest and coolest place of confinement and lodging for the prisoners employed. The forms and dimensions of a tunnel for a single track of rails may be taken as in the accompanying diagram, which would require the excavation of about 30 cubic yards of rock per yard forward. This, at the rate of 6*d.* per cubic yard, would enable us to execute the tunnel for about 17*s.* 6*d.* per yard forward, exclusive of the cost of powder.



The precipitous face of the Syhadree range will probably be found to average about one perpendicular to three horizontal, with an elevation of 1,500 to 1,800 feet at some of the Ghats above the more level country at its base. Its crest, for the most part offering a serrated line, with alternate salient and re-entering segments of curves of varying radii and cords, which we may assume to average somewhat less than semicircles of about half-a-mile radius; and occasionally diversified with spurs of considerable projection. The principle upon which these data should be dealt with in order to procure at the lowest cost a road fitted for a locomotive followed by a remunerative load, will be to conform as much as possible to the natural contour line of the hills, where the width can be obtained by a simple side cutting, intersecting, when necessary, such portions of the projecting segments, by cuttings or tunnels, and of the re-entering segments by embankments or viaducts, as shall bring the general line within the limits of well-considered radii of curvature.

I shall assume that the large proportion of one-half of every mile should consist of tunnels; this, at the rate above stated, of 17 s. 6 d. per yard forward, would make the cost of half a mile of tunnelling 682 l. Let us assume that the other half of each mile, consisting of cuttings, side cuttings, embankments and viaducts, would come to an equal amount of 770 l., we should thus have the gross amount of our road-way ready to lay down the rails at a cost of 1,540 l. per mile, which I believe would be found fully sufficient, as we must recollect that the tunnelling and side cutting would give an ample supply of building stone and ballasting. But to render security doubly sure, we shall add nearly 30 per cent., and say that the preparation of the road-way for the rails, including tunnelling, side cutting, embankments, viaducts and ballasting, may amount to 2,000 l. per mile. If we add to this for cost and laying of sleepers, rails, &c., per mile, 2,800 l., and road station-houses, &c. 200 l. per mile, we shall have our road finished along the Syhadree range, and ready for the engine and trains, at a total cost of 5,000 l. per mile.

With regard to the rate of ascent which it may be desirable to adopt, by inspecting the table of impulsive planes, we can regulate the length that the road should have, and thence the point at which to meet the precipice in order to reach the particular ghat by which we may propose to enter upon the table land. Taking the Bhore Ghat, which bears upon the Kistna Valleys, upon Poonah and the Shoolapore district, as our point of approach, and the height of this above the sloping ground at the foot of the precipice, to be about 1,500 feet, and choosing a rise of 16 feet in the mile, which answers to a continuous slope of one in 330, we should require a base of about 93 miles to overcome the ascent; a rise of 30 feet per mile, answering to a continuous incline of one in 76, would require 50 miles to overcome the ascent.

See Sketch Map
annexed.

See App. No. IV.

If it be determined to adopt the old principle of a continuous slope, I should prefer the long base of 93 miles, so as not to bring the gradient above one in 330. But if the principle I have suggested be adopted, that of using the alternate impulsive inclines, I should have no objection to the shorter base, because in that case we shall still be able to load the engine with the full weight that it can haul on a level.

To obtain a base of 50 miles terminating at the Bhore Ghat, would require us to commence the ascent of the precipice about 15 miles to the south-westward of the Malsej Ghat, or about midway between the Bhore and the Thul Ghats. And this would be a convenient point for a fork, of which one branch should bear southward by the Bhore for the southern sources of Kistna, and the other northward, by the Thul Ghat, for some source of the Godavery; a 50 miles base for an ascent of 1,500 feet would admit the adoption of the alternate impulsive planes, enabling us to give the engine a load due to a perfectly level road.

(signed) *J. P. Kennedy,*
Major.

Appendix, No. IV.

ALTERNATE IMPULSIVE PLANES.

TABLE, with Section attached, showing how Railways can be constructed, so that the Engine-power shall be economised, and applied to the Traction of effective Load, instead of absorbed unnecessarily by the gravity of Inclines. The principle consists in making all quick Inclines so short that they shall not destroy the momentum or velocity with which the Train reaches the foot of each Incline before it arrives at the top. With this view, the ascent is accomplished by means of short detached Inclines of quicker Gradient than the general rise of the Line, but not exceeding half a furlong in length, alternated with Level Planes not less than one and a half furlongs in length. Thus the Engine is enabled to overcome very considerable ascents with the Load due to a perfectly Level Road; any retardation that the Train meets with on each ascent is corrected, and the previous velocity is re-acquired on the alternate Levels

Rise, per Mile, which may be Required on various Railroads.	Gradient or Plane which regulates the Load of the Engine, when Combined with Short Impulsive Inclines.	Alternate Impulsive Inclines, 330 Feet long each, and Four to each Mile, placed at Intervals of 990 Feet apart.		Continued Gradient Required by Usual Practice to Surmount Rise	Tractive Power, per Ton, required To overcome Friction and Gravity on Plane which regulates Load,	
		Gradient of Short Inclines	Obstructive Power of Gravity, per Ton, on Short Inclines, in Opposition to Engine Power		By Using Alternate Impulsive Inclines.	By Using Method of Long-continued Inclines
<i>Feet per Mile.</i>		<i>1 In.</i>	<i>Lbs.</i>	<i>1 In.</i>	<i>Lbs.</i>	<i>Lbs.</i>
1	Level -	1320	1·696	5280	6	6·424
2	Level -	660	3·393	2640	6	6·848
3	Level -	440	5·09	1760	6	7·27
4	Level -	330	6·787	1320	6	7·696
5	Level -	264	8·446	1056	6	8·121
6	Level -	220	10·181	881	6	8·545
7	Level -	188·57	11·878	754·28	6	8·969
8	Level -	165	13·575	660	6	9·393
9	Level -	146·66	15·273	586·66	6	9·818
10	Level -	132	16·969	528	6	10·242
11	Level -	120	18·666	480	6	10·666
12	Level -	110	20·363	440	6	11·0909
13	Level -	101·53	22·062	406·15	6	11·515
14	Level -	94·28	23·759	377·12	6	11·939
15	Level -	88	25·454	352	6	12·363
16	Level -	82·5	27·151	330	6	12·7878

I trust that the principle of Impulsive Inclines will be found as important in the correction of the regulating gradients, and the consequent increase of the engine's effective load on existing lines at home, as in the prevention of grave defects in this respect in India. It will be found peculiarly applicable on such lines as the London and Birmingham, &c., which are perilously crowded with trains that appear still inadequate to the transport required; a contingency that can only be met by increasing the present tractive power, as regards effective load, on the principle I suggest, without increased cost, or laying down additional lines of rail on which to run additional trains, at proportionally increased expenditure, both for construction and permanent working.

EXPLANATORY NOTE and REFERENCES to the PLAN, Appendix No. V.

EXPLANATORY NOTE.

It is most surprising and most unfortunate that in their railway practice engineers appear to cast aside in a great measure the consideration that is due to the broadest rule of their professional science—that which relates to the effects of gravity on inclined planes. The case now before us exhibits a strong instance of this class of oversight. The nature of the country from Rajmahal to Calcutta would admit of a falling incline in the whole length of the line. If this result were obtained, the heaviest loads could be brought down with the smallest amount of engine power, and there would be a corresponding diminution in the consumption of fuel. But if occasional lengthy ascents are introduced in the wrong direction, and against the general fall, as proposed in the engineer's section now under consideration, the highest rate of cost for fuel must be incurred to keep the engine power at its full force on the whole journey, down as well as up; because it must be always ready to meet the occasional ascents in the wrong direction. This is a serious consideration, in addition to the still more mischievous effect of limiting the load of the engine. In the line of country now in question there can be no difficulty in avoiding this class of error. If the quantity of goods coming down exceeds much the quantity which goes up, it might be advantageous to spread over the road as much as possible the general fall, expunging every ascent in the direction of the fall, of which erroneous ascents the section contains about thirty miles. All this can be easily corrected, without much cutting or filling, by merely following a little more closely the contour line of the hills. It may be desirable to make the line on the principle of expecting equal loading both up and down. This can be effected on the admirable lines which I propose for trunk-roads, by introducing what I call the principle of alternate impulsive inclines; and the engine will thus be enabled to carry the full load in both directions which is due to a perfectly horizontal road, even although there may be considerable difference of level between the termini.—(See Appendix, No. IV.)

REFERENCES.

Like colours represent the corresponding lines in both Plan and Section.

The *broad dotted Black* lines show the direction and the levels proposed by the engineer of the East India Railway Company; from which it appears that his junction with the Colliery and Calcutta line would be 51·57 feet higher than the terminus at Rajmahal, although the latter point is more than 100 miles up the river. They show that the maximum gradient is one in 1,000, where a much better incline could be selected; and they show that he rises and falls unnecessarily 258·49, when there is the power of obtaining one uniform incline, with a difference of level of only 51·57 feet between his extreme points.

The *Red* continued lines, in Plan and Section, show how the project sent forward by the engineer could be improved in its gradients, without changing the point of junction. This, however, although a very great improvement, is not the most perfect correction that can be applied.

The *Yellow* line shows the most perfect improvement available, by the point of junction being changed to another point taken on a level with Rajmahal, and throwing the whole intervening line into one plane, which would consequently be quite level in its whole length.

The *small dotted Black* line shows what may be assumed as a horizontal contour of the hills at the surface of the ground, of which the salient and re-entering curves are cut off by yellow line, so as to reduce the curves of the railway within a desirable limit, without however any unnecessary degree of cutting or filling.

In crossing a series of rivulets and knowls, as in the present case, it is impossible without ruinous cost, and sometimes impossible, to obtain the most perfect railway in all respects on so straight a line as that proposed by the engineer's project. It must present a constant succession of easy inflexions, if perfection and economy are sought to be combined. "Laying-out" upon this principle gives some additional trouble to the engineer and his assistants, because it is easier to lay out straight lines than curves; but this additional trouble is unavoidable if we desire to keep clear of ruinous errors in our work. The question is simply whether we are to prefer a railway with vertical inflexions, which must diminish the load, or one with slight horizontal inflexions, avoiding those that are vertical. The correction which I here propose will effect a saving of 2·24 lbs. per ton of gross load in the tractive power on the whole length of this section of the work, besides a considerable saving in the cost of construction.

Torrington-square, 14 Sept. 1852.

J. P. Kennedy,
Major.

RAILWAYS (INDIA).

RETURN to an Order of the Honourable The House of Commons,
dated 8 June 1854;—for,

COPIES “of any DESPATCHES from the Court of Directors of the *East India* Company to the Governor-General of *India* in Council, in reply to their Letter, dated the 4th day of May 1853 (in the Home Department, Railway, No. 4, of 1853, and contained in Parliamentary Paper, No. 787, of Session 1853):”

“And, of any DESPATCHES to the Governments of *Madras* and *Bombay*, regarding the Measures adopted by the Court for extending RAILWAY UNDERTAKINGS in *India*.”

East India House, }
17 June 1854. }

JAMES C. MELVILL.

(*Mr. Aglionby.*)

Ordered, by The House of Commons, to be Printed,
20 June 1854.

COPIES of DESPATCHES from the Court of Directors of the *East India* Company to the Governor-General of *India* in Council, in reply to their Letter, dated 4th May 1853 (in the Home Department, Railway, No. 4, of 1853, and contained in Parliamentary Paper, No. 787, of Session 1853): And, of DESPATCHES to the Governments of *Madras* and *Bombay*, regarding the Measures adopted by the Court for extending RAILWAY UNDERTAKINGS in *India*.

COPY FINANCIAL (Railway) DESPATCH from the Court of Directors of the East India Company to the Governor-General of *India* in Council (No. 8), dated 17th August 1853.

Para. 1. WE have had under our consideration your letter and its enclosures, noted in the margin, regarding the various questions connected with railway undertakings in India, which we referred to you for your opinion and report.

Letter from, No 4
dated 4 May 1854

2. In the first place, we have to express the great satisfaction which we have derived from the perusal of the very able, lucid and comprehensive minute of our Governor-general upon the subject. We entirely concur with his Lordship, that the "magnitude and importance of the question can hardly be overstated;" and expressing, as he does, his sense "of the responsibility which attaches to the expression of an opinion upon measures that will affect so many and such vital interests," we cannot but attach the greatest weight to the recommendations which, with his intimate acquaintance with the subject, and his great opportunities of obtaining local information, he is so eminently qualified to offer.

3. We have also much pleasure in observing that the views of the members of your Government entirely coincide with those of the Governor-general.

4. We will now proceed to consider in their order the various propositions which you have submitted for our decision.

5. The first is, that a general system of railways, connecting the several Presidencies, and constituting the great trunk lines within them, should be sanctioned and executed without delay.

6. We cordially concur in the opinion of the Governor-general as to the great political, commercial and social advantages which must ensue from an extensive and well-devised system of railways in India. The effects are not perhaps within the range of calculation, nor would they be confined to India alone. The benefits resulting from the development of the resources of the country, and more especially from the extended growth and supply of cotton, would, we conceive, be very sensibly felt in this country. We have been anxiously looking forward to the period when a general system of railroads might be undertaken. Their first introduction was necessarily experimental. It was essential that the greatest caution should be exercised in proceeding with undertakings so vast and important. Precipitancy would have produced delay. The subject, however, can now be viewed unobscured by any doubts and fears as to physical impediments and other difficulties, and the only questions for solution are, what lines are best calculated to constitute those trunk roads which shall become the great arteries of communication throughout the country? and what means shall be employed for executing them? And we must here express our satisfaction at the confident expectation of the Governor-general, that on lines "judiciously selected, well and economically constructed, safely and thriftily worked," the returns will be remunerative, and that the Government will never "be called upon, after a line shall be in full operation, to pay the interest guaranteed upon the capital." There is much to encourage

in this opinion. For the financial success of works of public benefit in a country whose population requires all the impulse that English energy and enterprise can give, must have a most salutary effect upon the character and feelings of the people.

7. With respect to the lines required in the Presidency of Bengal, you recommend that the line of railway, by way of the Ganges Valley to the North-west should be completed as far as Delhi with all practicable speed, and be extended through the Punjab, westward, as soon as its construction may be found practicable.

8. Independently of the great economic advantages of this line, the value of a railroad from Calcutta to the North-west frontier, connecting every military station and depôt with Fort William, would, in a military point of view, be incalculable. His Lordship truly observes that the army now maintained might, through the means of such a line, be numerically reduced without diminishing its strength.

9. We give our assent to the immediate commencement in various parts simultaneously of this important line.

10. With regard to the proposed line from Diamond Harbour to Calcutta, the Governor-general states, that "as the dangers of the navigation do not loudly call for this line, as the interests of Government would in no respect be promoted by it, and as it is quite within the compass of joint-stock undertakings," he is very strongly of opinion "that it should not be taken in hand by the Government of India; and that if private parties should engage in it, the Court should not come under the obligation of guaranteeing interest upon the capital raised for it in any amount whatever." We shall act upon this opinion, and reserve pecuniary encouragement for works of greater public importance.

11. We have now to consider the question of connecting the several Presidencies by means of railways. First, with regard to Bengal and Bombay, the Governor-general recommends "that a junction should be formed between the trunk line in Bengal and the Presidency of Bombay, either by the valley of the Nerbudda, or by way of Baroda and Neemuch, but preferably by the latter in the first instance, if further examination should recommend it."

12. His Lordship has well described the great advantages which a line, connecting Upper India with the western ports, and with the Presidency of Bombay, would possess, and has referred to its value as affording the means of conveying military detachments, upon their arrival from Europe, to the Upper Provinces, without loss of time or risk to health. Concurring in the view as to the advantages of a line connecting Bombay with the Upper Provinces of India, and joining the line to be constructed up the valley of the Ganges, we shall be prepared to sanction the adoption of a line of railway by which these objects will be effected as soon as, by actual survey, the best line for this purpose shall have been ascertained.

13. With respect to the lines in the Bombay Presidency, the one of paramount importance is that which shall open a channel for trade with Candeish, Berar, and the cotton-growing districts beyond the Ghats. With this view, the Governor-general recommends the construction, as a local, and not as a great trunk line, of a railroad to connect Bombay with Candeish. But, entertaining doubts as to whether a better passage than by the Thull Ghat may not be found, either by the Taptee line, or over the Syhadree range at some other point, he recommends that the question should be settled by further surveys and examination. This recommendation has our approval, and we shall presently notice the arrangements adopted in view to the survey of the valley of the Taptee and that of the Syhadra range. In conducting the necessary operations for deciding this question, we should wish that ready access to the great cotton districts of Berar be kept in view as one great object of this line of railway. We notice the opinion expressed in your letter of the 19th May last, that "it is very desirable to have good reconnoitring surveys made next cold season by separate parties of both the proposed lines from Bombay to Hindostan, namely, that by the Chumbul, and that by the Nerbudda," and that "it would
be

be a great advantage if one or other of the railway companies were to be authorised to send out parties to make these surveys." We have authorized the Baroda and Central India Railway Company to "take immediate steps for the requisite surveys from Tannah, Callian, or Shawpoor, through the vallies of the Mhye and the Chumbul Rivers, to the Jumna," at or near Agra, and also "of the valley of the Taptee, from Surat, into the country at the back of the Ghats," and we have expressed our desire to the Great Indian Peninsula Railway Company, "that a more general survey should be made of the country between Candeish and some point, such as Allahabad or Mirzapore, in the valley of the Ganges, to which the line of railway might be extended, so as to effect a junction with the railway from Calcutta to Delhi." We are of opinion that, whatever course is finally adopted, the present experimental line at Bombay may properly be continued to Shawpoor, in accordance with the instructions which we have already given for that purpose.

14. We shall also be prepared to sanction a line from Bombay to Poonah, and probably to some further point in the Bombay territories when the best route over the Ghats to that town has been correctly ascertained.

15. With regard to the lines projected in the Madras Presidency, you are of opinion, if present anticipation should be at all fulfilled, that the line from Madras, *viâ* Cuddapah and Bellary, continued so as to unite with the line from Bombay, through Poonah, would form the best trunk line that can be found for uniting Madras and Bombay, and with the general system of "communication throughout the British territories in India." The military power of the British Government would be thereby still further enhanced, and its means of prompt and concentrated action most materially increased. As the connexion of Madras with the port in India, most accessible for communication from Europe, would also be of great value to that Presidency, in a commercial and political point of view, we give our assent to the construction of the line, if the result of the survey shall satisfy you that the projected route is the best that can be found. In the meantime we shall adopt measures in view to the execution of the line from Madras, *viâ* Vellore, Vaneembaddy, and Coimbatore, to the western coast; after which, we shall not object to branches being constructed from this line to Bangalore, and to the foot of the hills towards Ootacamund, if found practicable.

16. We now come to the important question of the agency by which the lines shall severally be constructed.

17. On this point the Governor-general is decidedly of opinion that the construction of the works by a railway company, under the supervision and control of Government, is the best system which is open for our adoption, and we concur in the views which he has expressed on this subject. We do not think that the guarantee of interest can (as has been supposed) under the present plan, have the objectionable effect of encouraging sloth or extravagance. There is not only held out the expectation of the higher remuneration to be derived from economy, but the Government, by its supervision and control, renders itself responsible for the exercise of the utmost care both with respect to the execution of the works and to the selection of the line. It must moreover be remembered, that in guaranteeing interest on the capital subscribed, we by no means guarantee to the shareholders a fixed rate of dividend. We are glad to find that the Governor-general concurs in this view, and that it is also supported by facts. We observe that the experimental line at your Presidency, the cost of which was estimated at from 14,000 *l.* to 15,000 *l.* per mile, will cost under 9,000 *l.* per mile in construction, inclusive of rolling stock, and the chief terminus at Hourah; and this, it should be observed, is probably the most extensive portion of the whole line to Allahabad. Now the general average cost of railways in the United States was, we observe, 9,200 *l.* per mile, and these are lines which are produced as examples of the greatest economy, and described as the cheapest that are constructed. We think, therefore, that there is no reason to be dissatisfied with the result of the experimental line, and we are glad to find that the Governor-general is of the same opinion.

*See Lardner's
Railway Economy,
p. 408.*

18. With regard to the next head, namely, the general principles which ought to be observed in the construction of railways, the Governor-general and all the

professional gentlemen who have been consulted, concur in opinion that the rules proposed by Major Kennedy cannot be universally adopted. It is undoubtedly very desirable to secure the most favourable gradients, and the closest attention and the greatest care should be observed, in order to obtain them when the selection of a line is under consideration ; but we do not think it at all necessary to sacrifice other advantages for the purpose of obtaining such low gradients as Major Kennedy recommends. Many circumstances besides the gradients must be considered in selecting a line of railway, and many districts would be deprived altogether of railway communication if such gradients as he recommends were considered indispensable. We are of opinion that at present, on the railroads in India, land should be taken sufficient to provide for a double line, and that bridges and difficult works should be constructed suitable for a double line, while the ordinary works and embankments should be made for a single line of rails, but so that they may be adapted hereafter for a double line, if the increasing traffic should render the addition advisable.

19. The Government officers should be required to exact the utmost economy, consistent with perfect security and efficiency, in the original construction of the line, and in all buildings and works of every description connected with it. The line when opened for the conveyance of passengers and goods, should in like manner be managed with the closest attention to economy in the working expenses, rather than with a regard to the high rate of speed and frequency of despatch which are the practice on English lines.

20. The last question to be considered is, what companies shall be engaged to undertake the lines above indicated.

21. The Governor-general recommends the immediate prosecution of the great trunk line from Calcutta to the North-west Frontier, and that the several portions of the work should be carried on simultaneously. He is of opinion "that economy and public convenience are promoted by as close an approach to uniformity of management as may be consistent with the exercise of a vigilant and effective control," and does not conceive that the substantive line from Calcutta to Delhi would be more than a single management could safely and effectively control, and that, being so, there would undoubtedly be great convenience and advantage, as well as considerable economy, in one uniform management, extending over the whole of this great trunk line. He does not, however, recommend that the line from Calcutta to Delhi should be given to the East Indian Railway Company, on a monopoly footing, or without giving parties already in the field a right of bidding for the preference, but submits that, in consideration of their having been pioneers of railway enterprise in India, they are entitled to be viewed with some favour when competing for the privilege to extend the work they have commenced over other districts directly connected with that in which they first began ; and he states, "that the public interests would be served by the line from Allahabad to Delhi being granted preferably to the East Indian Railway Company, if it will undertake the work in terms as favourable, or nearly as favourable, as those offered by the Upper India Company."

22. Considering the relative position of the Indian Railway Companies and the Government of that country, the former can only be regarded as agents for carrying out and executing the wishes of the latter, and we certainly do not perceive the necessity of employing a greater number than is consistent with the convenience and advantage of the public service.

23. Under this system we may hope that the usual beneficial effects of competition will be derived from a vigilant Government superintendence, and the inconvenience which would probably result from the pressure of conflicting interests will be avoided. We are even now apprehensive that the competition for freight will create a difficulty, although the railway companies will send their materials to different ports ; but we think that the number of competitors for freight to one port should be limited as far as possible ; and as you are of opinion that a single management could safely and effectively control a line extending from Calcutta to Delhi, we do not deem it expedient to employ two agencies for this line, but shall at once place ourselves in communication with the East Indian Railway Company, in view to making arrangements for the commencement

ment simultaneously, in various parts of the line, as far as Delhi, and for its ultimate extension to the North-west Frontier.

24. We shall be glad if arrangements can be made to allow those who have come forward under the denomination of the Upper India Railway Company, to take a share in the extended undertaking by their amalgamation with the East Indian Railway Company.

25. We have already stated that we have placed ourselves in communication with the Madras and Bombay Railway Companies upon the subject of the extension of the lines in those Presidencies, and we shall acquaint you with the result of our arrangements for the extended survey of the lines above mentioned, so that no time may be lost in giving to India the immense advantages of a ready and speedy intercommunication.

COPY FINANCIAL (Railway) DESPATCH from the Court of Directors of the East India Company to the Governor-General of *India* in Council (No. 10), dated 5th October 1853.

Para. 1. WITH reference to the latter part of our despatch in this department (No. 8), dated 17th August last, we forward, in the Packet, copy of the correspondence which has passed with the respective Indian Railway Companies regarding the extension of railway undertakings in India. See Appendix,
Nos. 1 and 4

2. These papers will explain the nature of the arrangements which we have made.

3. You will perceive that an amalgamation has been effected between the East Indian and the Upper India Railway Companies, and that the one Company has undertaken to construct the line to Delhi within a period of seven years. This work will be commenced in various parts simultaneously, and should any portions that might be worked with advantage be completed before the whole is finished, you will consider the expediency of allowing such sections to be opened, taking care that the capital and revenue accounts are kept distinct.

4. It seems to us especially desirable that the line through the Doab from Allahabad to Delhi should be proceeded with as soon as practicable, and we think the observations of your consulting engineer, in para. 51 of his Report of the 15th March last, upon the advantage of arranging the canal and railway operations with reference to each other, well worthy of consideration.

5. With regard to the means to be employed by the Railway Company for executing the works, we are disposed to think that, considering the magnitude of the undertaking and the comparatively short period fixed upon for its completion, it may be desirable to adopt the system of large contracts. The subject, however, is now under the consideration of the Railway Directors, and we will therefore await the receipt of their propositions before expressing any decided opinion upon the question; but should this plan be adopted, it will be necessary that contractors of great experience and large means should be only employed.

6. The Great Indian Peninsula Railway Company have undertaken to survey the mountainous districts between Bombay and Candeish, and the Bombay, Baroda, and Central India Railway Company will proceed to survey the proposed route into the same province by the coast and the valley of the Taptee. The former company have also engaged to survey the country from Candeish by the valley of the Nerbudda to Allahabad and Mirzapore, and the latter Company, the line from Surat, *via* Baroda and Neemuch, to Agra. When these surveys are completed, they will be submitted for your consideration with such observations and opinions from those engaged as you may have desired, and you will then be enabled to furnish us with your views with respect to the lines which would in all respects be calculated to meet the two-fold object of effecting a junction between Bombay and the line from Calcutta

cutta to Delhi, and of opening the great cotton districts of Berar to the western coast.

7. You will also perceive that we have sanctioned the commencement by the Great Indian Peninsula Railway Company of the line towards Poonah, so far as it will be common for either route over the Ghats. The surveys over these mountains, and of the country beyond towards Bellary, within the limits of the Bombay Presidency, will also be undertaken by this Company.

8. The Madras Railway Company have undertaken the construction within five years of the lines from Madras to Coimbatore and the western coast, with branches to Bangalore and the Ootacamund, also the surveys of the country towards Bellary, in view to ascertaining the best route within the limits of the Madras Presidency for the trunk line to Poonah and Bombay.

9. Should the general directions which the Railway Companies have received not appear to you to be sufficiently full and explicit, you will issue such further instructions as you may deem necessary in view to removing all doubts upon the questions remaining for decision.

10. With respect to the lines which have been sanctioned, we request you will adopt the necessary measures for providing the Railway Company with the land that may be required; and should you be of opinion that any improvement could be introduced into the system of Government control, whereby operations could be simplified or expedited, either by leaving details to the Government engineer, and requiring periodical reports from him, or by any other mode you may consider practicable, you have our full authority for making such arrangements as would effect this object, so long as an efficient superintendence is preserved.

11. The conditions under which these extended works have been undertaken are the same as those contained in the contract for the experimental line, with the exception of the rate of guarantee, and we regret that the state and prospects of the money market would not enable the Railway Companies to raise the required capital under $4\frac{1}{2}$ per cent. per annum.

COPY EXTRACT FINANCIAL (Railway) DESPATCH from the Court of Directors of the East India Company to the Governor in Council at *Fort St. George* (No. 6), dated 7th September 1853.

Letter from in Financial (Railway) Department,
No. 1, of 1853, dated 8 April.

(2.) Noticing the sanction signified by the Supreme Government to the construction of the line of railway as far as Menil, and stating that the necessary measures have been taken for the early commencement of operations, and for carrying out the instructions of that Government for the survey of a line to Bellary, through the Cuddapah district, and of the extension line from Vaniembady *vid* Salem to the western coast, and also of the pass from Vaniembady to Coopum, leading to Bangalore, for a branch line.

15th May 1850, shall form part of a general system, the object of which would be to facilitate communication for political as well as commercial purposes. To such a line we should wish to see all the energies and resources of the Railway Company, in the first instance, directed, under the superintendence of your government.

4. You will perfectly understand that it is not our desire by these observations to retard in any degree the rapid extension of railway works in your Presidency, but that, on the contrary, it is our anxious wish to hasten, by concentrated attention and energy, the completion of that which we consider the most important, viz. the line which shall ultimately form a part of the trunk roads for the Madras Presidency.

5. We

5. We forward, in the packet, copy of a Minute by the Governor-general, dated the 20th April last, upon the subject of railway communication in India, together with our despatch dated 17th August 1853 (No. 8), in reply thereto. The remarks made upon the lines of railway within the Madras Presidency will assist your judgment in the direction of the necessary surveys, preparatory to the adoption of those lines.

See *ante*, p. 3

6. We are now in communication with the Madras Railway Company, in view to the adoption of such measures as may be necessary for commencing forthwith the operations indicated in the above-mentioned documents, and we shall acquaint you at an early period with the arrangements which may be concluded for executing the extended undertakings in your Presidency.

COPY FINANCIAL (Railway) DESPATCH from the Court of Directors of the East India Company to the Governor in Council at *Fort St. George* (No. 7), dated 14th September 1853.

Para. 1. We forward, in the packet, copy of a letter, No. 11, addressed by the Directors of the Madras Railway Company to their agent at your Presidency, regarding the extension of the undertaking commenced by that Company, and the prosecution of the necessary surveys.

See Appendix,
No. 5.

2. With regard to the construction of the line from Madras to Coimbatore and the western coast, we have expressed our opinion that it would be highly desirable to commence the works from the west coast as early as possible, and carry on the lines from both termini simultaneously, as well as at any intermediate points, which may facilitate the early completion of the line.

3. We have sanctioned an increase of three millions and a half to the capital of the Railway Company, this sum being estimated as the amount required for the undertaking. The same terms have been granted for the execution of this work as were accorded to the Railway Company for the construction of the first portion, with a capital of 500,000 *l.* The whole is to be completed within a period of five years.

4. With respect to the surveys through Bellary and Cuddapah to the boundary of the Bombay Presidency, for ascertaining the best route for connecting the two Presidencies, you will observe that it has been arranged to keep the charge separate from the expenditure on the other lines, so that the expenses may be charged against the parties to whom the construction of that line may be ultimately entrusted.

COPY FINANCIAL (Railway) DESPATCH from the Court of Directors of the East India Company to the Governor in Council at *Bombay*, (No. 16), dated 14th September 1853.

Para. 1. We forward, in the packet, copy of our despatch to the Government of India upon the subject of an extended system of railways in India, and we also transmit, for your information, copy of the correspondence that has passed with the Great Indian Peninsula Railway Company, regarding the extension, in a south-easterly direction, of the line in your Presidency, and the surveys to be undertaken by them; likewise the correspondence with the Bombay, Baroda, and Central India Railway Company, respecting the surveys to be conducted by that Company.

Dated 17 August,
1853, No. 8.

See *ante*, p. 3.

See Appendix,
No. 3.

See Appendix,
No. 4.

2 You will perceive by these papers that we have sanctioned the construction by the Great Indian Peninsula Railway Company of the extension of the line from Tannah to such a point on the route to Poonah as it has been represented it will be necessary to reach, whatever pass may be determined upon as the best for crossing the Ghauts; and that we have sanctioned an increase of 1,000,000 *l.* to the capital of the Railway Company for the construction of this line, and for

its being carried on to Poonah. You will, however, understand that no part of this work is to be commenced unless it has been ascertained, to the satisfaction of your Government, that the representations alluded to are correct.

3. This Company have also undertaken the surveys of the mountainous district between Bombay and Candeish, and likewise surveys of the country by way of the Valley of the Nerbudda River to Allahabad or Mirzapore, so as to ascertain, by comparison with the line to be surveyed by the Bombay and Baroda Company, whether this would be the best route for connecting, in the first instance, Bombay with the line of railway from Calcutta to the north-west. The survey of the country within the limits of the Bombay Presidency, in view to the selection of the route for a trunk line from Bombay to Madras, has also been undertaken by the Great Indian Peninsula Railway Company.

4. The expenses for these surveys to the north-east are to be placed to a separate account, in order that they may be charged to the parties to whom the construction of the line is ultimately entrusted.

5. The Bombay, Baroda, and Central India Company has been found for the purpose of constructing a railway from Bombay to the Upper Provinces of India. The Governor-general, in his minute, copy of which we enclose, strongly advocates the expediency of connecting Bombay with the valley of the Ganges by a railway, and we have expressed our entire concurrence in this view. But our desire is to ascertain the best mode of gaining this object, and the surveys between Candeish, *via* the Nerbudda valley, to Mirzapore or Allahabad, and those by Surat, Baroda, and Neemuch to Agra, will furnish the Government with the means of ascertaining this point satisfactorily. The Bombay and Baroda Company are therefore about to undertake the survey of the line last indicated, and likewise the valley of the Taptee into the country at the back of the Ghats. One great object in committing the survey of the last route to this Company, is to obtain a report from parties who may not be in any degree prejudiced in favour of preconceived opinions, or even open to the remark that their reports were not impartial.

6. Although we have not entered into any agreement with the Bombay, Baroda, and Central India Railway Company further than an understanding that the expenses of the survey they are about to undertake will be reimbursed, if they are not employed to construct any of the lines in question, we desire that every facility may be afforded to their officers in the undertaking.

Dated 20 April
1853.

Appendix, No. 1.

COPY CORRESPONDENCE between the Court of Directors of the East India Company and the Board of Directors of the *East Indian* Railway Company. Appendix, No. 1.

(No. 308.)

East Indian Railway Company, 50, Old Broad-street,
London, 28 June 1853.

Sir,

THE Board of Directors of this Company, understanding that the Government of India has recommended a considerable extension of the line of railway now in course of construction by this Company, towards the North-west Provinces of India, and referring to the correspondence which has already passed on the subject, have instructed me to intimate their readiness at once to make arrangements for the completion of the line to Delhi, and, in order to expedite the construction as much as possible, would be glad to be favoured with an early communication on the subject from the Court of Directors.

J. C. Melvill, Esq.
&c. &c.

I have, &c.
(signed) D. J. Noad, Secretary.

Sir,

East India House, 20 July 1853.

I HAVE laid before the Court of Directors of the East India Company your letter, dated the 28th ultimo, expressing the readiness of the East Indian Railway Company to undertake the extension of the line of railway already commenced by them to Allahabad and Delhi.

The Court have likewise had before them a letter from the Government of India on the subject; and, being desirous of adopting measures for the commencement in various places simultaneously of a line of railway from Rajmahal to Delhi, in view to its ultimate extension to the Punjab and North-west Frontier, have desired me to request that the Board of Directors of the East Indian Railway Company will state the amount of capital they are of opinion will be required for the purpose, upon what terms they will undertake to raise it, and within what period they will engage to complete the line.

The East Indian Railway Company are aware that an association entitled the "Upper India Railway Company," have offered to undertake the construction of a line in the North-west Provinces; but as it may be considered that a single agency for the construction of a railway to the North-west Frontier is more consistent with the interest of the public service, it may not be deemed expedient to employ this company; and they have to request that, in the event of the East Indian Railway Company undertaking to raise the necessary capital for the line to the North-west Frontier, some arrangement may be devised for adding a suitable proportion of the capital subscribed for by the Upper India Company to that now to be raised for the extended undertaking, and for admitting a certain number of the directors to the Board of the East Indian Railway Company.

I have also to express the Court's wish that the whole capital of the East Indian Railway Company, including that raised for the experimental line, and the extension to Rajmahal, should receive one uniform rate of interest or profit; and I am desired to request that the directors will communicate to me their opinion as to the practicability of such an arrangement.

D. J. Noad, Esq.

I am, &c.
(signed) James C. Melvill, Secretary.

(No. 315.)

East Indian Railway Company, 50, Old Broad-street,
London, 26 July 1853

Sir,

I AM instructed by the Board of Directors of the East Indian Railway Company to acknowledge the receipt of your letter of the 20th instant. The Board of Directors, fully anticipating the extension of the line now constructing by this company to the North-west Provinces, have had the questions involved in such an event under their consideration for some time past, and are prepared, in accordance with the request contained in your letter, under acknowledgment, to state—

1st. That in their opinion the amount of capital required to carry the line from Rajmahal to Delhi will be 8,000,000 *l.* sterling. This estimate is for a single line, and is framed on the supposition that it will not be considered desirable, in the first instance, to bridge either of the Rivers Soane or Jumna; but should there be an excess over what is required to complete

Appendix, No. 1.

the line to Delhi, then the surplus may be applied either towards this object, or to the construction of the line from Delhi to the North-west Frontier. The surveys made by this company have not at present been carried beyond Delhi, and the Board of Directors are unable to fix the amount of capital required for this latter portion of the work. These surveys can be proceeded with whenever the Court of Directors should think it desirable, and arrangements made for commencing operations.

2d. Assuming the necessary arrangements to be at once concluded, and every facility to be afforded in this country and in India during the progress of the works, the company would undertake to complete the line to Delhi in seven years.

3d. With regard to the terms and conditions upon which the company will provide the capital, I am instructed to state that, adopting the provisions of the first contract on all other points, they will be prepared to raise the required capital, under a guaranteed interest of $4\frac{1}{2}$ per cent. per annum.

The Board of Directors have given this point very mature consideration, and after advising with parties constantly engaged in the largest financial operations, and looking at the nature of the guarantee, they have come to the conclusion that this is the lowest rate of interest under which, in the present state of the money market, the capital could be secured. It will be divided into 400,000 shares of 20 *l.* each, upon which the Board of Directors think it would be desirable at once to make a call of 2 *l.* per share, future calls being made at regular intervals, at the rate of 20 per cent. per annum.

4th. The Board of Directors see no difficulty in appropriating a suitable proportion of the capital to the holders of shares in the association entitled the "Upper India Railway Company," and they will be prepared to elect three members of that association into the Board of this company.

5th. With reference to the concluding paragraph of your letter, I am directed to point out to you, that, so far as the extension of the line from the experimental line to Rajmahal is concerned, no difficulty presents itself; and as the contract for that portion of the line has not been executed in form, it is assumed that it might be merged into the larger one now contemplated.

The Board of Directors see very grave obstacles in the way of reducing the rate of interest guaranteed under the first contract; and as the whole undertaking, including the experimental line, will be conducted as one scheme, so far as profits or losses are concerned, it is hoped that the object of the Court of Directors may be thus attained.

James C. Melvill, Esq.
&c. &c.

I have, &c.
(signed) D. J. Noad, Secretary.

Sir,

East India House, 8 August 1853.

I HAVE received and laid before the Court of Directors of the East India Company your letter, No. 315, dated the 26th ultimo, stating, in reply to my letter of the 20th ultimo, that the Board of Directors of the East Indian Railway Company consider that a capital of 8,000,000 *l.* sterling will be required to carry the line of railway from Rajmahal to Delhi, exclusive of the bridging of the Soane and Jumna Rivers; also stating that the directors are prepared to undertake the completion of the line to Delhi in seven years, and to raise the capital under a guaranteed interest of $4\frac{1}{2}$ per cent. per annum, and that they are prepared to appropriate a portion of the capital to the shareholders of the Upper India Railway Company, and to admit three members of that company to the East Indian Railway Company's Board. In conclusion, you state that there will be no difficulty in merging the capital of the extension line to Rajmahal into that now contemplated; but that the directors see very grave objections in the way of reducing the rate of interest guaranteed under the first contract.

In reply, I am commanded to state that, with respect to the last-mentioned question, the Court regret to find that it is not in the power of the Directors to meet their wishes; but, concluding that the difficulties are very serious, they will not press the point further upon their attention.

With regard to the other proposals of the East Indian Railway Company, the Court desire me to express their acquiescence in them, except that they think the line to Delhi ought to be completed in a less period than seven years. They would wish, however, that, instead of raising the capital of 8,000,000 *l.*, by calls at the rate of 20 per cent. per annum, the time for collecting it should be extended, by calling only 16 *l.* per cent. per annum.

I have, therefore, the commands of the Court to state that they will give immediate instructions to their solicitor to prepare, in communication with the Railway Company's solicitor, a deed of contract upon the terms above specified; the other conditions being similar to those upon which the experimental line from Calcutta has been undertaken. I have also to request that the Railway Company will take the necessary measures for passing any Bill that may be requisite to confer the increased powers upon them during the present Session.

The Board of Directors will clearly understand that all the conditions of the existing contract of 17 August 1849, and of the contract for the extension to Rajmahal, which has not yet been completed, must be considered as applicable to the line from Calcutta to Rajmahal, as if it were a distinct line terminating there.

D. J. Noad, Esq.

I am, &c.
(signed) James C. Melvill, Secretary.

Appendix, No. 2.

COPY CORRESPONDENCE between the Court of Directors of the East India Company and the Board of Directors of the *Madras* Railway Company. Appendix, No. 2.

Sir,

East India House, 20 July 1853.

I AM commanded by the Court of Directors of the East India Company to forward the extract of a letter from the government of India, regarding the extension of railways in the Presidency of Madras, and I am desired to request the directors of the Madras Railway Company will favour the Court with their views as to the best means which could be adopted for carrying out the recommendations of the Government.

James Walker, Esq.

I am, &c.
(signed) *James C. Melvill*, Secretary.

EXTRACT FINANCIAL RAILWAY LETTER from the Government of India (No. 4), dated 4 May 1853.

Para. 4. THE recommendations which we beg to offer to your Honourable Court are as follow :

“ That a general system of railways, connecting the several Presidencies, and constituting the great trunk lines within them, should be sanctioned and executed without further delay.

“ That a line should be formed in the Presidency of Madras by Menil (in which point it has already been sanctioned), Vellore, Vaniembady and Combatore, and thence to the western coast, with a branch to Bangalore, and a branch also to the foot of the hills towards Ootacamund.

“ That another line should be constructed in the Presidency of Madras, from that city, by Cuddapah, to Bellary, and that surveys, &c. should be made with a view to its extension across the table land to Poona, in the Presidency of Bombay, in order thereby to form a junction with the western coast.

“ That the construction of these lines should be committed to incorporated Railway Companies, under the control of the Government, in the manner which has been agreed upon in the case of the East Indian Railway Company.”

(No. 38)

Madras Railway Company, 33, New Broad-street,
London, 25 July 1853.

I AM desired by the Board of Directors to acknowledge your letter of the 20th instant, forwarding extract of a letter from the Government of India, regarding the extension of railways in the Presidency of Madras, and conveying the request of the Honourable Court to be favoured with the views of the Board as to the best means which can be adopted for carrying out the recommendations of the Government.

The Board beg, in reply, to state, that the views and recommendations of the Government of India on this subject are so entirely in accordance with the conclusions which, after mature consideration, they have themselves arrived at, that they have only to express their full concurrence therein, and their readiness to undertake the execution of the lines of railway proposed for the Presidency of Madras as part of the general system.

With regard to the continuation of the line from Menil, by Vellore, Vaniembady, Salem and Combatore, and thence to the western coast, with branches to Bangalore, and the foot of the hills towards Ootacamund, which is the first referred to by the Government of India, and on which we are already at work as far as Menil, and surveying up to Vaniembady, the Board were about to address the Honourable Court, with the hope of obtaining their sanction for entering at once on the construction of the entire line. It has been forcibly pointed out by the Company's chief resident engineer, that the cost of construction is much enhanced by restricting the operations to a small section of the line, since a great part of the establishment must be the same, whether we are making 50 miles or 500, and that in extending our operations towards the Malabar coast, there is this further important consideration, that the line beyond Vaniembady leads through a well-wooded and productive country, where there would be opened many facilities in procuring timber, and other materials for construction, which at the other end of the line are wanting.

For these and other considerations bearing on the early success of the line as a paying undertaking, the Board trust that, in conformity with the recommendation of the Government of India, they may now be favoured with the Honourable Court's sanction to their entering on the construction of the entire line from Madras to the Malabar coast as soon as the necessary extension of their capital and engineering establishment can be arranged.

Appendix, No. 2.

With regard to the surveys through Bellary and Cuddapah, the Court entirely approve of immediate steps being taken for the survey, keeping the charge separate from the expenditure on the former lines, so that the charge may be raised against the parties to whom the construction of that line may be ultimately entrusted.

Colonel D. Sim,
&c. &c. &c.

I have, &c.
(signed) *J. D. Dickinson,*
Deputy Secretary.

Appendix, No. 3.

Appendix, No. 3.

COPY CORRESPONDENCE between the Court of Directors of the East India Company and the Board of Directors of the *Great Indian Peninsula* Railway Company.

Sir,

East India House, 8 February 1853.

THE Court of Directors of the East India Company have had under their consideration the able reports of the Railway Company's engineer and of the superintending engineer to the government of Bombay, upon the surveys which they have made, in view to ascertain the route which it would be most advantageous to follow for the continuation of the line of railway from Callian. Before, however, adopting measures for the ultimate extension of the railway in question, the Court are desirous of possessing the views of the Government of India upon the route which should be followed. These opinions they hope to receive very shortly.

In the meantime, I am instructed to inform you that the Court are prepared to approve of the proposed extension of the present experimental line to Shapoor, for the expense of which the sum of 500,000 *l.*, already agreed to be raised by the Railway Company, may possibly suffice; but as the line will take a different direction to that designated in the existing contract, I am desired to request the assent of the Railway Board to the deviation.

C. Nicholson, Esq.

I am, &c.
(signed) *James C. Melvill,* Secretary.

(No. 16 of 1853).

Great Indian Peninsula Railway Company Offices, London,
No. 3, New Broad-street, 11 February 1853.

Deviation of the Experimental Line to Shawpoor.

Sir,

I AM instructed by the Board of Directors to acknowledge the receipt of your letter of the 8th instant, informing the Board that the Honourable Court are desirous of possessing the views of the Government of India upon the route for the extension of the railway before adopting measures for its ultimate extension; but that in the meantime they are prepared to approve of the proposed extension of the present experimental line to Shawpoor, and request the assent of the Railway Board to this deviation.

I am commanded to inform you that the Board of Directors readily assent to the proposed elongation and deviation of the experimental railway, and they will at once proceed to the construction of the line to Shawpoor. The Board will also consult their solicitors, with instructions that they should confer with the solicitors of the Honourable Court, as to whether there be any necessity for a formal agreement between the Honourable Court and the Railway Company in reference to this deviation supplementary to the existing deed of contract.

J. C. Melvill, Esq.
&c. &c. &c.

I remain, &c.
(signed) *Cornis. Nicholson,*
Superintending Director.

Sir,

East India House, 20 July 1853.

WITH reference to my letter, dated the 8th February last, I am commanded by the Court of Directors of the East India Company to forward the accompanying extract of a letter from the Government of India, regarding the extension of railways in the Presidency of Bombay, by which it will be perceived that the Government feels itself incompetent, for want of sufficient information, to recommend the route which it would be most advisable to adopt, not only for crossing the Ghats, but for the direction of any general line of railway to the Northern Provinces of India, and with a view to a junction with the line to be carried up the valley of the Ganges.

Under these circumstances, the Court desire me to inquire whether the Great Indian Peninsula Railway Company will be prepared at once to proceed with the surveys indicated by the Government of India, in view to the extension, with all practicable despatch, of lines of

of railway in the Presidency of Bombay, in north-easterly and south-easterly directions. It is not the wish of the Court to interfere with the progress of the line to Shawpoor under the instructions already issued. Appendix, No. —

C. Nicholson, Esq.

I am, &c.
(signed) *James C. Melvill*, Secretary.

(No. 63 of 1853.)

Great Indian Peninsula Railway Company Offices, London,
No. 3, New Broad-street, 22 July 1853.

Sir,

I AM instructed by the Board of Directors to reply to your letter of the 20th instant, enclosing extracts of a letter from the Government of India, in which you inquire whether the Board are prepared at once to proceed with surveys of the extension lines of railway in the Presidency of Bombay in north-easterly and south-easterly directions.

2. The Board are prepared to proceed at once with the surveys pointed out, in a north-easterly direction, from Shawpoor, by way of the Nerbudda, to the valley of the Ganges, also in a south-easterly direction from Callian to Poonah, with a view in this last case to obtain a line more favourable than the one already surveyed across the Bhore Ghaut. These surveys shall be commenced immediately, and be prosecuted with the utmost despatch. The cost of making these surveys will be placed to the separate account already opened, and kept apart for the expenses of the extension lines, as directed in the Honourable Court's letter, dated 4th October 1851.

3. The Board desire, however, to represent to the Honourable Court, that, inasmuch as the surveys here indicated will require a considerable period for their accomplishment, the works on the contemplated extension lines should not be altogether kept in suspense whilst these further surveys are being made.

4. The most expeditious and economical system of management with a miscellaneous staff of officers is to proceed simultaneously with the construction of proximate and progressive sections of the railway, and with surveys of further more distant portions of country. The Board have so far successfully pursued this plan, and the circumstances of the extension lines invite the adoption of the same policy, consistently with the views of the Honourable Court, and the Government of India, as expressed in your present communication.

5. The present cost of the Company's Establishment in Bombay is about 1,200 *l* per month, and without very materially increasing the cost of this establishment, the Board can carry on the works of the extension lines, hereafter more particularly pointed out, at the same time that the surveys previously mentioned are going on, whilst, on the contrary, if all works of construction are held in abeyance until those surveys are completed, a great waste of money, as well as a great loss of time, must ensue.

6. The Government of India state emphatically, in the letter from which you here furnish extracts, "that a line to Kandeish and a line to Poonah should both be undertaken."

7. First, with reference to the line to Poonah, the south-east line. The Board respectfully request that the Honourable Court will at once sanction the extension line from Callian to Poonah. Preliminary surveys have been made by the Bhore Ghaut, the distance from Callian to Poonah is $81\frac{1}{2}$ miles, and the estimated cost is in gross 910,500 *l*, or 11,200 *l* per mile on the average. The Company's chief resident engineer distinctly states in his report that there is a probability of obtaining, by more mature surveys, a more favourable passage than the Bhore Ghaut by taking an opening called the Kusoor Ghaut (north of the Bhore), and if that were not so, the Bhore Ghaut line itself can be amended on a further survey. But the first portion of this south-east extension line, viz. from Callian to the foot of the ascent, is most favourable, and may be taken to a considerable distance in the right line of direction for Poonah, whichever Ghaut may be ultimately preferred. The works are best indicated by the estimate, which, for 31 miles, is only 177,700 *l*. in gross, or at the rate of 5,700 *l*. per mile. There can be no reason, therefore, why the works on this section ought not to be proceeded with immediately from Callian to a point in the Oolassa Valley, which will suit either alternative line, whilst the further surveys beyond it are being carried out, it being understood that the line to be adopted shall be that which gives the best passage of the Ghauts, to be taken with the approbation of the engineer officers of the Government.

8. Secondly, with reference to one of the alternative north-eastern extension lines, namely, the one from Shawpoor direct to Kandeish. It appears evident, from the map of India, that, however valuable a line of railway may be from Shawpoor, by way of Baroda, to the Valley of the Ganges, such line cannot accomplish the purposes, or supersede the necessity of a railway directly into the heart of Kandeish, the great cotton field of India, which has always been the primary object of the establishment of this Company. The Board, therefore, respectfully request the sanction of the Honourable Court to the north-east extension line, from Shawpoor to Munmar, near Malligaun, in Kandeish. The distance is 110 miles, and the estimated cost is 996,400 *l*. in gross, or at the rate of 9,060 *l*. per mile. The Board cannot but feel, by the observations in the letter of the Government of India, that an

Appendix, No. 3.

extreme view has been taken of the supposed difficulties of this section of the railway. The ascertained cost of the railway works and stock from Bombay *via* Callian to Shawpoor, 50 miles, is about 600,000 *l.* in gross, or at the rate of 12,000 *l.* per mile, whilst the estimated cost of the works and stock, from data which experience dictates, of the line from Shawpoor to Munmar, is only 996,400 *l.* or 9,060 *l.* per mile. The Board refrain at this time from any discussion respecting the inclines, because their consulting engineer, Mr. Robert Stephenson, has expressed an opinion in confirmation of that of the chief resident engineer, that the proposed incline at the Thull Ghaut can be worked without difficulty by the ordinary locomotive, even if the present gradients be not improved by further surveys, which it is expected they will be. What the Board, therefore, desire to do, is to proceed without delay in the construction of one north-east extension line from Shawpoor to Munmar, in Kandeish, which can be finished whilst the surveys of the two extension lines already indicated are being prosecuted, the line to be adopted being that which gives the most favourable passage of the Ghauts under the sanction of the Government engineers.

9. This line, from Shawpoor to Munmar, in Kandeish, can ultimately be made part of a grand trunk railway from Bombay, through Kandeish, across the Nerbudda, to unite with the Bengal railways, if the surveys now to be undertaken testify in favour of that general route, or it may either be terminated at Munmar, or extended in the direction of Oomrawatty, if the general route by way of Baroda be preferred, and in this case be worked as a branch line, one which, in any event, the Board must always regard as a most important part of the undertaking. The traffic returns printed in the Bombay Government Gazette abundantly justify the line to Munmar merely as a branch. The Board are prepared to show to the Honourable Court that, independently of the line projected by way of Baroda and the Taptee, and whatever may be the result of the surveys now mentioned for the general route of the trunk line intended to connect Bombay with the Valley of the Ganges, this line from Shawpoor direct into Kandeish and the Valley of the Godavery is absolutely indispensable.

10. The Board desire to express their lively sympathy with the language of the Government of India, that these lines of railway "should be sanctioned and executed without further delay;" and they rejoice to think that they can, in the manner just pointed out, at once proceed with the construction of two divergent indispensable sections, simultaneously with the prosecution of the surveys which the Honourable Court now desires them to undertake. They therefore, in conclusion, request the sanction of the Honourable Court to these works, and also that the Honourable Court will authorise them to raise a further capital of two millions of pounds sterling for the purpose.

To J. C. Melvill, Esq., &c. &c.
East India House.

I remain, &c.
(signed) *Corn' Nicholson,*
Superintending Director.

Sir,

East India House, 10 August 1853.

I HAVE received and laid before the Court of Directors of the East India Company your letter dated the 22d ultimo, expressing the readiness of the Board of Directors of the Great Indian Peninsula Railway Company to undertake the surveys indicated in the extracts from the letter from the Government of India, which were forwarded to you with my letter of 20th ultimo, and requesting the sanction of the Court to proceed with the construction of lines of railway to Munmar in Kandeish, and towards Poonah.

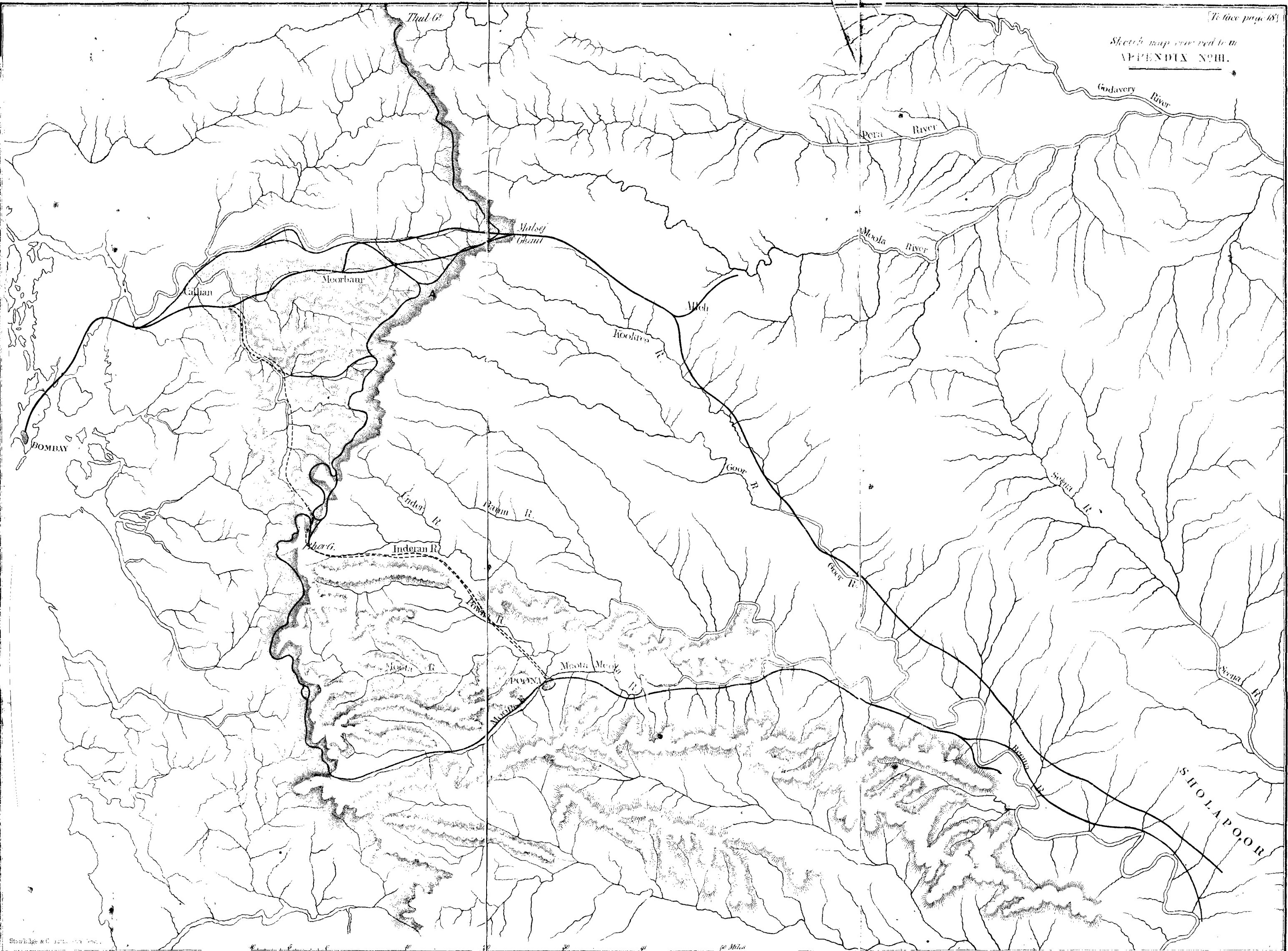
In reply, I am desired, by the Court of Directors of the East India Company, to state, that until the result of the surveys which are about to be undertaken to ascertain the best route for reaching Kandeish is known, the Court must suspend their sanction to the prosecution of any line in that direction. The Court request, therefore, that the Great Indian Peninsula Railway Company will at present confine themselves to adopting immediate measures for surveying the Passes over the Syadree range, in order to ascertain if a more favourable line can be found than the one proposed over the Thul Ghaut, and also whether, by more accurate investigation, some means of further improving this last-mentioned Pass may not be discovered. It is desirable, also, that a more general survey should be made of the country between Kandeish and some point, such as Allahabad or Mirzapore, in the Valley of the Ganges, to which the line of railway, if it is carried over the Thul Ghaut, might be extended, so as to effect a junction with the railway from Calcutta to Delhi. With that view, I am desired to request that the necessary steps may be taken for conducting the surveys during the approaching cold season.

With respect to any further extension of the line toward the south-east beyond Poonah, I am also directed to request that the Board of Directors will undertake the surveys of the country within the boundary of the Bombay Presidency. It should be borne in mind, in laying out any such line, that it should be so done as to form part of a great trunk line, connecting Bombay and Madras, if that line is ever made.

What arrangements shall be ultimately made for the construction of this line will be a subject for future consideration, and you will clearly understand that the authority and sanction given at present is merely confined to the necessary surveys.

The Court understand, from your letter, that there is a point on the route from Bombay to Poonah, to which it has been ascertained the line must be carried, at whatever part the passage of the Ghauts is effected. Should this have been clearly ascertained to the satisfaction

Sketch map referred to in APPENDIX No. III.



Stoddard & Co. cart. & engr.

Scale 1:100,000

APPENDIX N^o IV continued.

SECTION OF IMPULSIVE INCLINES.

In the Section underneath, the Red Dotted line shows the usual method of rising an ascent by a continued incline. The rise per mile in this case is 16 feet. The gradient, 1 in 330, requiring a tractive power of 12⁷⁰ lbs. per ton, to overcome friction and gravity for slow motion.

The Red continued line shows how the same ascent of 16 feet per mile is surmounted by the use of impulsive inclines. The velocity of the train in arriving at the foot of each short Incline is sufficient without any aid from the Engine, to carry the train to the top, when the velocity becomes again accelerated on the level so as to carry it up the next short ascent, and so on with these alternate levels and ascents.

The tractive power required in this case to overcome friction and gravity on the regulating plane, is only 6 lbs. or less than half of that required on the continued Incline.

14 Sept. 1852 54 Torrington Square
J. Kennedy Esq.



faction of Government, the Court will assent to the commencement of the construction of the line as far as this point without delay; and they are prepared to sanction such increase of the capital of the Great Indian Peninsula Railway Company, as may be required for the purpose, and to guarantee an interest, at the rate of 4½ per cent. per annum, upon the terms and conditions which have hitherto obtained with respect to similar guarantees.

I have further to add, that the Baroda and Central India Railway Company will be instructed to undertake the surveys along the coast to Surat and Baroda, and by the valleys of the Mhye and Chumbul Rivers, towards Agra, as well as from Surat, along the line of the Taptee, into Kandeish, and the cotton-growing districts east of the Ghauts.

C. Nicholson, Esq.
&c. &c. &c.

I have, &c.
(signed) James C. Melvill,
Secretary.

Great Indian Peninsula Railway Company Offices, London,
No. 3, New Broad-street, 12 August 1853.

Sir,

I AM instructed by the Board of Directors to acknowledge the receipt of your letter, dated 10 August instant, requesting the Board to make surveys for the extension lines on the north-east from Callian, *via* Kandeish, to the Valley of the Ganges, at Allahabad, or Mirzapore, and also on the south-east from Callian, across the Ghauts, to Poonah, and thence to the boundary of the Bombay Presidency; also sanctioning the construction of the south-east line of railway to such a point on the route to Poonah as will serve whatever passage of the Ghauts may be ultimately adopted, and signifying the readiness of the Honourable Court to guarantee interest, at the rate of 4½ per cent. on such amount as may be required for this purpose.

2. The Board regret that the Honourable Court has not sanctioned the construction of the line from Shawpoor into Kandeish, nor given them an opportunity of showing (as was stated in my letter of 22 July ultimo, they were prepared to do), that let the results of the proposed surveys by way of Surat and Baroda, in comparison with the Thull Ghaut line, be what they may, the direct line into Kandeish and the cotton field, already surveyed by this company, ought to be constructed, as necessary for the interests of the country.

3. The Board must, however, yield in their desired policy to the authority of the Honourable Court, and they will at once proceed with the surveys detailed in your letter under acknowledgment.

4. The Board will also proceed without delay in the construction of the first portion of the extension line from Callian towards Poonah. It is observed in your letter, in reference to the capital of this portion of the Railway, that the Honourable Court sanction only the raising of such capital as may be required for the purpose of constructing this indefinite portion of railway.

5. The Board beg to represent to the Honourable Court, that it is impossible to calculate what may be the amount of capital necessary for its construction; nor is it possible to say what may be the cost of the extended surveys now ordered by the Honourable Court, added to the expenses already incurred of surveys which have to be discharged out of the extension capital; and even supposing that it were in the power of the Board to make an approximate estimate of the cost of these joint operations, it would not be politic to enter into a contract with the Honourable Court for a small and uncertain amount, or ask the sanction of the shareholders to the issue of an unequal number of shares of a different denomination to the existing capital of the company. What the Board propose to do, therefore, is, to convene immediately a special meeting of the proprietors, and ask their sanction and authority to the creation of 100,000 shares (the same number as is now on the register) of the nominal value of 20 *l.* per share, making a present nominal "extension" capital of 2,000,000 *l.* The calls will, of course, be made only when and as monies may be required, under the sanction of the Honourable Court.

6. The Board further request that, in the instructions now to be given to the solicitors, in respect to a contract deed for carrying out the extension lines, the contract may be made to comprehend whatever capital may be required for the extension lines, so as to preclude the necessity for fresh contracts and agreements at every successive stage of the works. The Board have also another reason for making this request, namely, that it is possible they may have to apply to Parliament next Session for a short Act, giving unquestionable authority for making the varying rates of interest upon the experimental and extension capital chargeable alike upon the profits of both as one line. In such Act the amount of capital ought to be sufficient for all the contemplated extensions, and ought to accord with the formal contract or agreement now required to be executed.

To J. C. Melvill, Esq.

I remain, &c.
(signed) Corn^d Nicholson,
Superintending Director.

Appendix, No. 3.

Sir,

East India House, 27 August 1853.

I HAVE received and laid before the Court of Directors of the East India Company your letter, No 72, dated the 12th instant, in which you express the readiness of the Great Indian Peninsula Railway Company to undertake the surveys indicated in my letter of the 10th instant, and also the construction of the line towards Poonah; and in view to making arrangements for the commencement of operations, the Railway Board suggest the expediency of increasing their capital by the nominal amount of 2,000,000 £, in 100,000 shares, the calls being made as required under the sanction of the Court.

In reply, I am commanded to inform you, that, having considered the circumstances represented in your letter, the Court are of opinion that a capital of one million will be sufficient for the object now contemplated, and they are prepared to guarantee an interest of 4 ½ per cent. upon that amount, the same conditions being applied to this extended undertaking as are contained in the contract for the experimental line.

In issuing the new shares, the Court would wish that a call of 2 £. per share should be made.

With reference to this disappointment expressed by the directors at the postponement of the construction of the line into Kandeish, I have only to repeat that the Court cannot sanction a line that has not been recommended by the Supreme Government. The Board of Directors must be aware that the Government of India has not only declined to recommend the route proposed by the Railway Company, but has expressed doubts as to whether a better line for reaching Kandeish may not be found by making more extensive surveys. The Court trust that these surveys will be made during the ensuing cold season, and that the means will thus be afforded of enabling the authorities to arrive at a satisfactory conclusion on the question at issue.

I have further to add, that instructions will be given to the East India Company's solicitor to prepare, in communication with the Railway Company's Solicitor, a deed of contract for the construction of the extension lines, and that the suggestion contained in the last paragraph of your letter under reply will be referred to them, in view to its being carried out, if possible.

C. Nicholson, Esq.

I am, &c.
(signed) J. D. Dickinson,
Deputy Secretary.

Appendix, No. 4.

Appendix, No. 4.

COPY CORRESPONDENCE between the Court of Directors of the East India Company and the Board of Directors of the *Bombay, Baroda and Central India Railway Company.*

Sir,

141, Fenchurch-street, 8 March 1853.

THE directors of the Baroda and Central India Railway Company request that you will have the goodness to inform the Court of Directors of the East India Company that they have taken the requisite preliminary steps to obtain from Parliament an Act to incorporate their company, of which the accompanying is the Parliamentary Bill prepared for that purpose; and as this Bill is now about to be brought forward in the House of Commons, this Company trust that it will receive the support of the Court of Directors of the East India Company; this company clearly understanding that such support shall not be considered as altering their position in respect to such decision as the Government of India may think fit to arrive at on the subject of their memorial, which has been transmitted to the local authorities in India.

J. C. Melvill, Esq.,
Secretary to the Court of Directors of
the East India Company.

(signed) Robert Scott,
Honorary Secretary.

Sir,

East India House, 15 March 1853.

I HAVE laid before the Court of Directors of the East India Company your letter dated the 8th instant, forwarding a copy of the Parliamentary Bill for incorporating the Baroda and Central India Railway Company, and expressing the hope of the directors of that company that the Bill will receive the support of the Court. In reply, I am instructed to inform you, that, adverting to the correspondence which has already passed upon the subject of the railway in question, and to the fact that the propositions of the railway directors are now under the consideration of the Government of India, who have been requested to communicate their views to the Court at as early a period as may be practicable, the Court are of opinion that, pending a reply to this reference, any further proceedings in the matter should be suspended.

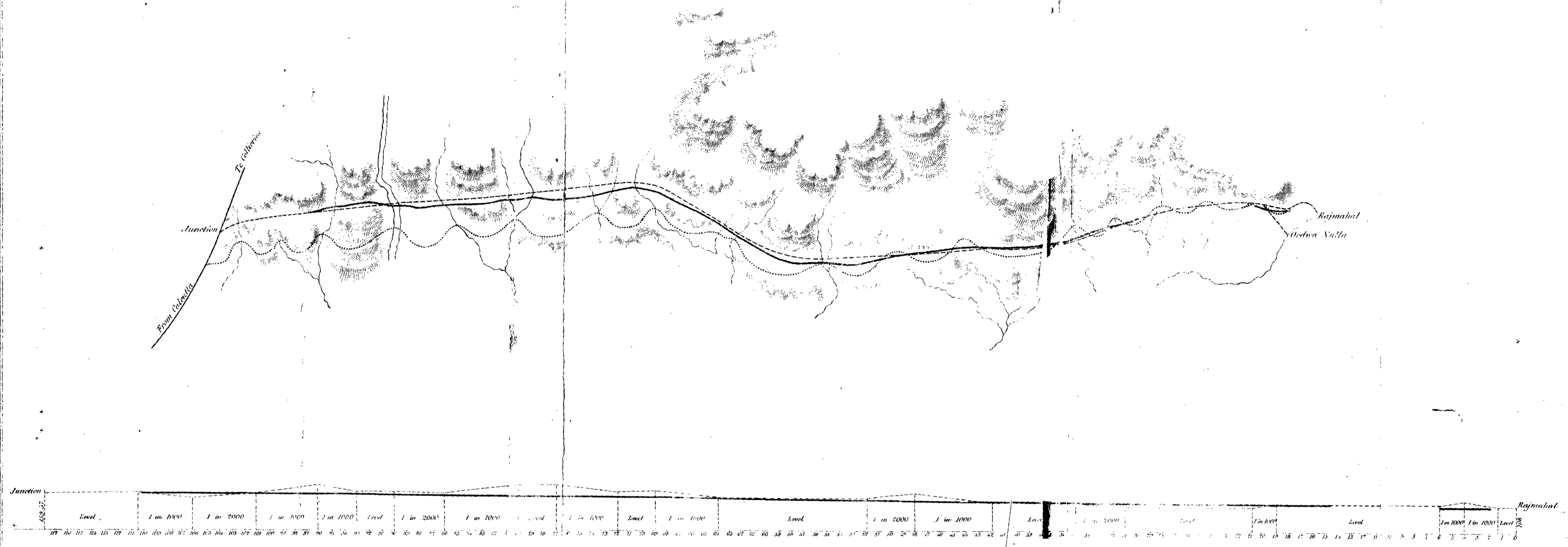
Robert Scott, Esq.,
Baroda and Central India Railway Company,
141, Fenchurch-street.

I am, &c.
(signed) James C. Melvill,
Secretary.

Appendix N^o V.

SKETCH PLAN AND SECTION OF THE PROPOSED LINE OF RAILWAY BETWEEN THE COLLIERY JUNCTION AND RAJMAHAL IN BENGAL,

to illustrate the method of "laying-out" with a view to avoid unnecessary Gradients, and to obtain the most perfect line with the smallest amount of Cuttings and Embankments.



Jermyn Square 14 Sep^r 1852
J. Kennedy Major

Sir,

141, Fenchurch-street, 17 March, 1853.

Appendix, No 4.

THE directors of the Baroda and Central India Railway beg to acknowledge the receipt of your communication, dated the 15th instant, stating the opinion of the Honourable Court of Directors that further proceedings for obtaining their Act of Incorporation should be suspended pending a reply on the subject of their project.

In reply, the directors of this Company have only to assure the Honourable Court that the sole object they had in introducing their Bill this Session was to save a year in commencing active operations in the event of the decision of the Government of India being favourable to their undertaking.

The opinion of the legal gentlemen who conduct their Bill is, that proceedings may be suspended until May, and still leave time to carry it through before the rising of Parliament.

The directors have therefore ordered that proceedings shall be suspended for that period, trusting either that the opinion of the Indian Government may reach England in the meantime, or that if it should not, the Honourable Court may then see the public importance of allowing them to proceed with their Bill.

To J. C. Melvill, Esq.,
&c. &c.

I have, &c.
(signed) Keane, Acting Chairman.

Baroda and Central India Board, 141, Fenchurch-street,
5 July 1853.

Sir,

REFERRING to your letter of the 15th March last, the Board of Directors of the Baroda and Central India Railway Company having understood that the report of the Government of India upon the project submitted by this company had reached the Honourable the Court of Directors by the last mail, will now feel obliged for the reply of the Honourable Court, in order that, should that reply be favourable to their project, or to any judicious modification of it, the requisite steps may be taken to making the ensuing cold season available to the utmost extent for the survey of the line in detail, and the commencement of such portion of the work as may be found practicable.

To James C. Melvill, Esq.,
Secretary to the Honourable Court of Directors
of the East India Company.

I have, &c.
(signed) P. T. French,
Acting Chairman.

Baroda and Central India Railway Board,
141, Fenchurch-street, 25 July 1853.

Sir,

IN reference to the interview which the chairman and deputy-chairman of the Honourable Court of Directors were so good as to give this day to the directors of the Baroda and Central India Railway Company, and in reference to the recommendation of the Supreme Government of India, that a survey should be immediately prepared of the line projected by this company;

I am directed to request that the Honourable Court would adopt our company as the agency for obtaining the survey required.

James C. Melvill, Esq.
&c. &c.

I have, &c.
(signed) Keane, Acting Chairman.

Sir,

East India House, 10 August 1853.

I HAVE received and laid before the Court of Directors of the East India Company your letter, dated the 5th ultimo, requesting a reply to the proposition of the Baroda and Central India Railway Company for the construction of a line of railway from Bombay to Agra, in order that the requisite steps may be taken to make the ensuing cold season available for the survey of the line in detail, and the commencement of such portion of the work as may be found practicable, likewise the further letter from Lord Keane, dated the 25th ultimo, upon the same subject.

In reply, I am instructed to forward, for the information of the directors, the extract from a letter from the Government of India, and from a minute of the Governor-general, in answer to the reference which I stated in my letter to Lord Keane of the 9th February last had been made to that Government regarding the line of railway proposed by the Baroda and Central India Railway Company.

It will be seen by these extracts that the Government of India, although sensible of the importance of connecting Upper India with Bombay and the western coast, does not feel itself in a position to recommend the adoption of any line without complete surveys being made of the country through which it has been suggested the railway should pass.

The Court would therefore suggest, that the Baroda and Central India Railway Company will take immediate steps for making the requisite surveys from Tanah, Callian, or Sharepoor, *via* Baroda, through the valleys of the Mhye and the Chumbul Rivers, to the Jumna, at or in the immediate neighbourhood of Agra, and also of the valley of the Taptee, from Surat, into the country at the back of the Ghats, with the view of ascertaining if a good communication can be made by this route from Bombay to the great cotton-

Appendix, No. 4. growing districts of Kandeish and Berar, the expenses which will be incurred on account of these surveys remaining for adjustment when the results are known.

Major P. T. French,
Baroda and Central India Railway Company,
141, Fenchurch-street.

I am, &c.
(signed) *James C. Melvill*,
Secretary.

Appendix, No. 5.

Appendix, No. 5.

COPY LETTER from the Board of Directors of the *Madras Railway Company* to *Edward Smalley, Esq.*, their Agent at *Madras* (No. 11).

Sir,

London, 22 August 1853.

I HAVE the honour, with the concurrence of the Board, to forward, for your and Mr. Bruce's information, copy of correspondence with the East India Company on the subject of continuing the survey of the line of railway now under construction beyond Vaniembady, through Salem and Coimbatore, to the western coast, with branch lines to Bangalore, and the foot of the Neilgherries, and of surveying a second line of railway from Madras, through Cuddapah to Bellary, to be continued ultimately towards Bombay, to meet a line from that Presidency.

2. The Board, as you will see, has applied for authority to send out four additional engineers, which will no doubt be granted, to enable you and Mr. Bruce to carry the wishes of the East India Company into effect, and it is hoped that at least two of the four will proceed by the steamer of the 4th October, to arrive in time to begin the surveys at the commencement of the favourable season. Mr. Bruce will thus have ultimately seven assistants, one of whom it is intended shall be a man of superior knowledge and experience.

3. Mr. McMaster went by the steamer which sailed on the 20th, and with his aid it is hoped that Mr. Bruce will be able to proceed at once with the survey on to Vaniembady, and thence to the western coast. On this line it is believed that the only uncertain portion is the descent into the Salem Valley from the Barrahmahl, which has not yet been minutely examined, but it is expected that a suitable pass or opening will be found without much difficulty. Major Pears has already discovered a convenient pass through which the branch line will ascend to Bangalore.

4. The country through which the line from Madras to Bellary will proceed is not so well known, and its examination and survey call for particular attention on the part of Mr. Bruce. There are several routes by which the Bellary district may probably be approached. The minute of the Governor-general appears to point to the Cuddapah Valley, ascending from the Carnatic by the Triputy Pass, and that line possesses considerable advantages. It is rather the shortest, passes through the centre of the Cuddapah district, and follows the present route of greatest traffic. The Triputy Pass will probably be found to be not very steep; but it is feared that the construction of a railway may prove expensive, from the necessity of crossing a number of rivers, and the country being otherwise difficult.

5. There is another route by Palmanair to the Bellary district which deserves attention, and on which there is at present considerable traffic: it leaves the greater part of the Cuddapah district on the right, and would not therefore prove so directly beneficial to it as the preceding line, but it passes through the principal cotton country. On this subject you will find in this packet a useful memorandum by Major Montgomery, who is well acquainted with the part of the country, having surveyed it, and to which the Board would wish Mr. Bruce to give his attention.

6. There is a third route more to the north, leaving the Pulicat Hills to the south, and ascending by the valley of the Pennaur. This has the disadvantage of being the longest; but possibly it might prove the easiest of construction, and, in a commercial point of view, the most beneficial and remunerative.

7. The relative value and merits of the several lines can, however, only be determined with accuracy by careful examination and surveys, and the chief object in now alluding to them is to direct Mr. Bruce's attention to the subject previously to the arrival of the engineers, and he may perhaps have an opportunity of taking a general survey of the country during the cool weather, when it can be done with most comfort and least risk.

8. An additional supply of surveying instruments and stationery, as per accompanying list, will be forwarded; and if Mr. Bruce requires a larger number of any particular instrument, or any instruments not included in the list, his wishes will be immediately attended to.

9. By Mr. M'Master are forwarded sections of the map of India on a large scale, which will be found useful, and save much time and labour in the approaching surveys, and also a plan of the "permanent way" of the railway prepared by Mr. Rendel, and recommended by him to be adopted.

10. The Board wish to be favoured at Mr. Bruce's earliest convenience with his opinion on "the permanent way" as applicable in all respects to the Madras railways, and particularly on the following points: the weight of rails best suited to Madras, considering the probable traffic and the effects of the climate on the iron; the fish joints, and the triangular form of the sleepers, and the necessity of coating the rails and other iron-work with coal-tar, or other preparation, as a protection from rust. The present high price of iron, together with the cost and difficulty of obtaining freight, render it very desirable that heavier rails and chairs be not used than absolutely required for durability and efficiency. In the Bombay railway the weight has recently been reduced to 65 lbs. to the lineal yard, chiefly on the ground of the additional strength and durability communicated by the fish joints, while in Bengal and Madras it is 84 lbs. still.

11. The Board has had under its consideration the question of medical attendance to the servants of the railway, and has made inquiries as to the practice in that respect in Bengal and Bombay. It would appear that in Bengal, by a private arrangement with the zillah surgeons, medical aid is obtained from them to the workmen and servants employed within their respective zillahs, but that no allowance is made at the Presidency; while at Bombay the only assistance is the privilege of obtaining medicines, without paying for them, from the Government dispensaries.

12. The Board, after fully discussing the question, consider it objectionable to supply medical attendance to the officers of the Company, because their salaries are supposed to provide for all personal expenses, and are fixed on that principle. But it is somewhat different with the subordinate servants and workmen, who in such an undertaking are liable to accidents in the execution of their duties, and to much exposure occasionally in unhealthy parts of the country, and have not the means nor opportunity of always procuring for themselves medical aid when required. It may, therefore, be proper that some provision should be made for medical attendance along the line, to parties employed at a distance from the Presidency, and the Board will not object to the entertainment of one or more apothecaries for that purpose if found necessary. Under this view of the question, it will be necessary to discontinue the employment of Mr. Saunderson, reported in your letter of the 7th July.

13. Considering the additional duty and responsibility which will devolve on Mr. Bruce, from the extended field of operations on which this Company is now called upon to enter, the Board has intimated to the East India Company its intention, with their sanction, of raising Mr. Bruce's salary at once to 1,500 l. a year.

14. Tenders will be immediately invited for the supply of the articles noted in the margin, to complete the construction of the railway to Memil; and it will be desirable to receive hereafter from Mr. Bruce indents, of a list of such articles as he may require from time to time for proceeding with the undertaking, giving as long warning as possible, as freight cannot always be readily obtained. The Board also wish Mr. Bruce to take into his early consideration the description of engines and carriages best suited to the railway, and to favour us with his opinions and suggestions on that important subject. In regard to carriages, it is expected that it will be necessary to send only the ironwork from this country, and to have the woodwork made up in India.

	Tons.
Rails, 84 lbs. to the lineal yard	3,000
Chairs - - - -	2,000
Fishing Plates - - -	330
Bolts, Nuts, and Washers -	55
Wood Keys, No 10,000, (of which 500 are for joint Chairs).	which
Wood Trenails, No. 10,000.	

15. With respect to supplies from England, it is the wish of the Board to be guided, as much as possible, by requisitions from you and Mr. Bruce; for being on the spot, you are the best judges what the country furnishes beneficially; but it is necessary that all indents for articles and applications for servants be submitted to and sanctioned by the Madras Government before being sent to us.

I am, &c.
(signed) *Duncan Sim*, Chairman.

RAILWAYS (INDIA).

COPIES of DESPATCHES from the Court of Directors of the *East India* Company to the Governor-General of *India* in Council, in Reply to their Letter, dated 4 May 1853; and of DESPATCHES to the Governments of *Madras* and *Bombay*, regarding the Measures adopted by the Court for extending Railway Undertakings in *India*.

(*Mr. Aglionby.*)

Ordered, by The House of Commons, to be Printed,
20 June 1854.

318.

Under 4 oz.

EAST INDIA RAILWAYS.

ABSTRACT

OF

RETURN to an Order of the Honourable The House of Commons,
dated 30 March 1855;—for,

COPIES OF EXTRACTS “ of CORRESPONDENCE between the COURT of DIRECTORS of the EAST INDIA COMPANY and the several Governments in *India*, relative to the Progress of Railway Undertakings in *India* (in continuation of Parliamentary Paper, No. 318, of Session 1854).”

MINUTE by the Most Noble the Governor-General, dated 12 October 1854.

1. THE Secretary to the Government of Bombay has transmitted the Minutes of the Governor and of the Members of Council upon the first Report, which has been submitted by Lieutenant-colonel Kennedy, on behalf of the Bombay, Baroda and Central India Railway Company. Bombay, Baroda and Central India Railway.

Observations by Major Crawford, the consulting engineer, upon Colonel Kennedy's Report, have also been transmitted.

The Report itself is not included among the papers sent; I therefore transfer to the Home Department the Report, together with maps, plans, and other documents, which Colonel Kennedy was so good as to forward to me privately, in my last.

I annex also two notes of Colonel Baker, our consulting engineer, to whom these papers were referred, in order that I might have the advantage of his opinion before proceeding to form my own judgment upon them.

2. I am desirous of acknowledging in the first instance my obligations to the Governor of Bombay, and to the Honourable Mr. Lumsden, who have discussed this important question with so much ability, care, and local knowledge as to have rendered the discussion itself complete, and to have left me little more to do than to record the conclusions to which I have come.

I am no less desirous of acknowledging my obligations to the consulting engineer, Major Crawford; although I find myself unable to concur in some of his views, they well deserve the attention and respectful consideration of us all.

3. Colonel Kennedy has proposed that a railway should be constructed from Bombay by Surat and Broach to Baroda, and that from Baroda the line should be carried onwards, either by way of Neemuch to Agra, or further to the westward by way of Ahmedabad and to Delhi. Preliminary surveys of the line from Bombay by Baroda and Neemuch to Agra have been made. As yet no survey has been made of the alternation line from Baroda to Delhi by way of Ahmedabad.

If connexion with this main line, Colonel Kennedy has proposed various branches to Indore, &c. &c. He has also proposed a very extensive branch line, whereby a communication would be opened between Candeish and the Port of Surat, by way of the valley of the Taptee River.

4. The leading object of the company which Colonel Kennedy represents is to carry into execution that portion of the scheme for railways in India, which recommended that “a junction line should be formed between the above-mentioned trunk line (in Bengal and Hindoostan) and the Presidency of Bombay, either by the valley of the Nerbudda, or by way of Baroda and Neemuch, but preferably by the latter in the first instance, if further examination should recommend it.

Minute, 20 April
1853, p. 99.

5. The main question, therefore, for the consideration of the Government of India is, whether the project submitted by Colonel Kennedy is well calculated to form the junction above described, and whether it should now be sanctioned wholly or in part.

6. There is also an important, though secondary, question for consideration, viz., whether the line from Surat, by way of the Taptee Valley, into Candeish, proposed by Colonel Kennedy, should receive the sanction of the Government of India, in preference to the line from Bombay into Candeish, by way of the Thull Ghat, which has already been proposed by the Great Indian Peninsular Railway Company.

I shall take these questions in their order.

7. However widely the opinions now before us, relative to the several schemes projected by Colonel Kennedy, may differ upon some points, all unanimously concur in holding that if a junction is to be formed between the western coast and the railways of Bengal and Hindostan, the line between Baroda and Bombay ought to receive the sanction of the Government of India as the best suited for effecting that purpose.

Minute, 18 July
1854, p. 47.

The Governor of Bombay observes: "I have myself no doubt of the great advantage, in a commercial point of view alone, of connecting Bombay by railway with its most fertile province; and, looking upon the project in this narrower light, I am not disposed to consider the two sections into which Captain Crawford has divided this part of the line, and independently of each other; but, as a Government, we are bound not to confine ourselves solely to mercantile considerations.

p. 48.

"Bearing in mind the great political and military objects contemplated by the Governor-General, as explained in the 30th to 35th paras. of his Lordship's minute of 20th April 1853, I cannot doubt that the Baroda line ought to be sanctioned."

Minute, 29 July
1854, p. 7.

The Honourable Mr. Warden concludes, "that as we are bound to address ourselves, in the first instance, to the trunk lines, which are to be entered on without delay, for the reasons urged by his Lordship the President, from the 12th para. of his minute, and never doubting that, whichever route we take, the line will readily draw the traffic to itself, I cannot hesitate to express my concurrence in the opinion conveyed in his 48th para., that the Baroda line ought to be sanctioned."

Minute, 2 Sept.
1854, p. 150.

The Honourable Mr. Lumsden, while contending, quite correctly, that approval of the line from Bombay to Baroda does not of necessity imply a final condemnation of the line from Bombay into Candeish, by way of the Thull Ghat, desires that he "may not be understood to be blind to the great interests so strongly advocated by our Right honourable President, in connexion with the construction of the northern railway, I once more repeat that I subscribe to every word advanced both by him and by Colonel Kennedy on this subject. I trust to see the work taken up and vigorously prosecuted; and assuredly it will be, if completed, a great imperial work, as beneficial to the interests of commerce as to those of the State."

Letter, No. 118,
1854, 31 May, p. 5.

Lastly, Major Crawford, though a strong and consistent advocate for a line over the ghats, rather than by the coast, frankly admits, that "If the general project of opening a communication by railway with these provinces (North-west Provinces) is entertained, I fully concur with Colonel Kennedy, that so much of the scheme as is included between Bombay and Baroda must be considered as determined."

8. Adhering to the opinion which I expressed last year of the value and importance, both for India and for England, of effecting a junction by railway between the Presidencies of Bengal and Bombay; satisfied by the report now submitted by Colonel Kennedy of the eligibility of the line selected between Bombay and Baroda, and fortified in my belief of its eligibility as a trunk line by the concurrent opinions of the members of the local Government, and of its consulting engineer, I have no hesitation in proposing that a general sanction should be given by the Government of India to the line proposed between Baroda and Bombay.

9. The remarks of Major Crawford upon the incompleteness of the survey and calculations submitted on behalf of the railway company, might be held, under some circumstances, sufficient to deter the Government from giving its sanction to this project until more full and more accurate information should have been obtained. In this instance, I do not think that the undoubted incompleteness of detail in the project before us, should induce this Government to withhold the general assent which it has been proposed to give.

The survey has been hasty, the observations partial, the information obtained less full, and perhaps less accurate than it might be. Future examination, and further and closer inquiry, probably may in some degree affect the calculations already made; but I apprehend that enough is already known to enable the railway company and the Government "to ascertain approximately the probable amount required for the construction of the line," and this was all that it was proposed, in the first instance, to demand as a preliminary to the grant of a guarantee of interest on the capital to be subscribed.

Minute, 20 April
1854, p. 99, s. 7

10. Having thus recorded my conviction that the proposed construction of a line of railway between Bombay and Baroda ought now to be sanctioned, I must add the expression of my opinion that the Government is not yet in a condition to pronounce a decision upon any other portions of the several lines projected.

The survey of the country between Baroda and Neemuch, and thence to Agra, is exceedingly unfavourable. Its natural difficulties are great, and for an aggregate distance of 10 miles no better gradient than 1 in 120 can be alleged.

The alternative line suggested by Colonel Kennedy from Baroda to Delhi, by way of Ahmedabad, has not been surveyed at all. It is very probable that the anticipations expressed in the Report of the practicability of this line, of its ready construction and easy gradients, may be realised on closer investigation of the country through which it is to run. But a junction at Delhi is further removed to the westward than is at all desirable, and the proposed direction of the line on the margin of the desert would carry it where there is little produce, little population, and little chance of creating such a general traffic as alone can make the line a profitable undertaking.

11. Again, the branch towards Indore, and that by which a junction with the Calcutta and Delhi line might be effected through the valley of the Nerbudda, have received no examination whatever. The Government, therefore, cannot as yet be called upon to offer any opinion regarding them.

12. In like manner it is impossible for the present to form any judgment on the relative merits of the competing lines which have been proposed to connect Candeish with Bombay.

During last year the Government of India declared its opinion that the "Thull Ghat Line to Candeish shall not be sanctioned until a survey shall have been made of the line recommended by the River Taptee, and that the Thull Ghat Line should in no case be sanctioned until it shall have been ascertained by full survey that no better entrance to the table land can be found, and until further survey of the Thull Ghat and Bore Ghat Lines shall have been made, with a view to determining specifically those modifications of the objectionable features of both lines, which the engineers appear to be confident of effecting:" up to this time the Government of India has no further knowledge of the Thull Ghat Line than it had during last year: no additional survey, no further examination of the ghauts has been reported to it.

Minute, 20 April
1853, p. 54.

A partial survey of the Taptee Valley is stated by Major Crawford to be in progress by the Great Indian Peninsular Railway Company. A partial survey of the Taptee Valley has also been made by Colonel Kennedy; but the former has not been laid before this Government, and the latter is avowedly incomplete and superficial; and unless the allegations of Major Crawford, as to grave errors in its computation, shall be refuted, it cannot be relied upon as trustworthy.

13. Under these circumstances, in the total absence of any additional information regarding the Ghat Line, with very incomplete, and apparently inaccurate information regarding the River Line, I decline altogether to give my judgment, or to commit myself even to a speculative opinion upon the question at issue.

14. The practical course which I recommend the Government of India to follow, is this:

1st. That the line proposed by Colonel Kennedy, from Bombay to Baroda, shall be sanctioned, as the first section of an intended line of railway from the western coast of India towards the North-western Provinces.

2dly. That further surveys shall be prosecuted between Baroda and Agra, and Baroda and Delhi, with a view to discovering the best line of junction between the Presidencies of Bengal and Bombay.

3dly. That as it may be found impracticable to construct an eligible line, either by way of Neemuch to Agra, or by way of Ahmedabad to Delhi, and as a connexion with the Nerbudia Valley is in itself of great value to the proposed trunk railway, as well as to all that tract of country, a further survey shall be instituted, for the purpose of ascertaining whether the line by the Taptee Valley, or a line by the northern bank of the Nerbudda, be more favourable for the formation of a communication eastwards.

4thly. That the Great Indian Peninsular Railway Company shall be urged to complete their examination of the ghats, in order that the Government of India may have before it all the materials necessary for forming a judgment regarding the best line of communication between Bombay and Candcish.

15. The adoption of this course will involve some delay; but in the present instance the delay proposed is no more than the caution demands. The inevitable intervention of such delays, and the necessity for such due caution in prosecuting the large measures which have been projected, are thus forcibly urged by Colonel Kennedy in the 45th and 46th paras. of his Report. He says—

“ 45. The true nature of what is now required of us calls for some explanation, that it may not be confounded with the class of railway projects usually brought forward in England, and limited to some 50, 100, or possibly 200 miles, running through well-known accessible country, which has been all accurately surveyed and recorded on correct maps, where the whole object is simple and well defined, to carry a short line between two specified termini; where the most rapid means of conveyance are everywhere at hand to carry all concerned the short distances required to reach respective points of the work, where the working year is twelve instead of six months, and where communication by letter is certain and immediate.

“ 46. Our task is of a totally different character. The length and breadth of our project extends over a territory about double the size of Great Britain; a territory of which little is known as relating to our object; of which accurate maps do not exist; a territory, through which the vast journeys required for exploration, must be made under a hot sun, at the slowest pace, on our own exhausted and way-worn horses; where, in many instances, it requires three weeks to obtain an answer from an officer on an out-station. It is not a mere line between two given termini, but a vast system of railways, which must be so cautiously planned, that, however gradually executed, it shall be certain to secure, by future extension, the interests of every minute district.

“ If we take a more limited view than this of our important task, we must commit grievous error, and entail irremediable injury on large masses of people, whose interests are placed in our hands.”

Entirely concurring in the sentiments which Colonel Kennedy has here expressed, I trust that none of these large measures may be determined upon without full inquiry, and all due deliberation given to them.

16. If my honourable colleagues should be of opinion that the measures specified in the preceding paragraphs should be adopted, sanction may be recommended at once for the execution of the section between Bombay and Baroda, in the manner proposed by Colonel Kennedy.

17. There are two large questions connected with this section, on which I wish to make a few remarks before I bring my minute to a close.

18. A doubt has been more than once expressed during the discussion, of the policy and prudence of executing that portion of the section from Bombay to Baroda, which lies between Bombay and Surat. It is surmised that the great difficulties which will impede the construction of a railway along the coast, and the alleged impossibility of successfully competing with the coasting trade now existing between Surat and Bombay, will render the construction of a railway costly and unprofitable. It is even affirmed, that the railway company which projects the line is not itself favourable to it, for the Hon. Mr. Lumsden observes in his minute, that Colonel Kennedy, “ as observed by Major Crawford, would seem to have projected the Bombay and Surat junction, more out of deference to the wishes of the Governor-General than as recognizing its necessity.”

I am unable to find any passage in Colonel Kennedy's Report which justifies the inference that he has proposed the Bombay and Surat line solely out of deference to my wishes; nor am I aware of any circumstance which could give countenance to that assumption, except the fact, that Colonel Kennedy did originally propose to commence his line at Surat; in his first prospectus, which was issued before the company was aware of the extended scale on which the government of India desired that the execution of railways in India should thenceforth be carried on.

However that may be, I have seen no good reason given as yet for surrendering the opinion I recorded last year, "the omission of the link between Bombay and Surat would be a great imperfection in the proposed scheme."

Minute, 20 April
1853, p. 38.

19. There is nothing in the documents now before us, which appears to me to show that the line, though not an easy one as far as Surat, would be inordinately costly. Nor is there enough in those documents to convince my judgment that if the railway should be constructed along the coast, it will be unable to compete successfully with the coasting trade.

Colonel Kennedy, the projector of a rival line to that which was in contemplation at Bombay, urges the advantages which Surat as a seaport already possesses by nature, or which it may acquire by art, and he anticipates its future rise with all the ardour of a sanguine disposition. I for my part am unable to see anything in the present known condition of Surat, or in the plans which have been conceived for it, which would enable it to compete with Bombay as a shipping port if a railway existed to the latter harbour we know that at present Surat is a port of very inferior quality. During one season of the year it is wholly inaccessible to shipping. Its situation must make it at all times more perilous, and by no exertions of science or art can it ever be rendered comparable with the harbour at Bombay. How inferior it now is, and how little hope there can be of ever making it a successful harbour, except at an enormous expenditure of time and money, appears to me to be manifest from Colonel Kennedy's own Report, which, in support of his railway scheme, contains two large collateral schemes for the improvement of Surat, the one of which has for its object to remove from the town the inundations which annually accumulate where there ought to be dry ground, while the other is designed to remove from the harbour the ground which annually accumulates where there ought to be deep water.

Looking, then, to these facts and admissions upon record, I am unable to believe that Surat will ever be made a good shipping port.

20. I can as little persuade myself that if a railway should be formed from Surat to Bombay, goods will leave the line of railway at Surat in order to be carried thence at a cheaper rate by sea in country craft to Bombay.

Taking the figures as they are given in these papers, I am unable to admit the probability that exporters of cotton or opium or other produce of Guzerat or Central India, which shall be conveyed on the railway from the place of produce to Surat, will sacrifice the greater security, the greater regularity, the greater rapidity of conveyance afforded by the railway, and will there transfer their goods to coasting craft to be carried on them to Bombay, even though the quoted difference of cost of carriage now existing should not be lessened by the tariff of the railway company, which in such case would most probably be done.

21. Wherefore, seeing no probability of extraordinary cost in the construction of a line from Bombay to Surat; unable to receive the conviction that Surat will ever be made an eligible shipping port, and equally unable to believe that goods brought from the interior, and intended for shipment at Bombay, would be diverted from the railway to the coasting craft at Surat by such economy of conveyance as is illegal; further, bearing in mind that the certainty of a large passenger traffic is admitted, I am not prepared to assent to the opinion that a line from Bombay to Surat is an impolitic or imprudent scheme, even in a commercial point of view.

22. But the scheme must not be considered from a commercial point of view, alone.

The Honourable Court of Directors has given its assent to the principle propounded by the Government of India, "that a general system of railways connecting the several Presidencies, and constituting the great trunk lines within them, should be sanctioned and executed without further delay. The Honourable Court has also recognised that the first of the main considerations, which should

Minute, 20 April
1853, p. 99.

p. 15.

determine the selection of a great trunk line in India, should be "the extent of political and commercial advantages which it is calculated to afford;" wherefore in deciding upon the substantive line proposed by Colonel Kennedy, the political advantages which would be sacrificed by the omission of the link between Bombay and Surat must not be lost sight of.

23. A railway commencing at Surat, and connecting the line in Hindostan with the western coast, would no doubt be a great advantage in itself; but it would form no part of the system of railways which the Government has had in contemplation, and would not give to it the military and political advantages which it aims at securing.

A line stopping short at Surat would not connect the Bengal lines with those of Bombay, nor with those of Madras. The break of 200 miles thus intervening would effectually destroy that continuity of communication by which the troops of one Presidency would be readily made available for use in the remotest parts of another Presidency, so that the several armies in India should become practically interchangeable, and the military power of the Government should be increased tenfold.

24. Such a break, moreover, would interpose a fatal obstacle to the great improvement which it was stated the Government hoped some day to see introduced into the mode of conveying to and fro the European troops and recruits and invalids, who are perpetually on the move.

If the design of the Government shall be executed in its integrity, troops may be brought from England by the shortest possible route to Bombay for whichever of the three Presidencies they may be intended, and may be forwarded upon a continuous system of railways to whatever station they may be destined to occupy; so also regiments returning to England; so also recruits and invalids may, by the operation of such a continuous system, be sent on their way easily, quickly, healthily and cheaply.

But if that link in the system to which I have referred shall be dropt, these undoubted benefits will in a great degree be lost, and the railway system which the Government of India has projected will be left half maimed and mutilated.

25. Rather than this should come to pass, the Government of India, in my opinion, would be wise to face the probability of having to pay annually the whole guaranteed interest upon the capital, which might be small, in forming a line from Surat to Bombay.

I have already given my reasons for entertaining the conviction that that line would not be commercially unprofitable; I trust, therefore, that the Honourable Court will feel no hesitation in giving its sanction to the entire section from Bombay to Baroda.

26. The only remaining point which it is necessary to notice is Colonel Kennedy's proposal that the railway company which he represents should undertake the preparation of the iron which it will hereafter require for its own consumption, from iron mines to be formed and worked in the Nerbudda Valley.

The vast advantage of obtaining a supply of iron for railway purposes in India cannot be overstated. The great economy which would be effected by obtaining such a supply for the present undertaking has been clearly and fully explained in the Report. The existence of abundant mines of iron of good quality in the Nerbudda Valley, I apprehend, is not questioned, and if the shareholders of the Bombay, Baroda and Central India Railway Company shall consent to undertake a great mining enterprise on the chance of its facilitating the original object for which the Company was incorporated, it may be competent to the Company to do so.

But unless the Honourable Court shall be pleased to provide specially for the point, I conceive that the guarantee of interest by the government cannot be held to extend to that portion of the capital which is to be applied to mining operations.

27. Those operations may be very successful, but they may be altogether the reverse. The Court of Directors, when it guarantees a certain rate of interest on the capital to be expended in the construction of a line of railway, looks to the ordinary causes of expenditure, and to the ordinary risks of such an undertaking, but it cannot have had in its contemplation a conjunction of objects so unusual as large

large iron-works and a great railway, nor can it be expected to accept this double risk without some special provision to that effect.

28. It will be for the Honourable Court to decide whether it will extend its guarantee in favour of the Bombay, Baroda and Central India Railway Company to that portion of its capital which the Company now proposes to employ in mining and all other operations required for the production of iron to be used in the construction of its lines; but as it seems to me to be at least questionable whether the Honourable Court will consent to do so, I think it right to draw especial attention to the point in doubt.

12 October 1854.

(signed) *Dalhousie.*

MINUTE by the Honourable *J. Dorin*, dated the 17th October 1854.

I ASSENT entirely to the practical course recommended in the 14th para. of the Minute of the Most Noble the Governor-general; his Lordship's four propositions seem to me most judicious, and completely warranted by the information we yet possess as to railway construction in the West of India.

In whatever direction it may be ultimately decided to connect the Great Western and Eastern trunk lines in the North of India, it is quite clear that the first section of the rail from Bombay must pass by the way of Broach and Baroda, and I think the Government of India is justified in sanctioning it so far.

The first portion of this section, as far as Surat, will doubtless be both difficult and expensive, yet it is so essential to the complete connexion of the system of the grand trunk line, that I quite agree with the Governor-general, that it will be worth guaranteeing as a political object, independent of any commercial advantages that may attach to it.

I have no expectations, however, that it will fail as a commercial speculation. I do not believe that Surat can ever be made a good seaport, nor that goods once on the line will leave it for cheapness of sea transport from Surat to Bombay; on the contrary, I should consider that a break on the line would be fatal to its perfect efficiency, the tendency of goods being not to take to a railway till they can be carried on it throughout to their point of destination.

There can be no doubt of the vast advantage of obtaining a supply of iron in India for railway purposes; but I should prefer to see mining operations, such as those proposed by Colonel Kennedy at Poonassa, carried on by capital separate from that of the railway company.

17 October 1854.

(signed) *J. Dorin.*

MINUTE by Major-General the Honourable *J. Low*, c. B., dated the 23d October 1854.

1. I HAVE read the above quoted minute, and have examined the maps and other papers circulated along with it, with great interest.

2. The various facts described, and the reasons stated by the Most Noble the Governor-general, are fully convincing to my mind as to the accuracy of his Lordship's opinion, that "a general sanction should be given by the Government of India to the line proposed between Baroda and Bombay."

3. The Governor-general has also shown clearly that it would be very unwise, in our present defective information, to decide now whether the line connecting Baroda with the North-western Provinces should be taken *via* Neemuch or *via* Ahmedabad.

4. From my knowledge of the Oodeypore country, through which a railroad to Neemuch must pass, I cannot help thinking it very unlikely that such a railroad will ever be constructed; but I beg to mention, that even if it were certain that a railroad is to be made through Neemuch to Agra, I would still advocate that there

should be a railroad from Baroda, as far as Ahmedabad, the latter being a large and opulent city, and the capital of one of the richest provinces (for its size) in all British India.

5. I would therefore suggest that a survey should be made of the country between Baroda and Ahmedabad.

6. A railroad from Bombay through Baroda to Ahmedabad, would, I feel sure, be of very great advantage, both in a political and a commercial point of view, even if it never went further than the last-named city; but I have a strong impression on my mind that Ahmedabad, Deesa and Pallee (the latter is a town of great trade), will ultimately be the line fixed upon to connect Bombay with the North-west Provinces. From Pallee, however, I would not advocate that the railway should go to Delhi through a thinly inhabited line of country; I would rather take it from Pallee, through Ajmere and Nusseerabad, and thence direct to Agra.

7. But I beg, in conclusion, to say, that I have only written the above remarks as suggestions for the consideration of better informed persons, and not as recommendations; for I would never venture to give positive advice as to a line of railroad in any country, till all the lands through which it was projected to run had been carefully surveyed and minutely described by engineers of proved ability and judgment.

23 October 1854.

(signed) *J. Low.*

MINUTE by the Honourable *J. P. Grant*, dated the 24th October 1854.

I THINK a great deal of time would have been saved if the discussions at Bombay had been restricted to the single question on which, in the present state of the case, it is possible to form any well-founded judgment.

The matter stands thus: the Great Indian Peninsular Railway Company proposed to make a line of railway from Bombay to Candeish, in a north-easterly direction, ascending the ghauts at the Thull Ghaut; that line was found to be open to this objection, that the ascent of the ghauts was made by a course which combined gradients of extreme severity, with curves of extreme sharpness. In forwarding the project, the consulting engineer of Government avoided committing himself to a positive opinion of the safety of such a line, and indicated his doubt of its safety, by recommending, in order to make it safe, an untried plan of a sort of back-action atmospheric system, to be combined with the common locomotive system, which plan has found no favour. As no attempt had been made by a survey of the whole line of ghauts towards the required direction, to ascertain whether the ascent of the ridge could or could not be made at a less unfavourable spot than this very unfavourable Thull Ghaut, and as no attempt had been made to survey a line up the Taptee Valley, by which obviously the whole ridge would be turned and avoided, or to compare the advantages and disadvantages of such a line with those of any line breasting the ridge, common prudence dictated to the Government of India and the Home Government, the necessity of suspending a judgment upon the projected line until the two surveys above-mentioned should be made.

A rough sectional survey has now been made of the line up the Taptee Valley; but no survey has yet been made, at least none has yet been reported, of the ridge of ghauts, so that it remains still uncertain whether the Thull Ghaut be the very best possible place to ascend the ridge (if the ridge is to be ascended) or not. For anything that has been yet officially alleged to the contrary, it may be amongst the worst possible places that could have been selected for that purpose. In this state of our information, the consulting engineer of the Bombay Government takes the occasion of a report from the officers of another railway company being submitted, to press for the immediate execution of the Thull Ghaut project by the Great Indian Peninsular Company, without waiting for the topographical information necessary to form a rational judgment upon that question being completely obtained.

This is done on the ground that one of the two requisite surveys has been made, namely, that of the line which would turn the ridge by the Taptee Valley; and

and that although the result is not physically unfavourable, the grounds which induced the consulting engineer originally to recommend the Thull Ghaut line have as much force in his mind now as they had before the highest authority pronounced them to be insufficient, in the absence of further information, which is still wanting.

I agree in thinking that this (the Thull Ghaut question) is a question which it would be waste of time for us even to look at, until we shall be in possession of the whole of the information which has been pronounced to be requisite for its solution.

This reduces the matter now before us to the single question of the propriety of authorising the construction of the line northwards, from Bombay, through Surat, Broach and Baroda, projected by the Bombay, Baroda and Central India Railway Company. For the reasons set forth in the minutes of Lord Elphinstone and the Governor-general, I am of opinion that this line of railway is essential to the completeness of the Indian system of railways; and I heartily concur in the proposal of the Governor-general to authorise, under the power given to his Lordship in Council, the immediate construction of this line by the company which has projected it.

I hope the following remark will not be considered overcautious. The Governor-general proposes that this line should be sanctioned "as the first section of an intended line of railway from the western coast of India, towards the North-western Provinces." I think it will be more prudent, in conveying our sanction of this line, to sanction it *simpliciter*. It is recommended by the Bombay Government as being a line most desirable in itself, inasmuch as it connects their capital and their great port with the richest provinces under the Presidency. It is recommended also as having the collateral advantages of running so far in the direction of Scinde, with which, eventually, a connexion by railway is anticipated. It is so far on the way to the Malwa Opium Districts. These considerations, in my opinion, are ample, not merely to justify, but to force the Government of India to accede to the recommendation of the Bombay Government in favour of what is now actually recommended. It is true that the greater part of the line now recommended must necessarily form part of any line which hereafter may be made to join Bombay with the Ganges Valley Line, at any place from Agra westwards. But it is admitted that we are not yet in a position to point out any such line: the only line of which we have a survey from Baroda to Agra is pronounced to be objectionable. A better line between those two points may exist, but it has not yet been found. It is believed that a line physically unobjectionable, from Baroda by Ahmedabad to Delhi exists; but Delhi is pronounced to be further to the west than is desirable for the junction; and such a line must certainly be open to the objection of passing, for the most part, through a thinly peopled country. I cannot divest myself of the impression, that when all the information necessary to the solution of this great and complicated question has been acquired, it will be demonstrated that the cheapest and most useful manner of connecting Bombay with the Ganges Valley Line will be by a line running up to the top of the valley of the Nerbudda, and thence to the Ganges Valley Line at some point between Allahabad and Patna, probably Mirzapore.

Mr. Jacob's report upon the iron, lime, wood and coal in auspicious proximity to each other, of excellent quality and in inexhaustible quantity, in the Nerbudda Valley, in my opinion definitively settles in the affirmative the question of a railway up that valley. It is impossible to imagine a railway from the west coast to Jubbulpore, without feeling sure, after a glance at the map, that the connexion of Jubbulpore with the Ganges Valley Line must be a necessary consequence. When this line, of which the primary object is commercial, is completed, will not the political and military objects of the junction of Bombay with the Ganges Valley Line be adequately provided for? The answer may depend on the result of surveys yet to be made; but in the present state of the question I must say, that the road that shall carry to the Indian Ocean and the Ganges the iron, coal, cotton and grain of the Nerbudda Valley, has a claim to priority, which it will be difficult to withstand.

For these reasons, I think it would be prudent for the Government of India, in freely sanctioning the Baroda railway, not to commit itself unnecessarily to any ulterior project.

I agree entirely with General Low in thinking that the line ought to be sanctioned all the way to Ahmedabad. It has, as I understand the papers now before us, been surveyed all that way; and the Bombay Government earnestly ask for it all that way. Should the main line go on from Baroda to Agra, Indore, or elsewhere, still it is explained that the line from Baroda to Ahmedabad will be indispensable as a branch line. It matters nothing now whether it is to be called a branch line hereafter, or not; I understand it is this part of the line, whereby the rich province at the head of the Gulph of Cambay is tapped, to which the Company and the Bombay Government look as the feeder which is to make the goods traffic of the line south of Baroda remunerative. I trust that the Bombay Government may not be disappointed in this part of their plan, which, in my opinion, is independent of the question of the production of the main line northwards.

In all other points I concur, without reserve, in the practical course proposed by the Governor-general in para. 14 of his minute.

Upon the question of the ports in the Gulph of Cambay, which, as a collateral question, is much discussed in these papers, I think that if any reasonable outlay of money would make a good harbour in that quarter safe for large vessels during eight months of the year, no regard for the inhabitants of Bombay, or the proprietors of the railway, ought to prevent such outlay. Bombay is about as far from such a port as Liverpool is from Bristol.

I do not see what public or private good will be done by the Nerbudda iron mines being worked by a railway company. I take it for granted that the guarantee will not extend to such operations. If it do not, the company must keep separate accounts, and it will certainly not transfer its iron from its iron account to its guaranteed capital account at anything less than the highest market value of the commodity; it would be much simpler for the same individuals to form a separate iron company.

My own opinion is, that the Government should do more than it usually does in the way of pioneering upon occasions of this sort. If no company or capitalist should come forward to work this iron, I think the Government itself should work it; it would reap an ample reward merely from the result of the knowledge which thereby it would impart to the natives of the country; and for railways in India just now, iron is the one thing wanting.

24 October 1854.

(signed) *J. P. Grant.*

MINUTE by the Most Noble the Governor-General, dated the 28th October 1854.

1. THERE is such close concurrence of opinion among us regarding the Bombay and Baroda Railway, that I see no need to reserve it for consideration in Council when it is so desirable that the papers should be transmitted to England by the mail next week.

2. I therefore beg leave merely to add a few words to my former minute, for the purpose of saying, that if it is thought that in the sanction proposed to be given to the Baroda line "as the first section of an intended line of railway from the Western Coast of India towards the North-western Provinces," the concluding phrase is likely to be misapprehended, I have no objection whatever that the phrase should be left out, and that a general sanction should be given to the line from Bombay to Baroda.

3. In referring to a line from the Western Coast towards the North-western Provinces, I meant only to indicate the great junction line, which all are agreed should in some direction or other unite the Western Coast with the joint line of railway which is to traverse the North-western Provinces, as well as the Lower Provinces of the Presidency of Bengal; in this sense the Bombay and Baroda line is the first section of an intended line from Bombay towards the North-western Provinces, whether the further section shall run by the Nerbudda Valley, or by way of Neemuch.

4. With

4. With reference to the line by way of the Nerbudda Valley, on the importance of which Mr. Grant has justly dwelt, it will be remembered, that I mentioned that line as an alternative one with the Neemuch line in my minute of 1853; and although I thought, and still think, that the Neemuch line would be preferable on the whole as a junction trunk line, the remarks which I have lately recorded on the surveys, as far as they have gone, indicate the opinion which I am at present inclined to hold, that the Neemuch, as well as the more western line, will be found objectionable, and that an immediate and close survey of the Nerbudda line is therefore very desirable.

5. I have no objection that the small branch line from Baroda to Ahmedabad (for such I am persuaded it will prove to be) should receive sanction now.

28 October 1854.

(signed) *Dalhousie.*

EAST INDIA RAILWAYS.

COPIES of MINUTES relative to the Progress
of RAILWAY UNDERTAKINGS in India (in
continuation of Parliamentary Paper, No. 318,
of Session 1854).

(*Sir Joshua Walmsley.*)

*Ordered, by The House of Commons, to be Printed,
25 May 1855.*

272.

Under 2 oz.

RAILWAYS (INDIA).

COPY of MEMORANDUM by Major *Kennedy*, on the Question of a general System of RAILWAYS for *India*, referred to in the MINUTE by the Governor-General in Council of 20 April 1853, relative to Railway Undertakings in that Country.

(*Mr. French.*)

Ordered, by The House of Commons, to be Printed,
27 March 1854.

[*Price 2s. 6d.*]

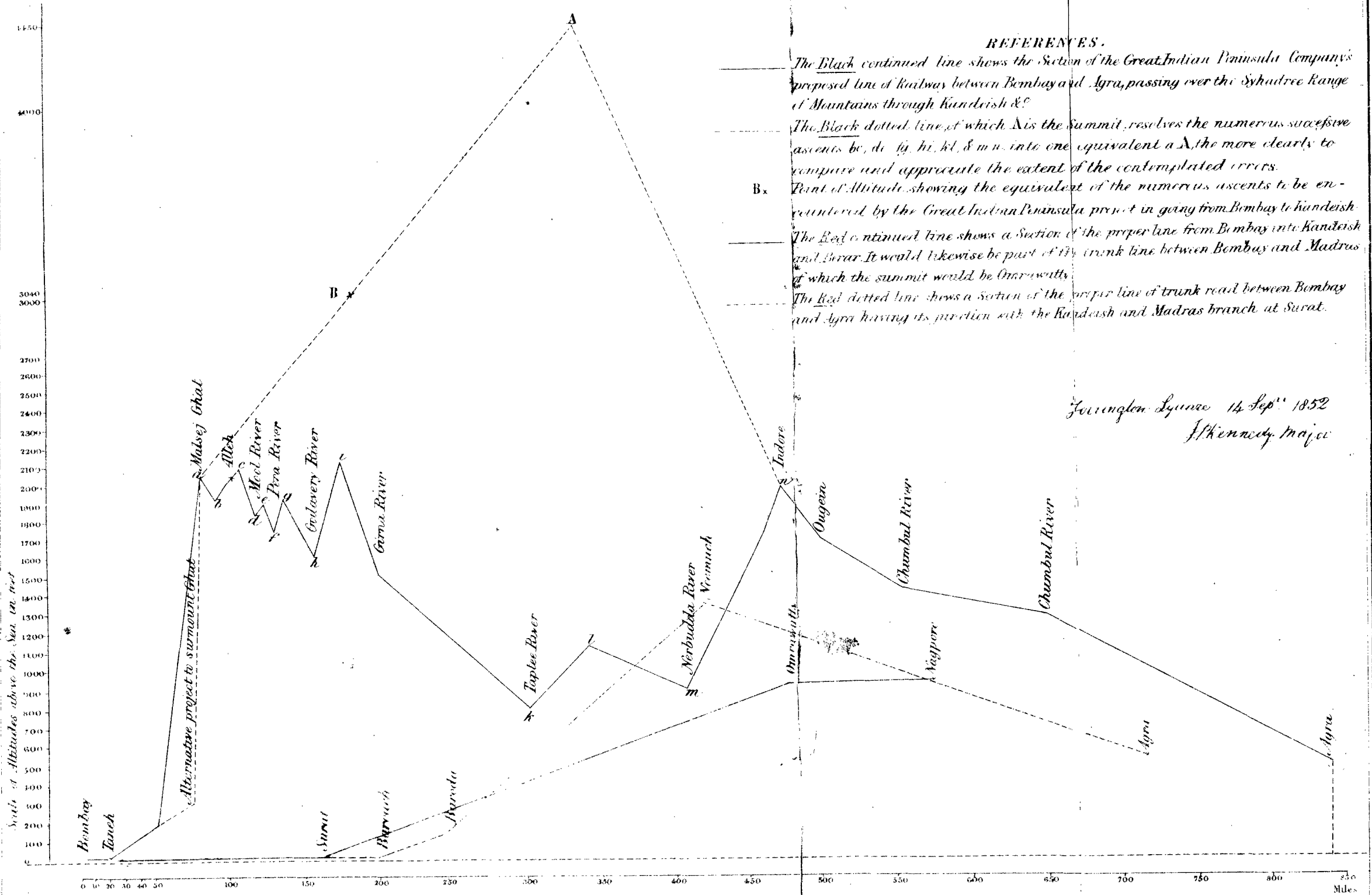
131.

Under 8 oz.

APPENDIX No. II.

PROXIMATE SECTIONS,

to illustrate the errors in progress under the project of the Great India Peninsula Railway Company, in the Presidency of Bombay &c.



REFERENCES.

The Black continued line shows the Section of the Great Indian Peninsula Company's proposed line of Railway between Bombay and Agra, passing over the Syhadree Range of Mountains through Kandeish &c.

The Black dotted line, of which A is the Summit, resolves the numerous successive ascents bc, de, fg, hi, kl, & mn, into one equivalent Δ , the more clearly to compare and appreciate the extent of the contemplated errors.

Bx Point of Altitude showing the equivalent of the numerous ascents to be encountered by the Great Indian Peninsula project in going from Bombay to Kandeish.

The Red continued line shows a Section of the proper line from Bombay into Kandeish and Berar. It would likewise be part of the trunk line between Bombay and Madras of which the summit would be Oranwally.

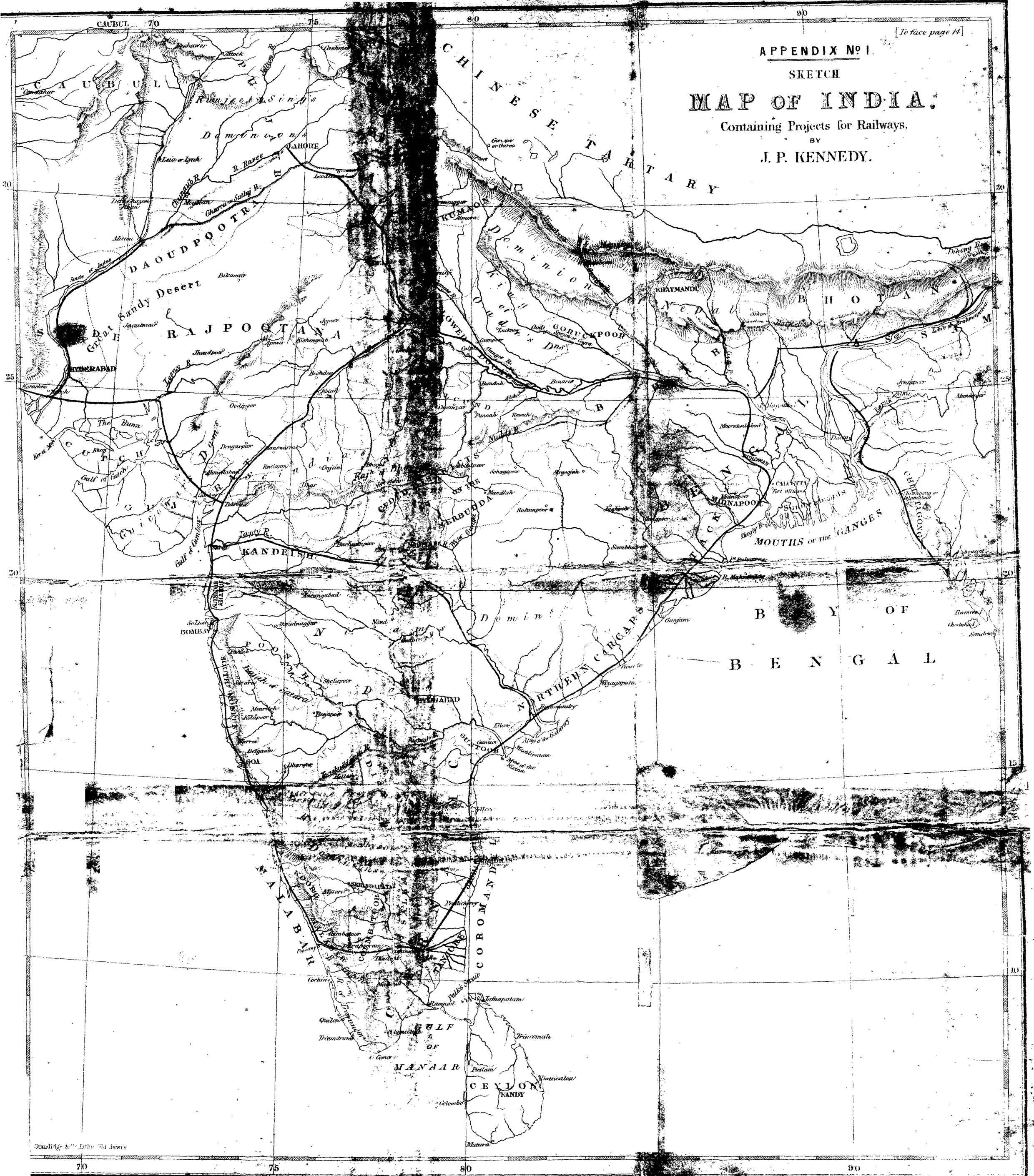
The Red dotted line shows a Section of the proper line of trunk road between Bombay and Agra having its junction with the Kandeish and Madras branch at Surat.

J. Kenney Major
 14 Sep 1852

Scale of Altitudes above the Sea, in feet

[To face page 14]

APPENDIX No 1.
SKETCH
MAP OF INDIA.
Containing Projects for Railways,
BY
J. P. KENNEDY.



Stoddard & Co. Litho. 31 Jewry

[To face page 15]

APPENDIX No 1 (continued)

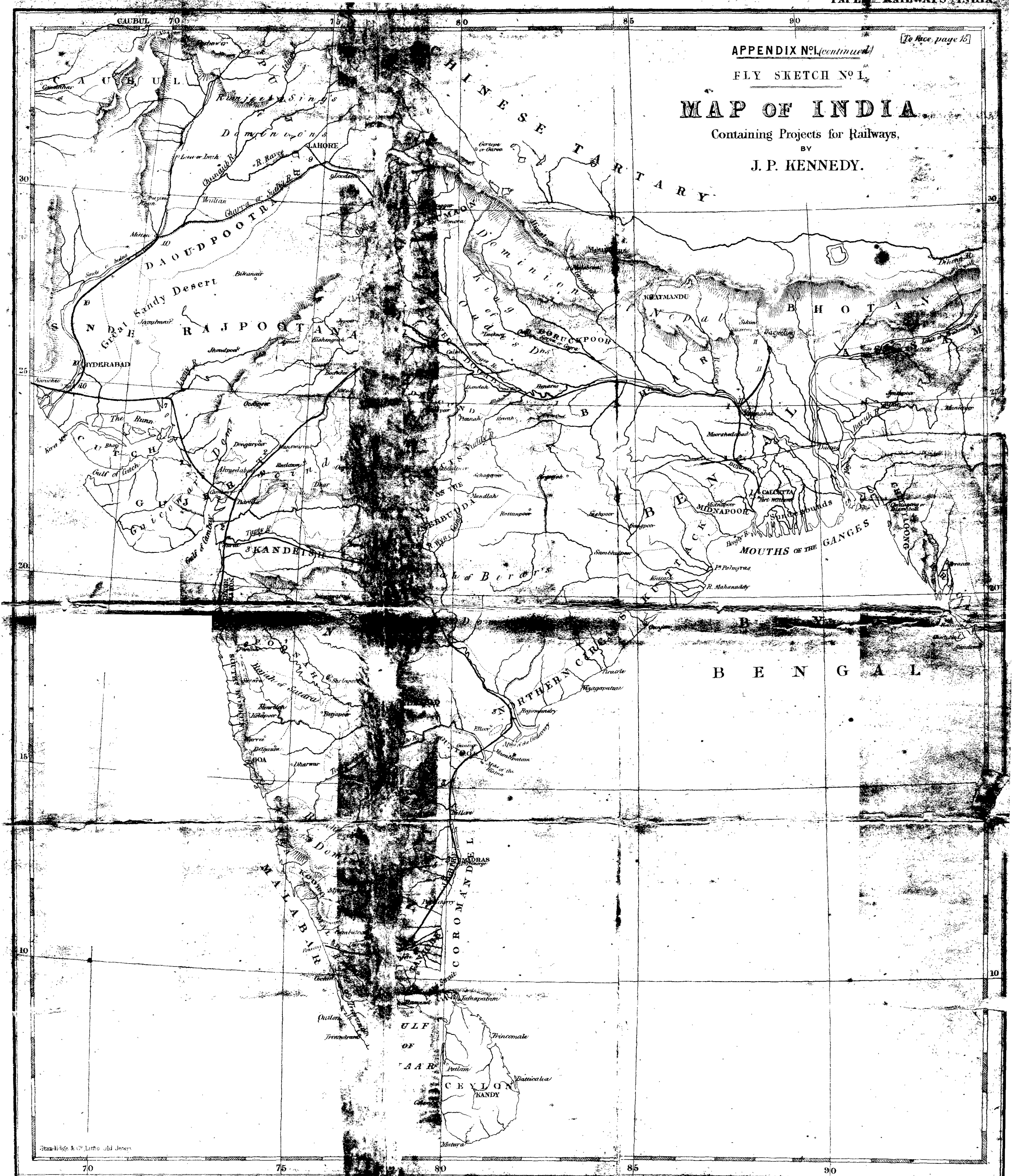
FLY SKETCH No 1.

MAP OF INDIA.

Containing Projects for Railways,

BY

J. P. KENNEDY.



[To face page 16]

APPENDIX No. (continued)
 FLY SKETCH No. 2.
MAP OF INDIA.
 Containing Projects for Railways,
 BY
J. P. KENNEDY.



Wm. Ridge & Co. Litho. Old Jewry.