Public Works (189) Department.

RAILWAY BRANCH.

G.O., No. 1058 Ry.

DATED 22nd Sept. 1899

Short room

560/45

[Despatch Abstract.]

Mr Spring's Manual Entitled "Railed Road

Ordered that copies of —— be sent to the Collectors and Presidents of District Boards in the Presidency for report on certain points.

[F. W. 26. 1,000—11-8-99.]

Indexed.

17

BACK PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.

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G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.
	987	Ry&W 3-7-00.					
	1318	Ry&W 28-9-00.					

RAILWAY.

Government {1899} of Madras.

PUBLIC WORKS.

Recd. } 1899. *Enclosures*

Regd. } *Spare copies*

G.O., No. 1058 Ry., 22nd September 1899.

SEPTEMBER.

Mr. Spring's Manual entitled "Railed Roads"

Ordered that copies of — be sent to the Collectors and Presidents of District Boards in the Presidency for report on certain points.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Railway.

Read the following paper :—

Mr. Spring's Manual entitled "*Railed Roads.*"

ORDER—No. 1058 Ry., dated 22nd September 1899.

Copies of the Manual will be sent to the Collectors of each of the districts in the Presidency and to the Presidents of the District Boards, who should submit a report, before the 23rd December next, in regard to the following points :—

(*a*) Suggested additions and alterations.
(*b*) Additional subjects in regard to which useful information might be embodied in the Manual.
(*c*) Length, locality, and other particulars of roads in their districts which there seems reason to believe might at some future time be usefully converted into light cheap railways.

Presidents of District Boards are recommended to take the opportunity of the next Board meeting to interest the members of their Boards in the subject, and to endeavour to enlist their assistance and to evoke suggestions.

Government is desirous that by the time the proposed amendments of clause 57 of Chapter III of the Madras Local Boards Act come before the Legislative Council for discussion, public opinion may to a certain extent have been educated, and that it may be possible to roughly gauge how far each district in the Presidency is likely in the future to be in a position to avail itself of the provisions of the proposed amendment of the Act.

(True Extract.)

FRANCIS J. E. SPRING,
Secretary.

To all Collectors.
„ all Presidents of District Boards.
„ the Consulting Engineer for Railways.
Editors' Table.

Exd. W. D'Moss.

FORM No. 1.

PUBLIC WORKS DEPARTMENT,

RAILWAY BRANCH.

Papers to be read in Proceedings :—

Again G.O., dated 189 , No.
Again G.O., dated 189 , No.
Current No. of 189 , dated , from
„ „ „ 189 , „ , „
„ „ „ 189 , „ , „

Mr. Spring's Manual entitled "Railed Roads".

ORDER No. 1058 Ry dated 22/9/99

Copies of the Manual will be sent to the Collectors of each of the Districts and to the Presidents of the District Boards, in the Presidency, who should submit a report, before the 23rd December next, in regard to the following points.

(a) Suggested additions and alterations.

(b) Additional subjects in regard to which useful information might be embodied in the manual.

(c) Length, locality, and other particulars of roads in their Districts which there seems reason to believe might at some future time be usefully converted into light cheap railways.

President of District Boards ~~Collectors~~ are recommended to take the opportunity of the next ~~District~~ Board meeting to interest the members of their Boards in the subject, and to endeavour to enlist their assistance and to evoke suggestions.

Government is desirous that by the time the proposed amendments of clause 57

F.J.E.S. 18.9.99

Yes Sir. I wd. add and to the Presidents of the D.C. Bds. I think the G.O. ought to be communicated in Kan. and if my proposed addition is made, to in L & M.

MA 19.9.99

Yes Sir. It is the Presidents who must do this. Some little verbal alterations are needed.

MA

Yes Sir 21-9-99

of Chapter III of the Madras Local Boards Act come before the Legislative Council for discussion, public opinion may to a certain extent have been educated, and that it may be possible to roughly gauge how far each District in the Presidency is likely in the future to be in a position to avail itself of the provisions of the proposed amendment of the Act.

7/9

R.

12/7/99

No. 12 dated 22/6/99.

To Secretary Rev. & L. & M. Dept. for C.C.

7/9

21/7/99

22.

The G.O. will run thus: Begin to end Boards to Collectors. Then with Comptroller print 500 copies of the Memorandum with other connected papers to be cleared. Print all this under the G.O. or The G.O. should be printed and dealt with Mayo

7/9

22/7/99

Press Officer return this Copy to Office

To,

All Collectors.

All Members of District Boards.

The Engineer.

The Editor Fort St. George Gazette.

Despatched on 31/10/99

Form No. 10.

PUBLIC WORKS DEPARTMENT.

RAILWAY BRANCH.

C. No.....

HIS EXCELLENCY THE GOVERNOR.

THE HON'BLE MR. ARUNDEL C.S.I.

THE HON'BLE MR. H. M. WINTERBOTHAM, I.C.S.

SUBJECT.

Mr. Spring's Manual entitled "Railed Roads."

FOR ORDERS.

Permission should be granted.

A.G.H. 18.9.99

I have kept a copy. A.G.H.

and 9 Rd

Do. H.S. 21-9-99

I am now able to put up a copy of my completed Manual on light railways for District Roads. I know that it probably omits many points of importance to Collectors and others——points which might most usefully find a place in such a memorandum. I therefore ask permission to circulate it under the G.O. drafted below. Valuable suggestions are certain to come in, and I am very anxious that it should be as complete as possible by the time the new power of levying an extra cess, under the Amended District Boards Act, is conferred on the Boards.

I put up a spare copy for His Excellency and for each of the Honourable Members, besides the copy, appended to this Note, in which I have marked in red pencil some of the points which I think are worthy of attention. Please see Index pages 51 - 52.

7/9

R.

12/7/99

H.S. letter 1/9 H. 21.9.99

RAILED ROADS.

A MANUAL

FOR

LOCAL BOARDS, DISTRICT OFFICERS, AND RAILWAY OFFICIALS

INTENDED CHIEFLY FOR THE

MADRAS PRESIDENCY.

BY

FRANCIS J. E. SPRING, C.I.E., L.C.E.,

MEM. INST. C.E., MEM. INST. MECH. E., M. AM. SOC. C.E.

Chief Engineer in the Indian Public Works Department,

Govt. Consulting Engineer for Railways, Madras; and Senior Govt. Inspector of Railways, Madras Circle.

MADRAS:

PRINTED BY THE SUPERINTENDENT, GOVERNMENT PRESS.

1899.

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PREFACE.

This memorandum is intended to serve a specific object which, so far as I am aware, has not yet been served by any other publication. That object is, to place such information at the disposal of local self-governing bodies in the Indian Presidency with which just now I happen to be officially connected, and of their advisers, the members of the Indian Civil Service who hold charge of districts in that Presidency, as will enable them to deal intelligently, in its initial stages, with the problem of how best to supply their districts with light cheap railways, or as I prefer to call them Railed Roads.

The memorandum, in its present form of a Government publication, has been specially prepared in anticipation of the early passing into law of certain provisions in a Bill, No. 2 of 1898, which purports further to amend Madras Act V of 1884 (The Madras Local Boards Act). The Bill, now in the Legislative Department, proposes, *inter alia*, the following amendments of clause 57 of Chapter III of the Madras Local Boards Act, with a view to legalizing the levy of a special cess having for its object the extension of light district railways and tramways:—

> 57. (ii) *A tax not exceeding 3 pies in the rupee on the annual rent value of all occupied lands to be utilized solely on the construction of tramways or railroads.*
>
> 58. *Provided that the tax mentioned in clause (ii) of the aforesaid section [57] shall not be levied unless the levy thereof is determined by a resolution of the District Board supported by not less than three-fourths of the members then on the Board, such resolution being confirmed after a period of six months by a like majority.*

Should these amendments pass into law, District Boards will have been put in possession of potential credit capable of accomplishing great possibilities, the immediate value of which I have endeavoured to roughly gauge in the table at the end of Chapter IX. It seems necessary however, or at least desirable, that at as early a date as may be found practicable by the Government of India a brief Bill should be brought in amending the Indian Trust Act, II of 1882. For, pending the amendment suggested, it will apparently not be lawful to invest Trust Funds in the newly created security. I have dwelt on this point in Chapter IX.

It is never safe to prophesy; but I venture nevertheless to predict that a most important railway development in India in the early future will be the great extension of cheap light £1,500 to £2,000 (Rs. 22,500 to Rs. 30,000) per mile railways, intended to serve, not as trunk lines, but as feeders to our 5′ 6″ and metre gauge railways. If the extension of our Indian railways is to progress at a rate commensurate with its importance as an enriching, a safe-guarding and a civilizing influence, trunk lines will suffice in themselves to fully occupy the attention of, and to absorb the borrowed funds of, the Government of India. The extension, therefore, of little railways of local interest must necessarily be left to the care of those local self-governing bodies who are immediately interested in them,

Heretofore such bodies have for the most part looked on railways as being quite outside the sphere of their powers and duties. The passing of the amended Madras Local Boards Act will, however, bring them within their purview, and it is the purport of this memorandum so to educate those to whom it will fall to give effect to the provisions of that Act that they may find matters made fairly smooth for them when they can see their way to taking practical action.

What this memorandum is *not* intended to be, except incidentally, is a treatise for the use of Engineers; of such treatises there have been published an ample quantity. A District Board proposing to get a branch line made will nearly always in India have at its disposal the professional skill of the Engineers of the trunk line of railway of which the projected light line will form a branch. I have therefore refrained from going into professional or constructional details. Those seeking such I would refer to *Light Railways for the United Kingdom, India and the Colonies*, by Mr. J. C. Mackay,—London, Crosby, Lockwood and Son, 1896, and to *Light Railways at Home and Abroad*, by my friend Mr. W. H. Cole,—London, C. Griffin & Co., 1899, where examples will be found of the best and most modern practice. I am more or less familiar, from personal inspection, with between 200 and 300 miles of India's 2′ 0″ and 2′ 6″ gauge lines. All of them are very efficient means towards the ends which they severally have in view. The Darjeeling line is something quite exceptional in its adaptation to the character of the country traversed—a country of extraordinary difficulty. The Barsi line is a magnificent advertisement of what narrow gauge rolling-stock can be made to do. Neither of these, however, is the model which I have in view for my "railed roads." For these I can offer no better model than the Tezpur line, which, equipped as it is with rolling-stock for a considerably greater mileage, has been completed for less than Rs. 21,000 per mile.

I have referred above to a suggested amendment of the Indian Trusts Act, 1882. A reference to clause 20 of that Act will show that trust money cannot legally be invested in District Board loans. They can, on the other hand, be invested "in debentures or other securities for money issued by, or on behalf of, any municipal body under the authority of any act of a legislature established in British India." A reference to Chapter IX will show that at the time of the passing of the Indian Trusts Act, 1882, District Board loans were not really available as a form of investment, and by the time they became available it probably did not occur to anybody to amend the Trust Act in order to admit them on a par with municipal loans as a legitimate investment for trust funds. All that seems now necessary is to insert the words "*or District Board*" after the words "municipal body" in clause 20 (*d*) of the Indian Trusts Act, 1882. These loans will then become available as a very suitable form of investment for the Provident Funds of our railways.

It may be thought that some excuse is due to the readers of this memorandum for a certain discursiveness and colloquialness of style and for a certain elementary treatment of matters which to many will appear to need no such treatment. My excuse is that, intended as it is largely for the perusal of Native members of District Boards and for Native gentlemen of influence in their districts, to whose lot it may never have fallen to think out for themselves the elementary principles of the rail-*versus*-road problem, the memorandum has entered into these principles in an elementary manner with a clear purpose in view. Readers who are no novices in the subject can skip such parts.

I attach a high value to the views of the Madras Railway officials, and especially to those of Mr. Louis S. Moss, the able and experienced Agent and General Manager of that long-established broad gauge line. I have therefore, in appendix B, printed my official correspondence with him and his officers. How extraordinarily public opinion has altered in regard to this question in the last few years may be realized by a perusal of a letter from the Government of India, No. 915 R.C., dated the 3rd September 1887, in which regret was expressed for inability to accede to a proposal to make a line from Mayavaram to Tranquebar on the 2′ 6″ gauge, 18 miles long, without guarantee, on the grounds that "the introduction of a variety of gauges for railways on the plains of India is much to be deprecated," while perusal was invited of a note by their then Consulting Engineer for Railways, Mr. (now Sir) G. L. Molesworth, on the defects found by him in the, since so successful, Morvi line which was held up as an example, to be shunned, "of the unsatisfactory working of light rails and light rolling-stock, and as affording an instructive illustration of the drawbacks of adopting a different gauge from that already in the district." Mr. Molesworth's note concludes as follows: "This unfortunate failure affords an instructive example of the disastrous results following the adoption of crude suggestions without due consideration and competent professional advice." Nevertheless it would appear from Colonel H. O. Selby's letter at foot of page 45, in appendix B, that the Morvi railway's original 19lb rails and light sleepers have stood in the most marvellous way. I presume that a good deal of money has been expended since the date of Sir G. Molesworth's strictures; but, however that may be, the little Morvi line is still a going concern, and a very useful one at that.

It may be convenient to note here that at the present rate of exchange the relative value of the Rupee, the pound sterling, and the United States dollar are as follows:—

R. 1 = £ 0·066	£ 1 = R. 15·000	$ 1 = £ 0·206
R. 1 = $ 0·324	£ 1 = $ 4·860	$ 1 = R. 3·087

An anna is a penny, and a pie one-third of a farthing.

There would now seem to be every reason to believe that Government will succeed in the future in fixing the relative values of the pound sterling and of the rupee at those above given, viz., Rs. 15 = £1.

OOTACAMUND, F. J. E. S.
15th August 1899.

NOTE.—*It is intended that this Memorandum, in its present form of a Government publication, should be circulated amongst persons likely to be interested in the subject of it, with a request that they will be so good as to communicate to the author any suggestions which they may have to offer, whether in regard to omissions or to commissions. It is more particularly desired that if District officials find that the Memorandum omits to furnish information on any particular point, they will write to that effect. It is proposed, later on, to issue the Memorandum in a more complete form.*

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CHAPTER I.—PREFATORY.

Although this memorandum may perhaps be found useful in other parts of India, it is specially written for Madras, and for the information more particularly of District officials, Members of Local Boards, and Native gentlemen interested in the development of their districts. It is only reasonable to expect that the higher officials and Government should devote more attention to trunk lines of railway extending perhaps through several districts than to cheap feeder lines intended for the convenience and development of limited areas. It seems to me, however, that in this Presidency we have now so nearly reached the limit of due extension of trunk lines of railway, that the time has come for devoting more consideration to cheap and light feeder lines whose function it will be to bring distant towns and villages into touch with the general railway system. When speaking to Native gentlemen about light district railways I generally find that though fully recognising their many advantages they do not, as a rule, know how to go about securing them for the districts in which they are interested. The principal object of this memorandum is to supply them with the necessary information. I have no intention of attempting to occupy the ground already covered by Mr. J. C. Mackay and Mr. W. H. Cole in their valuable and instructive books on the subject of Light Railways; but, where necessary for my purpose of instructing those for whom these notes are intended, I propose with grateful acknowledgments to draw freely from these and other sources of information.

A few facts about the length, gauge, and cost of railways in India may be of general interest. At the end of March 1898 the figures were as follows:—

Particulars.	Units.	5′ 6″ gauge.	3′ 3½″ gauge.	2′ 6″ and 2′ 0″ gauge.	Total.
Length	Miles.	12,210	8,631	315	21,156
Cost per mile	Rs.	1,56,625	71,529	33,984	..
Gross earnings	..	18,90,77,909	6,53,14,984	15,58,799	25,59,51,692
Passengers carried	No.	94,897,070	55,478,448	888,298	151,263,816
Goods carried	Tons.	25,323,367	8,207,721	167,529	33,698,617
Passengers carried 1 mile ..	No.	3,921,899,554	1,985,118,059	23,938,363	5,930,946,976
Goods carried 1 mile	Tons.	3,842,273,077	966,119,061	5,444,529	4,813,836,667
Gross earnings in 1897	Rs.	18,90,77,909	6,53,14,984	15,58,799	25,59,51,692
Working expenses in 1897 ..	..	9,06,13,396	3,35,77,753	9,20,482	12,51,11,631
Net earnings in 1897	..	9,84,64,513	3,17,37,231	6,38,317	13,08,40,061
Return on capital, per cent. in 1897 ..	..	5·03	5·05	6·21	5·04

These are eloquent figures. They show that our twenty-one thousand miles of Indian railways perform services for the people of India which are considered by the latter to be worth paying for at the rate of 25½ crores per annum, and that they are so economically worked that they earned 13 crores of rupees net profit, giving a return of over 5 per cent. on the capital expended on them. In other words, and for the benefit of people who think in pounds sterling, that the £173,000,000 sterling invested in Indian railways produces a net profit of nearly 8¾ millions sterling, or just over 5 per cent.

Though of great general interest, these figures are not exactly those of which I am in search with a view to the instruction of Native gentlemen and others who are interested in district development. The bare statement that the Indian railways carried 593 crores or billions of people one mile, and 481 crores or billions of tons one mile, conveys to the mind a vague idea of immensity. But what the practical man wants to know is, not the quantity of useful work done or the number of rupees earned, but how much per cent. he would have got for his money had he been a shareholder in Indian railways as a whole. The answer is that while any number of millions sterling within reason can be borrowed in London on good security at from 2½ to 3 per cent., the 173 millions sterling invested in Indian railways paid over 5 per cent. That seems quite good enough, and sets one wondering why a powerful syndicate has not already offered to raise enough millions to take over the whole of the Indian railways. Of its magnitude there is probably no sounder or safer property in the world.

The figure which more than any other is of interest, in connection with our proposed enquiry into the advantages of light district railways, is the 6·21 per cent. which was earned by the 2′ 6″ and 2′ 0″ gauge lines as compared with the 5 per cent. earned on the metre and broad gauge lines. Now it would be very foolish to argue that if the whole 21,000 miles of railway had cost only the price per mile, Rs. 34,000, of the narrow gauge lines, and had earned their full 25 crores, but had been worked at the same percentage of gross earnings, viz., 60, which prevailed on the little lines, they would have earned 10 crores net and paid interest on their capital cost at the rate of 14 per cent. The reason why such an argument would be foolish is that there are several thousand miles of railway which if they had been on the narrower gauges could never have carried the traffic which they now carry. But I do not think that I shall be going very far wrong if I say that at least 2,000 miles of the metre gauge lines might have been made on one or other of the narrow gauges at a cost of Rs. 30,000 per mile instead of Rs. 70,000, and that the capital so saved might have been advantageously spent in the construction of another two or three thousand miles of narrow gauge, to the immense financial benefit not only of the districts served but also of the owners of the money. Thus, a certain 440 miles of metre gauge railway in this Presidency usually earns only about Rs. 60 per mile per week, while the remaining 600 miles of the system to which it belongs earns about Rs. 220. The 315 miles of narrow gauge lines earn on the average between Rs. 90 and Rs. 100 per mile per week, and, as we have seen, paid nearly $6\frac{1}{4}$ per cent. in 1897.

We have got accustomed in India to thinking of earnings at per mile per week, but it is for some reasons more convenient to think of them at per mile per annum. The earnings of the three classes of railways, referred to this rate-unit, were as follows for 1897 :—

	Standard Gauge.	Metre Gauge.	Special Gauges.
	Rs. 15,486	Rs. 7,568	Rs. 4,958
or in pounds sterling	£1,032	£504	£330

If one were disposed to draw a general deduction not only from these figures but from his personal knowledge of the capacity and every-day working conditions of the average run of Indian railways, he would not be far wrong in laying it down as a maxim that for lines likely to earn, when fully developed, Rs. 6,000 per mile per annum the 2′ 6″ gauge is quite good enough ; but that the metre gauge had better be adopted for all lines likely to earn from Rs. 6,000 to Rs. 10,000 per mile per annum ; and that, beyond that, the standard, 5′ 6″, gauge will be suitable.

A comparison between the railways of India and those of the United Kingdom will be interesting—

	England.	India.
Miles of double (or more) line ...	11,589	1,284
,, of single line	9,688	19,699
Total open mileage	21,277	20,983
Cost per mile open	Rs. 7,25,760	Rs. 1,23,705
	£ 48,384	£ 8,247
Gross earnings	Rs. 1,35,17,86,830	Rs. 25,59,51,692
	£ 90,119,122	£ 17,063,446
Working expenses	Rs. 75,28,86,360	Rs. 12,51,11,631
	£ 50,192,424	£ 8,340,775
Net receipts	Rs. 59,89,00,470	Rs. 13,08,40,061
	£ 39,926,698	£ 8,722,671
Paid up capital	Rs. 15,44,21,30,025	Rs. 259,57,00,000
	£ 1,029,475,335	£ 173,046,666
Dividends	3·88 per cent.	5·04 per cent.
Passenger carried	980,339,433	151,263,816
Goods carried, tons	356,468,009	33,698,617

It will be seen that the mileage of railways in the two countries was approximately the same, but that the English lines cost nearly six times as much per mile as the Indian. This is quite easily accounted for not only by the enormous cost of land in England, estimated at £4,000 to £5,000 per mile or fully 30 times the cost of the corresponding item for Indian railways, and by the cost of getting railway bills through

Parliamentary Committee, but also by the fact that while less than half the mileage of English railways consists of single track, more than nine-tenths of the India mileage is single. In England the cost of entering the great cities is enormous, running sometimes into crores of rupees, or millions sterling, per mile. The standard of maintenance in England is on the average very much higher ; for, on the average, English speeds are fully double Indian speeds. English railways carry about six times as many passengers and ten times as much goods as Indian lines, and this necessitates not only a very much larger amount of rolling-stock but all sorts of safety appliances and station facilities. Yet with all these differences the net commercial result is something over 5 per cent. in India and something under 4 per cent. in England on the total capital expenditure—results perhaps reasonably proportionate to the financial circumstances of the two countries.

It seems reasonable that just as the conditions of Indian differ from those of English railways so ought those of Indian district railways to differ from those of Indian lines in general ; that is, means should be adapted to ends. Now it may reasonably be asked what are the ends which we have in view in proposing to enter on an extensive scheme of district railway building. To my mind they are as follows :—

(*a*) To enable a very large number of simple villagers to travel at reasonable hours from village to village, and from their homes to the nearest railway station, with reasonable comfort, in weather proof vehicles, with reasonable time to refresh themselves, and at a cost which with the other advantages will cause them to prefer the railway to the road.

(*b*) To enable them to despatch their goods and merchandise with speed and safety, and at a cheaper cost than by bullock cart.

(*c*) To do this at no inordinate cost to the District, so that if possible no charge may fall on the district funds after the first four or five years.

These being the objects in view, the means of attaining them seem to be as follow :—

(*a*) *Cheap construction*—to be secured by laying narrow gauge lines on existing district roads, and so, incidentally, saving much of the annual cost of maintaining such roads, owing to the diversion therefrom of traffic to the railway and the consequent saving of wear and tear of metalling.

(*b*) *Slow speeds*—for slow speeds mean cheap working and maintenance, as well as reasonable stoppages for travellers' convenience.

(*c*) *Low rates and fares*—just enough to induce people to prefer the trains to the gharries, ekkas, bandies, jutkas and other country carts.

It must be recollected that there will be but little demand on such lines as these for luxurious saloon carriages ; selfish demands for these by rich individuals must therefore be resisted ; for the comparatively small number of first-class tickets likely to be taken will not pay for the cost of running empty vehicles about, day after day. If the rich man does not like the reasonably comfortable accommodation afforded, why he can go by road ; nobody will hinder him. On the Darjeeling-Himalayan Railway when a Governor or a distinguished person wants to travel an extra cushion or two is put into the ordinary upper class vehicle which scarcely differs at all from the third class one ; each has pretty much the same sort of accommodation as a tonga gives, and people are perfectly satisfied. If the people of a district are luxurious enough to want something extra good they must be prepared to pay for it, either in higher fares or in being obliged for a longer period to make good the deficiency of net earnings.

CHAPTER II.—THE RAILWAY ACT AND THE TRAMWAYS ACT.

Railways in India are constructed under one or other of two Acts, viz., THE INDIAN RAILWAY ACT, No. IX of 1890, as amended by Act IX of 1896, and THE INDIAN TRAMWAYS ACT, No. XI of 1886. The Railway Act enables a Railway Administration, under the authority of the Governor-General in Council, to do everything that is necessary for the making and for the subsequent working of a railway. It enables the Governor-General in Council to appoint Inspectors of Railways. It lays down rules for the opening and, where necessary, for the closing of railways or parts of railways; authorises the appointment of Railway Commissioners for the settlement of differences between Railway Administrations; directs that the several railways shall provide proper facilities for the movement and interchange of traffic, and that rules shall be made to regulate the safe and convenient working of railways, whether open or under construction; specifies the responsibility of Railway Administrations as Carriers; regulates enquiries into accidents; and lays down penalties for offences whether of railway servants or of the public.

The Indian Tramways Act, the provisions of which have recently been extended to the Madras Presidency by a Notification on page 532, Part I, of the *Fort St. George Gazette*, dated the 5th May 1899, with effect from the 1st October 1898, differs chiefly from the Indian Railways Act in transferring from the Supreme Government to the Local Government the powers and responsibilities of enabling promoters to make and to work lines of communication which are in no way specially differentiated from railways except in their being built under the authority of the Tramways Act instead of under that of the Railway Act. In the Tramways Act the local authority—therein defined as "a Municipal Committee, District Board, body of Port Commissioners, or other authority legally entitled to, or entrusted by Government with, the control or management of a municipal or local fund"—must either promote the tramway itself or must have approved of the proposals of the promoters. When it is proposed that the tramway shall in any way interfere with a road, the consent of the road authority is essential. When it is proposed that the tramway shall be laid in two or more circles of authority and when one of the authorities does not consent, the power of consent vests in the Local Government. The Act provides that when the Local Government is satisfied as to the propriety of proceeding on a promoter's application, it shall publish in the local Gazette a draft of a proposed order authorising the work to be proceeded with; and if, after considering any objections that may be put forward with respect to the draft, it is satisfied that the application may be granted, it may publish an order accordingly. The Act provides that the order shall be so framed as to fully provide for all difficulties likely to arise between the promoters and the various authorities and the public, whether during construction or afterwards, as well as for its inspection and for its proper working and maintenance. The Act provides for traffic on the tramway, for its lease by the promoters to third parties, for its discontinuance, for the insolvency of the promoter, for its purchase by the local authority, and for its working when owned by such authority. It gives the Local Government power to make rules; it specifies offences and penalties; and it provides for the settlement of differences and for the recovery of tolls.

The chief difference between the Railway Act and the Tramways Act is that while under the former the control of the relationship between the public and the persons interested in the undertaking vests in the Governor-General in Council, and the Local Government has only such control as the Government of India may see fit to delegate to it; under the latter the Local Government takes the place, in relationship to the public and to the promoters, which under the Railway Act is taken by the Government of India. Under the Railway Act the Government of India may, if they choose, make railways, or authorise persons to make them, across country from anywhere to anywhere and through cities and towns, with or without reference to the wishes of local authorities. Under the Tramways Act on the other hand the prior consent of the local authority, or if two or more local authorities are affected, of the Local Government, is necessary before a promoter can move.

In England there is no single general Railway Act. A special Act of Parliament is necessary before any person or company can make a railway or before a railway administration can do anything not provided for in the initial or subsequent Acts. In these Acts, of which there are now many thousands, maxima rates and fares are specified. Besides these innumerable special Acts for individual railways there are several special Acts which direct that railway administrations shall do and leave undone certain things considered to affect the interests of the general public. When an English railway promoter goes to Parliament to obtain his Act he is subject to attack and opposition, whether from the public or from corporations or from other interested railways; and he usually only succeeds in obtaining his Act after much delay and at considerable expense, estimated I believe at 2 or 3 per cent. of the whole cost of the English railways. His land he obtains under a special Act. All this appears to us in India to be a very cumbrous procedure, but in spite of its cumbrousness England is nowadays covered so closely with a network of lines that the average man throughout the entire country is within a distance of 2 or 3 miles of a railway station.

In the United States of America where they will soon have ten times our Indian or English mileage, the Supreme Government exercises no more authority over railways than it exercises over any other industry. The safety of the public is left to the care of the common law of the land, and to the influence of wholesome competition. The several States, or as we would call them in India, Local Governments, appoint railroad Commissioners to control railways within each State, very much on a par, I take it, with the Consulting Engineers with Local Governments in this country. But in the absence of any supreme authority the movement of traffic through or between States is left to the ordinary operation of supply and demand. Any man or company who chooses to take the risk of doing so can lay down a railway from anywhere to anywhere, and everything is left to private negociation; precisely as if a man desired to buy a field and to build a mill on it without aid from the State. The result is excellent for the general public, though there has been an immense deal of bankruptcy, and of selling of non-paying lines, and of writing down of capital; a sort of thing of which so far as I am aware there has been only one very petty instance in India, where the State blue books exhibit the actual outlay to a penny on every railway in the land.

Between the extreme difficulty which a promoter of a railway in England must encounter and through which he must fight his way, and the extreme ease with which the American promoter can advance without State interference, the course of the Indian promoter under the Railway Act preserves a happy mean. While reserving to itself, as is right, full control over matters affecting the interests of the public and of users of the railway, to an approved promoter the State offers much in the way of reasonable assistance, sometimes providing him with plans and sections at first cost, and at other times obtaining land for him without trouble on his part beyond in some cases his paying for it. Under the control of the one general Railway Act the legal difficulties of an Indian railway promoter or administration are comparatively light.

The Tramways Act is the outcome of an attempt on the part of the Legislature to facilitate the construction and working of railways of so merely local an interest that it seems inexpedient that the Supreme Government should trouble itself about them. The presumption is that the local authority of the area within which the proposed local railway is to be built is perfectly well able to guard its own interests, under the general control and assistance, when necessary, of the Local Government. The only reference throughout the Act to the Supreme Government is in section 4 (*b*) where it is laid down that if any part of the proposed tramway is to traverse land which is not included within the limits of a municipality or cantonment, the order shall not be published without the previous sanction of the Governor-General in Council.

Since the passing of the English Light Railway Act of 1896, 175 applications have been made in respect of about 1,800 miles of railway, the total estimated cost of which is about £11,000,000 or an average of a little over £6,000 per mile. Most of them had a length of considerably under twenty miles. Up to the end of 1898, sixty-nine of them with a total mileage of 617 and a cost of £3,415,000, or an average of £5,535 per mile, had been approved; forty-seven had been rejected or withdrawn; while the remainder were still under consideration. The Act gives power to local

authorities, corporate bodies and private persons to make application, to the Commissioners appointed by the Board of Trade, to construct light railways and to raise the necessary capital, in connection with which the treasury has power, on recommendation of the Board of Trade, to encourage the construction of such lines by granting loans at a low rate of interest, or in special cases by making free grants. Of the 617 miles already sanctioned 131 consist of class B lines averaging £7,260 per mile, to be constructed either wholly or partly along public highways and streets. All these are intended to be worked, or are worked, by electricity. The remaining 486 miles are A class lines, that is light railways of ordinary type but cheaply constructed at an average cost of £5,690 per mile.

It is important to enquire whether interest can or cannot be paid during the construction of a tramway or light railway, and under what Act it may legally be paid. When a District Board constructs a railway with the aid of its own accumulated resources there will of course be no question about the payment of interest during construction. When, however, a Limited Liability Company is formed with a guarantee from the District Board of gross or of net earnings, it is quite possible that intending shareholders may demand that interest during construction shall be paid to them out of their own capital; indeed it may not be possible to raise the money on any other conditions. Indian Act X of 1895 authorises the payment, under certain restrictions therein laid down, of interest during construction to the shareholders of a Railway Company formed to construct railways as defined in section 3, clause (4), of the Indian Railways Act, 1890; Railway Company being defined as a company registered under the Indian Companies Act, 1882, and formed for the purpose of working or making a railway in India. Light railways and tramways, constructed under the Indian Tramways Act of 1886, have not as yet been specifically brought under the provisions of Act X of 1895. A company formed in India under the Indian Companies Act, 1882, cannot, apparently, unless it has been formed for the purpose of constructing a railway as defined in section 3, clause (4), of the Indian Railways Act, 1890, pay dividends out of capital; for in the first schedule of the Indian Companies Act, clause (73), it is expressly laid down that "no dividend shall be payable except out of the profits arising from the business of the company." Yet the Directors of the Ranaghat-Krishnagar Tramway Company (Limited), who have recently completed a light district railway in Bengal under the provision of the Indian Tramways Act, did, as a fact, pay interest during construction to shareholders, at the rate of $3\frac{1}{2}$ per cent.

There is an English Parliamentary Act entitled "the Indian Railway Act, 1884," which authorises the payment from capital of interest to shareholders during construction by the Directors of an English domiciled company making railways in India under the Indian Railways Act, 1895. But the case of light railways and tramways built under the Indian Tramways Act is not provided for in the English Act referred to.

It would appear therefore that amended legislation is necessary, bringing within the scope of Act X of 1895 light railways constructed under the Indian Tramways Act by Indian domiciled companies. An amendment on similar lines of the English Act, "the Indian Railway Act, 1884," also seems desirable, for meanwhile no English domiciled company, formed for the purpose of constructing light railways or tramways in India under the Indian Tramways Act, can pay interest out of capital to its shareholders. There is no doubt that the power of paying interest out of capital during construction, a thing ordinarily prohibited to joint stock companies in India and in England, acts as a strong attraction in inducing proposed investors to risk their money in Indian railways. It seems anomalous that the same privilege should not be allowed to those risking their money on another class of railway, and that for this there should be no apparent reason beyond the fact of their being constructed, as a matter of administrative convenience, under an Act which designates them Tramways.

CHAPTER III.—BREAK OF GAUGE, AND COST OF TRANSHIPMENT.

If district railways are to be built at as low a price as Rs. 20,000 to Rs. 30,000 per mile, there must necessarily, for all goods and passengers, be a change from the cars of the little railway to those of the main line, and *vice versâ*, at the junction. It is of course true enough that light and consequently cheap branch railways can be made on the same gauge as the main line by its being insisted on that no wheel loads, even of locomotives, shall exceed the wheel loads of the waggons of the main line, and that speeds shall be very slow. On squatting down alongside of a railway and watching the behaviour of one of the rail joints when it is passed over by a fast train and by a slow one, and especially when the heavy wheel of a fast engine is passing over it, one notices the greatest difference between the vigour and violence of the blow or shock produced by the heavy wheel of a fast engine and by the wheel of a slow waggon. Once this is realised it is easy to understand that, if all wheel loads be kept light and if all speeds be kept slow, it will be less necessary to have heavy and expensive rails, sleepers, and fastenings; the same thing applies also to bridge girders. Therefore, without narrowing the gauge, a cheap branch railway may be built capable of carrying the main line waggons hauled by special light engines at slow speeds. But even such a railway as this is not cheap enough for our purposes, especially in a country that is at all rough; though in parts of Northern India where for scores or hundreds of miles the country is as flat and, until irrigated, as bare as a threshing-floor, light lines of this sort can be made very cheaply. In Southern India however where there are always a certain quantity of banks, cuttings, and bridges these must cost nearly as much for a light railway as for a heavy one unless the gauge be narrowed, and unless everything be made so small and so light that the existing road and its bridges can be utilized, and so a great part of the cost of construction saved.

But there are people who cannot get their thoughts beyond the mere statement which somebody has made to them that break of gauge is an evil. I suppose that if such a person had a farm a quarter of a mile off a main trunk road, and if every morning a lot of heavy bullock carts passed along the trunk road on their way to the town, and if the person we speak of had every day just one basket of farm produce to send to the town for sale, he would try to induce the District Board to make a branch road to his house costing a thousand rupees in order that a cart might come right up to his door, rather than that he should have to send the basket load down to meet the carriers' carts on a cooly's head.

The people who originated the theory that break of gauge was an intolerable evil, though they never intended the proposition to be universally applied irrespective of circumstances, were the military advisers of the Government of India on the North-West frontier where considerations of facility for transporting troops and war materials occasionally outweigh all other considerations; and where so important is it that during war time there should not be a break of gauge that it is considered worth while to keep hundreds of miles of railway, even during years of peace time, doing perhaps only half or a quarter of the work which they are capable of doing, and no more than might perfectly well be done by a railway on a narrower gauge costing only half the money. But in Southern India, and particularly in regard to the class of district railways now under consideration, we need not allow ourselves to be influenced by any of the considerations which so influenced the northern railway administrations. What we require is something a great deal better than roads, and yet a great deal cheaper than most of the existing railways. There are undoubtedly certain disadvantages in the employment of the thing that we can afford instead of the thing that we cannot afford, and one of these disadvantages is break of gauge; but the disadvantage of this has been extraordinarily exaggerated and I shall now endeavour to show what it really costs.

On the subject of the time, cost, and inconvenience of transhipment I have consulted Traffic experts who have been good enough to send me the following replies:—

Mr. W. C. Boyce, the Traffic Superintendent of the East Coast Railway, writes:

I conclude that what you require is the cost of junction transhipment between gauges, and not ferry transhipment which is a very complex and costly matter.

(*a*) For junction transhipment procedure and cost are as follows:—

(1) *Procedure.*—Accurate tallies are necessary and registration recording the results of the tallies. I enclose a form of register I am using on this railway which has been successful.

(2) *Cost* is dependent on accommodation, procedure, and staff. If the accommodation and appliances are suitable and the staff well trained, the work will be done quickly, correctly, and efficiently, and the consequent cost of demurrage to stock and claims on goods will be greatly minimized. The latter are often the major items of expenditure.

(*b*) The question whether narrow platforms or broad platforms are best, depends on the class of goods and the procedure adopted—

(1) *For coal and such like.*—Where the contents of one gauge are transhipped into another gauge, you only require standing room; better still if shoots or tilts are employed between the gauges, the contents could be shovelled out and in.

(2) *For general goods.*—If the goods are to be checked on the platform, the platform should be broad. If the goods are carried direct ex-waggons and checked *when passing on the coolies' heads into the transhipped waggons*, the platform should be narrow—the former plan is the one generally adopted, the latter plan is the most expeditious, the staff of checkers however would have to be larger.

(3) *For labour.*—The cost is dependent on the local rate for labour, &c., but should average per 1,000 maunds.

Per unit.	General goods.	Heavy over 10 maunds.	Coal, &c., baskets supplied by contractor.
1,000 maunds	Rs. 3 to 3½	Rs. 3½ to 5	Rs. 3 to 4
Ton	15 to 18 pies	18 to 26 pies	15 to 21 pies

(4) *Establishment.*—The cost for an average of 5,000 maunds per day is as below:—For larger or smaller averages, the establishment should be proportionately increased or reduced.

Designation.	No.	Cost.
Transhipment head clerk	1	Rs. 50
Tranship clerk, outwards	1	„ 30
Do. inwards	1	„ 25
Checkers	4	„ 60
Khalasees	3	„ 21
Total ...		„ 186

This estimate does not include watch and ward, and it presumes that the transhipclerks and number-takers are members of the joint staff of the station.

Mr. H. Davies, the Traffic Manager of the South Indian Railway, writes:

It is difficult to fix a general charge for transhipment as the conditions vary so. This work, at our joint stations, is done by the ———— and the ———— railways as the case may be, and a number of porters are allowed for it; but of course it would not be a fair criterion to take the cost of transhipment at these stations, as the men's services are not fully engaged. At odd times they may be assisting in shunting or doing portering.

When you have got a rake of broad-gauge waggons on one side of the transhipplatform and metre-gauge waggons on the other side, the cost of labour for transhipping loads from one side to the other would all depend upon the nature of the load, but it could be approximately ascertained.

I give below a memorandum giving an estimate of the cost of transhipping and loading a six-ton truck load of various commodities under such conditions.

Memorandum showing the cost of transhipping and loading by manual labour a six-ton truck of—

	Rs.	A.	P.
Grains	0	6	0
Plantains	0	6	0
Cocoanuts	1	0	0
Jaggery	0	8	0
Cotton, loose or pressed	1	0	0
Cotton with seeds	1	4	0
Soap sand	1	0	0
Stones	1	0	0
Oil-cakes	0	8	0

Number of bags loaded in a truck—

Paddy	100 bags.
Oil-cakes	105 „
Rice	75 to 80 „
Cocoanuts in bags	140 to 150 „
Jaggery	69 to 79 „
Cotton pressed of 400 lb.	30 bales.
„ „ of 300 lb.	40 „
„ loose, big iron covered waggons	14 to 16 bdls.
„ „ small „ „	10 to 12 „
„ with seeds	30 to 40 „
Soap sand	60 bags.

Mr. A. Pope, Traffic Supdt. of the O. & R. S. Ry., writes as follows:—

Taking the case of transhipment of bags of grain from waggon to waggon, I find by actual practice that it takes—

(1) Six men from 26 to 34 minutes to tranship 105 bags across a narrow platform 5 or 6 feet wide.

(2) The same number of men 35 to 50 minutes to tranship the same number of bags across a broad platform 58 feet wide.

I also think that though the narrow platform gives a distinct advantage where transhipment can be made direct from waggon to waggon, still when temporary stacking is necessary the broad platform is no doubt better.

With regard to the payment of coolies: at small stations, the coolies are engaged by the stationmaster who is remunerated at the rate of one pie for every maund, or 2½ annas per ton, handled. At the large stations the railway engages the coolies and pays the stationmaster for supervision at the rate of Rs. 1–8–0 per 1,000 maunds, or 0·648 annas per ton, handled, after deduction of coolies' wages and half the balance.

Across broad platforms the loading and unloading are calculated as two operations and across narrow platforms as one operation. The lifting capacity of a cooly is taken as 350 maunds per day. The average time a cooly would work daily is eight hours.

The men and time occupied for loading a six-ton truck are as follows—

Grains	4 men about 30 minutes.
Oil-cakes	
Jaggery	
Soap sand	
Cotton, loose and pressed ...	8 men about 2 hours.
Cocoanuts	4 men about 4 hours.
Stones	3 men about 3 hours.

Mr. T. J. McCloughlin, Deputy Traffic Manager of the South Indian Railway, writes—

The cost of transhipment varies nearly everywhere—independently of the quality of the transhipping facilities—according to the cost and quality of local labour and the goods to be handled, or to whether labour is available at all locally or has to be imported. Then there is the cost of supervision, clerkage, &c., which also varies according to the congeniality or otherwise of the climate, facilities for obtaining supplies, habitations, &c., at the station. Labour and staff have to be imported sometimes from long distances, the supervising staff have to be paid specially high salaries, and at some places quarters have to be specially built for the coolies.

I think that a charge of 1 anna to 1½ anna per ton would be a safe figure to estimate for.

In reply to an enquiry about the labour required for the transhipment of salt in bulk, Mr. F. W. Read, Traffic Manager, of the Madras Railway, writes as follows:—

For coal, sand, salt, &c., in bulk, 10 coolies on contract work would load or unload (distance 50 paces) 6 waggons of 12-ton capacity in 9 hours. This is hard work, and daily-paid men would do less. On contract work 167 men would load 100 waggons per day and the same number would be required to unload.

Contract labour for this work is 1 anna per ton for loading and the same for unloading. The cost per ton of transhipping at Guntakal is 14 pies, at Arkonam 15 pies and at Bangalore City 9 pies. The cost at Arkonam is high because of the small weight transhipped, only one-fifth or one-sixth of that handled at other places.

From this evidence of four Traffic experts, all working in South India, it would appear that from 1 to $1\frac{1}{2}$ anna per ton is a fair price for transhipping from one gauge to another, while it may run up to $3\frac{1}{2}$ annas for specially bulky and troublesome goods, and may cost, for such goods as grain, as little as half an anna per ton. How really unimportant a matter is this cost of transhipment will be seen from a perusal of chapter IV, where it is shown that on the Morvi Railway the average sum received in ten half-years for the carriage of *one ton* of goods *one mile* was about $1\frac{1}{4}$ anna.

Mr. W. C. Boyce brings to notice that a not unimportant item of cost of transhipment consists of payments by the railway administration of claims made by consignors or consignees on account of damage occasioned to goods during transhipment. But the public soon get to recognise that, when their goods are carried by carts or by canal boat, there is practically no possibility of recovering anything on account of damage done in transit.

As an ordinary charge for railway freight of average goods is from 3 to 6 pies (one farthing to one halfpenny) per ton mile, and as the cost of transhipment is from 1 to $1\frac{1}{2}$ annas (a penny to three halfpence) per ton, it follows that the cost of transhipment is equivalent, according to class of goods handled, to haulage over from three to six miles of railway. This cost the merchant of course pays, but he pays it indirectly, for the general run of rates throughout a line is regulated by the management so as to cover all incidental costs of working of which transhipment is one. It may safely be predicated that the cost and delay of transhipment at the junction of a railed road with the main line of which it is a feeder will, when added to railway freight charges, usually be considerably better for the consignor than the cost and delay incidental to carriage by country cart.

I noticed lately that, even on the short 22 miles Barsi light railway, carts had been practically cleared off the excellent metalled road on the side of which the railway runs.

In an article on Rhodesia and its Railways published at page 502 of *Engineering* of October 22nd, 1897, I find that the main 3′ 6″ gauge railways of South Africa are joined at Umtali by the 2′ 0″ gauge Beira line. The length of the Beira 2′ 0″ line is 222 miles from Beira to Umtali, and thence to Fort Salisbury 160 miles by 3′ 6″ gauge. With reference to the change of gauge the article remarks as follows:—

Much has been said about change of bulk; and when distances are short and competition great the objections are unanswerable. But where 100 miles have to be traversed on one gauge and then there comes a change, the cost of such breaking of bulk, only representing 6*d.* per ton, means simply, with the freight paying 4*d.* to 6*d.* per ton mile, an increase equivalent to one or two miles longer haulage.

There is of course some delay, and there is of course occasionally some damage to goods, during the process of transhipment; but this is very small indeed as compared with the delay and loss incurred if for the sake of preserving continuity of gauge a railway must cost so much that a district cannot afford to secure it. Writing as I am for clever intelligent men, such as largely compose our Southern India District Boards, I need not insult their intelligence by enlarging any more on this subject. If in future anybody talks rubbish to them about the evils of break of gauge they will be able to quote figures if the objector is a sufficiently influential person to be worth the trouble of replying to.

CHAPTER IV.—CONDITIONS FOR REMUNERATIVENESS.

When the President or an energetic member of a District Board thinks it likely that it will be advantageous to get a light railway made through a certain part of his District, he will naturally ask himself what the financial results to the District generally are likely to be. It goes without saying that in nearly any case that could be named the indirect results to the piece of country actually served will be beneficial, for the movement of produce and of travellers will be greatly cheapened and made much more convenient than heretofore.

When a man grows rice and wants sugar and tobacco, while another man grows sugar and tobacco but wants rice, they will exchange their produce to the greatest advantage to both if they live in the same village, because it will cost very little to carry each man's produce to the house of the other. But if all the people in one piece of country grow rice and only rice, while no sugar or tobacco is to be got except by going four or five days' bullock-cart journey to another district where the people grow plenty of sugar and tobacco but very little rice, neither set of people will get as much in exchange for their own produce as they desire to get; because a cartman who grows nothing has got to be paid enough to feed his bullocks and himself and all his family as well as a proportion of the annual cost of rent, clothing, &c., on the four or five days' journey and back again, out of the rice, sugar and tobacco which would otherwise pass from one farmer direct to the other. If now the road be metalled and bridged, and so improved that the cartman can do the return journey in four days instead of in eight or ten, there will be less to pay to the cartman, and each of the two farmers in return for what he grows will get more of the thing that he wants but does not grow. If now in due course a railway be substituted for the road, so that only half as much money as heretofore has got to be paid for moving the rice to the house of the sugar and tobacco man and the sugar and tobacco to the house of the rice man, both men will either get more of what they want, or, what comes to the same thing so far as their happiness is concerned, will have to grow less in order to obtain a sufficiency of what they want; and so all round they will have more leisure, be better off and happier, and have more to exchange for other luxuries.

The illustration holds good if in place of individual men we substitute towns and groups of villages. The villagers grow rice and other crops and want piece-goods, iron, kerosine-oil, salt, &c., in exchange for the surplus of their field crops; while the merchants in the town who sell piece-goods, kerosine-oil, iron, &c., can only obtain these things by exporting village produce, rice, ground-nuts, hides, die stuffs, &c. Between the town merchants and the village traders come perhaps hundreds of cartmen and these have all got to be paid. When a railway comes and charges only half or a quarter as much as the cartmen charged, while delivering the goods in a fraction of the time and in very much better condition, the villagers, the village farmers and traders as well as the town merchants all are benefited.

But the sort of benefit which has just been referred to has nothing to say to the profit or loss of the District from the point of view of the District Board's finances. It is quite possible that a far seeing District Board may recognise that, even if railways are worked at a direct loss, such loss is more than made up for by indirect profit in the shape of the increased prosperity which must follow the abolition of a great part of the cost of transport. The village people being better off can stand a little more taxation, and it does not take much taxation per head of population to cover loss of interest on the capital cost of a cheap local railway. Thus for 100 miles of railway at Rs. 20,000 per mile, interest at 4% comes to Rs. 80,000 per annum. This distributed over one million people in a District comes to only about *one anna per head per annum*, or one pie ($\frac{1}{12}$rd farthing)—say a handful of grain—per head per month. Taxation on so low a scale as this if properly distributed is so little felt that it is easily conceivable that the million people of the District, if they were only intelligent enough for a plebiscite to be taken on the subject, would vote for 100 miles of railway, even at the cost of the extra tax of the value of a handful of grain per head per month, rather than continue as heretofore at the tender mercies of the cartmen.

But it may be asked how about the cartmen; what are this hard working class to do? The reply is that, with the increased movement of produce and of imports which invariably follows the advent of a railway, the cartmen will have better employment than heretofore; only, instead of working along the main route followed by the railway, they will work on branch routes between the railway stations and the villages, twenty or thirty miles on either side of the railway. The District being saved a great part of the cost of maintaining the main line of road on the route now occupied by the railway, will be better able to afford to devote attention to branch feeder roads; upon these the cartmen will work for hire, and the outlying villages will obtain a share of the services of carters who heretofore have been obliged to confine their operations to main lines of road.

If only railways can be made cheap enough, and can be worked cheap enough, they can always afford to charge less for the transport of goods than the cartmen can, while at the same time paying all working expenses and interest on capital as well. I assume of course that they are properly managed. But before a railway can entirely drive carts off a road, it is essential that it should penetrate quite close up to the smaller villages; because, what with the delay and trouble of loading and unloading carts, once a man has got his goods well loaded on a cart he will often prefer to let it go on, even 10 or 20 miles, rather than unload it again, perhaps four or five miles away, at a railway station. But railways cannot possibly be carried right up to every important village unless they can be made very cheap indeed. I suppose that if they could be made for Rs. 5,000 per mile, they would in a few years extend so that few villages would be more than four or five miles away from a railway, as is the case in England now; though in England even the cheapest railway costs a couple of lakhs per mile. We have not yet found out how to make railways for Rs. 5,000 per mile, but I hope to show how they can be made, quite good enough to reduce the cost of carriage very considerably, for Rs. 20,000 to Rs. 25,000 per mile; and at this price an enterprising District *ought* to be able to bring a railway within 15 or 20 miles of every one of its villages.

It will probably be admitted that it is foolish to spend more money than will just suffice to effectively serve the object in view. Thus a company wishing to erect spinning mills, and knowing absolutely that they are extremely unlikely ever to get more work than can be done with 10,000 spindles, would not deliberately erect a mill of 20,000 spindles. An adviser might say to such a company "A fine big mill is *such* a handsome thing, and there is *so* much more room to walk about, and perhaps, who knows, there may be a strike in Manchester some time or other and it will be a *great* thing then to have plenty of power ready in anticipation." Would not the company's Directors say to such an adviser "All very fine, but how about interest on our capital all the time we are waiting for a Manchester strike." Well, in railway matters it is pretty much the same. I have over and over again heard people say "a broad gauge line is *so* comfortable, one has *so* much room in one's carriage, and it looks so *much* handsome and safer than a little toy 2-foot railway, and who knows some time there may be a war, and it may be necessary to move troops and supplies, and it will then be *so* convenient to have a broad gauge railway." The obvious reply to such a suggestion is "we never expect to get more passengers and goods than can perfectly easily be carried in eight or ten trains each way daily on a 2-foot gauge line. Even the least comfortable 2-foot gauge carriages are less uncomfortable and very much quicker and more punctual than jutkas and shigrams, and no railway wagon ever made was so leaky or so slow as a bullock cart, and who is going to pay us interest on the difference in cost, perhaps 25,000 to 75,000 rupees per mile, between a 2-foot line and a broad or a metre gauge line." Interest on the extra money is a very heavy price to pay, perhaps for many years, as an insurance against the possible cost of a war.

To the subject of the cost and inconvenience of break of gauge, I have already devoted a special chapter. It will be interesting now to try to co-ordinate the amount of work likely to have to be done by a railway with the capital which it could be judicious to spend on its construction.

When a company are about to start erecting a spinning mill, if they are wise they will make an estimate of how many pounds weight of yarn they are likely to sell, and by enquiring into the published profits of other mills which have been working for several years they will ascertain what would be a fair profit per lb. of yarn. Then

they will enquire how much capital they can afford to spend, on the understanding that interest on this capital is to be paid by the profits per lb., or per so many lbs. of yarn made. Similarly, in judging how much per mile we would be justified in spending on a railway, we would be wise to look into the statistics of other similar railways elsewhere, and so to ascertain what is the fair average profit on carrying one passenger and one ton of goods one mile. Then making the best guess we can of the probable number of passengers and tons of goods likely to be carried on each mile of our projected railway, we apply the profit figure and so ascertain how much capital we would be justified in spending.

In the annual Administration Report of Indian Railways published by the Director of Railway Traffic we find almost every conceivable sort of statistics of the working of most of the Indian railways, and we have access to this information for many years past. On turning to these statistics I got the following figures for the Morvi Railway, 2′ 6″ gauge, 95 miles long, the property of His Highness the Takore of Morvi, which cost about Rs. 25,000 per mile, and which has been working satisfactorily for many years. The figures which I give are averages for the ten half-years ending 31st December 1898. The profits are in annas (pennies):—

Passengers ..	Received per passenger per mile	As.	0·280
	Cost ,, ,, ...	,,	0·150
	Profit ,, ,, ...	,,	0·130
Goods ..	Received per ton per mile	As.	1·245
	Cost ,, ,, ...	,,	0·635
	Profit ,, ,, ...	,,	0·610

It will be useful to compare the net profits on the Morvi line in pies ($\frac{1}{3}$rd of a farthing) per passenger mile and per ton mile, with the corresponding figures for the year 1897 on the Madras and South Indian Railways, the conditions of one or of both of which are familiar to the people of the Presidency for whom this memorandum is intended. I also give corresponding figures for about 17,000 miles of Indian railways of all gauges and conditions, for the year 1897:—

Railway.	Gauge. FEET.	Length. MILES.	Net profit on one passenger carried one mile. PIES.	Net profit on one ton of goods carried one mile. PIES.
Morvi	2·6	95	1·56	7·32
Madras	5·6	858	1·29	4·01
South Indian	3·3½	1,103	1·11	3·74
Mean of 17,000 miles	..	..	1·26	3·14

Over many thousands of miles of Indian railways the average passenger travels about 40 miles and the average ton of goods about 120; on a 2,000 mile railway, 220 miles is a long average lead for a ton of goods, and 80 miles for a passenger. On a short line of local railway the average length of journey will, naturally, be less than the length of the line, and in estimating probable traffic due allowance must be made for this reduction of the average.

The object of the table at foot of next page is to give at a glance the capital which it would be justifiable to spend per mile of railway for various rates of interest and for various estimates of quantity of traffic to be carried, on the assumption that the *net profit* for carrying one traffic unit one mile is one pie. If it is judged that the net profit per traffic unit will be greater than one pie, the justifiable capital outlay will be proportionately greater. Thus for example if it is judged that the proposed line can be worked so economically that the net profit per traffic unit will probably be $1\frac{3}{4}$th pie per mile, and if money can be obtained by the District Board at 4 per cent., and if the best estimate that can be formed of probable traffic is 400 traffic-unit-miles daily, then, instead of Rs. 19,000 per mile, it will be worth while to spend as much as Rs. $19{,}000 \times 1\frac{3}{4} =$ Rs. 33,250 per mile, and so on.

It will be convenient to take the single passenger mile as the standard traffic unit and to co-ordinate with this the weight of goods which may fairly be taken as giving about the same net profit per mile hauled as is given by one passenger. It will be observed that on the Morvi line the profit from a passenger mile is 1·56 pies, while that from a goods ton mile is 7·32 pies, therefore for that line 1·56 ÷ 7·32 = 0·213 of a ton of goods gives a profit per mile equal to that obtained on one passenger mile. Again on the South Indian Railway, by a similar calculation the same profit is obtained by hauling 0·216 of a ton one mile as by hauling one passenger one mile. The corresponding goods unit on 17,000 miles of Indian Railways is about 0·40 of a ton, and on the Madras Railway 0·32 tons, and so on. The weight of goods to be assumed as the equivalent of one passenger for profit-giving purposes will depend on all sorts of considerations, relative importance of the two sorts of traffic, whether wagons are habitually well filled, whether a large proportion of the passenger traffic is carried in slow cheap trains, whether a fairly high fare is charged for passengers and a comparatively low rate for goods, or the opposite policy, according to the Manager's estimate of what each kind of traffic can afford to pay, &c. It is impossible to definitely say beforehand what weight of goods carried one mile may fairly be taken as giving the same profit as one passenger carried one mile. All that is possible is to form the best estimate practicable, and this may best perhaps be done by accepting the average figures of some neighbouring railway.

It will not unfrequently be found that *one-quarter of a ton may pretty fairly be taken as giving the same net profit as one passenger, per mile hauled.* On this assumption therefore, estimated daily ton miles multiplied by four and added to estimated daily passenger miles will give the estimated number of daily traffic units. The figure thus arrived at should be searched for, or the nearest to it, in the first column of the table below, and the capital outlay which it would be justifiable to spend will be found opposite in the appropriate column headed by the rate of interest at which money is obtainable.

I desire it to be clearly understood that the object of this method of framing an estimate of how much per mile a district would be justified in spending on a railway is that the first roughest guess may be framed as to the class of railway which the district can afford. It does not follow that if, as the result of such an investigation, it should appear that Rs. 50,000 per mile would be justifiable, the district *need* spend this sum, unless it pleases to treat itself to the luxury of a specially good light railway; for, as I hope to show, one of the cheap or Rs. 20,000 to Rs. 25,000 for mile class of lines will, if properly managed, often do quite as much work as the other.

Table giving capital outlay per mile of railway which would be justifiable, for various estimates of traffic, on the assumption that a *traffic unit* hauled one mile gives a profit of one pie.

Number of traffic units carried one mile daily.	Profit per annum at one pie per unit.	Justifiable capital outlay in rupees per mile.			
		At 3½ per cent.	At 3¾ per cent.	At 4 per cent.	At 4¼ per cent.
	Rs.				
320	608	17,371	16,213	15,200	14,306
340	646	18,967	17,226	16,150	15,200
360	684	19,543	18,240	17,100	16,094
380	722	20,628	19,253	18,050	16,988
400	760	21,714	20,266	19,000	17,882
420	798	22,800	21,280	19,950	18,776
440	836	23,886	22,293	20,900	19,671
460	874	24,972	23,307	21,850	20,565
480	912	26,057	24,320	22,800	21,459
500	950	27,143	25,333	23,750	22,353
520	988	28,228	26,347	24,700	23,247
540	1,026	29,314	27,360	25,650	24,141
560	1,064	30,400	28,373	26,600	25,035
580	1,102	31,486	29,387	27,550	25,929
600	1,140	32,571	30,400	28,500	26,824
640	1,216	34,742	32,426	30,400	28,612
680	1,292	36,914	34,453	32,300	30,400
720	1,368	39,086	36,479	34,200	32,188
760	1,444	41,257	38,504	36,100	34,076
800	1,520	43,428	40,532	38,000	35,765
900	1,710	48,907	45,749	42,750	40,235
1000	1,900	54,286	50,666	47,500	44,706

CHAPTER V.—FORECAST OF PROBABLE EARNINGS.

The usual method, heretofore adopted, of forecasting probable earnings has been to station persons at selected points on the route under consideration for a period of from three months to some years, with instructions to count all the traffic passing along the road and to estimate its weight. Were no better method available, such a system might be better than nothing; but it involves many assumptions, and these, if not very intelligently applied, are apt to give fallacious results. Thus it is scarcely wise to assume that all the existing traffic along the roads will come on the railway unless there are branch roads on which the carts can find employment, for the cartmen class will carry goods for very low rates indeed rather than lose their livelihood; for example if a village is situated a couple of miles away from a railway station so that it becomes necessary to load goods up on a hired cart before they can be booked, the cartman will probably try to make a bargain to have them left on his cart and carried on, perhaps a day's journey, perhaps two, to their destination. Then, on the other hand, it is pretty certain that if feeder roads are made from railway stations into the heart of the country to tap important villages from ten to twenty miles off on either side, the traffic which will eventually come on the railway will become considerably greater than that counted along the roads before the line was opened. The amount of passenger traffic to be expected, and by this I mean 3rd class for the others scarcely count, may be greater or less than that enumerated along the roads according as the people are well off and able to afford to travel and have inducements in the way of trading or industrial employment for leaving their houses, or are so poor as to find it impossible to afford themselves the luxury of a ride on a railway. In India the bulk of the passenger traffic is very considerably affected by weddings and family connections. Where there are no railways, and for the first few years after a railway is open, the parents of young people betroth and marry them within their narrow circle of acquaintance or connection, that is perhaps within a range of 10 or 20 miles, or farther in the case of the better-off folks. But once people begin to find it possible to travel at a cheap rate and to go 100 miles in the same time that it used to take them to go ten, they will enlarge their circle of acquaintance and will go farther afield for the settlement in life of their children; later on this of course means visits and intercourse between families at a distance, and improved passenger returns on the railways. Similarly as regards goods; so long as it takes a village merchant two or three days' arduous journey to get to the town where he wishes to sell the village produce and to buy foreign stuff, he will not trade beyond that town. But when railways come, he can visit perhaps four or five equally good or better towns for trading in, in the same time, in much greater comfort, and at half the cost; so naturally he will trade on better terms; and the villagers, finding that it pays them better to grow grains, seeds, &c., because the village chetty or bania, gives them a better price, will naturally grow a larger area of grain, &c.; and so, as years go on, more and more stuff will come on the railway.

It is not very difficult to make a fair estimate of the quantity of goods and passengers that will pass on to the railway from or towards the large towns; for either the existing traffic of those towns can be gauged and a factor applied to it by an experienced traffic officer, or else a comparison can be made with the actual amount of business done by similar towns similarly circumstanced on existing open railways.

The difficulty lies in estimating how much traffic will come from the rural and village tracts which the line will traverse. A very good solution of this problem has recently been offered by Mr. F. Palmer of the East Indian Railway, who has suggested that the annual earnings of a section of railway from its rural and village customers may, with a very fair approximation to accuracy, be taken at one rupee per head for a belt of country parallel to the railway, perhaps 5 miles, 6 miles or 8 miles on either side. In Madras we are exceptionally favourably circumstanced for making a census of the population of any given strip of country, for we have the taluk maps of the Survey Department, which give every village and hamlet, and we have the taluk and village volumes of the census report of 1891. It is not a labour of much difficulty with the aid of the maps and volumes referred to, to make a census of a strip of

country of any desired width on either side of the centre line of the projected railway. But where judgment is necessary is in estimating what width of country may fairly be taken, in order that Re. 1 per head of population may give probable rural earnings.

When we compare the actual earnings from rural tracts on sections of several of the Indian railways, we find that when a railway is newly opened, before the country people have got into the habit of making much use of it, one rupee per head of population per annum of a strip of country three miles on either side of the line fairly approximates to what is actually earned from the rural population; whereas when a line has been open for several years one rupee per head per annum for a strip 6 or 7 miles on either side is nearer the mark. It of course requires judgment to suitably apply the factor, *width of strip*: and that is only to be got by experience and by the accumulation of facts and figures with the co-operation of railway traffic officers. Recently when estimating the probable earnings of a line from Bezwada to Masulipatam, I made the best estimate I could of passenger and goods traffic from the one large town to the other, based on existing and known statistics of road and canal traffic. Thus, with the aid of the taluk maps and of the taluk and village census statistics of 1891, and making an allowance for the increase of population in the eight years which have elapsed since then, I ascertained that the density of the population on a strip of country within 5 or 6 miles on both sides of the line was 210 people to the square mile. I then estimated that, on the first opening of the railway, earnings from this rural population will probably amount to one rupee per head per annum from the inhabitants of a strip only 4 miles on either side of the line, but that by the end of the first ten years it will probably amount to the same sum per head per annum on a strip 6 miles on either side. This sum I added to the estimated earnings from through traffic between the big towns to arrive at total probable earnings.

Other reasons than mere density of population of course affect rural earnings, as for example the people's willingness or unwillingness to travel, their poverty or wealth, the amount of field produce which they despatch from the roadside stations, the amount of foreign produce which they consume, &c. It is these causes which influence the gradual growth of the width of the strip of country to be taken for the purposes of the one-rupee-per-head-per-annum estimate. The effect of these causes will of course differ greatly in different countries, and it is here that in framing the estimate judgment comes in.

When Mr. Palmer's suggested method was applied to two of the sections of the Madras Railway it brought out results, for a strip of country 6 miles wide on either side of the railway, which coincided remarkably closely with actual rural earnings. One rupee per head of population at 157 persons to the square mile on a strip 12 miles broad along the 91-mile section between Cuddapah and Tadpatri gave local earnings Rs. 1,71,444, the actual figure for last year being Rs. 1,77,746. Again, on the 75 mile section from Salem to Jalarpet, calculated earnings at one rupee per head of population on a 12-mile strip of country at 212 people to the square mile came to Rs. 1,90,800, actuals for last year being Rs. 1,86,966.

When Mr. Palmer's method was applied to the South Indian Railway, the following results were obtained:—

Mayavaram to Tanjore (excluding Mayavaram, Kumbakonam and Tanjore).

For 33 miles × population 496 per square mile = 16,368.

Earnings Rs. $\frac{2,32,519}{16,368}$ = 14·2 miles width of strip giving one rupee per head of rural population.

Pakala to Dharmavaram (excluding both junctions).

For 134 miles × population 135 per square mile = 18,090.

Earnings Rs. $\frac{1,35,436}{18,090}$ = 7·4 miles width of strip giving one rupee per head of rural population.

Madura to Tuticorin (excluding Madura, Tuticorin and Virudupati).

For 84 miles × population 318 per square mile = 26,712.

Earnings Rs. $\frac{2,48,875}{26,712}$ = 9·8 miles width of strip giving one rupee per head of rural population.

When Mr. Palmer's method was applied to the East Coast Railway it gave the following results:—

Bezwada to the Godavari (excluding Bezwada and Ellore).

A strip of country was marked off on the Taluk map 5 miles on either side of the centre line of railway. The villages inside this strip being listed, and their population being extracted from the volumes of Taluk and Village statistics for the census of 1891, and 1¼ per cent. per annum being added for increase of population, the following results were obtained:—

Bezwada taluk ... ... population		37,000
Nuzvid " ... ... "		56,000
Ellore " ... ... "		105,000
Tanuku " ... ... "		62,000
Yerragudem taluk ... ... "		55,000
Total ...		315,000 people.
Deduct for the large town, Bezwada	23,000	
" " Ellore	32,000	
		55,000
Leaving rural population = 260,000 on 880 square miles, giving a density of 296.		

Now, a reference to the Revenue statistics of the East Coast Railway for both halves of 1898, gives the following figures:—

Amount received at the rural stations referred to, for passengers and goods despatched elsewhere ... ... Rs.	78,602
Amount received elsewhere, for passengers and goods despatched to the rural stations referred to ... ... "	1,15,019
Total rural earnings ... "	1,93,621

Length of section 88 miles. Therefore $\frac{193,621}{88 \times 296}$ = 7·4 miles = width of strip which at Re. 1 per head of population gives rural earnings. It should be noted that here there is very severe canal competition.

For the rough purpose for which Mr. F. Palmer's method of estimating rural earnings is designed to be used, there is no need to take account of the probability of much goods being despatched from village stations to be paid for at destination, because this is probably balanced by a more or less equal quantity of goods from outside which is paid for on delivery at the village stations in question.

To any one with a knowledge of the local conditions of the several localities above referred to, it will be evident that the influence governing width of strip is the condition of backwardness or the reverse, and of wealth or of poverty, of the mass of the people.

It might be convenient to vary the mode of application of Mr. F. Palmer's suggested system by invariably taking a standard breadth of say 10 miles, that is 5 miles on either side of the centre line; and, applying to this standard strip of country the known figures of population density, to judge how much per head may be expected to be earned by the railway from the rural population. It may be any figure from As. 8 to Rs. 2–8–0 per head, and the figure to be applied must be carefully judged of in each case from the known figures of similarly circumstanced rural populations along existing sections of railway.

In every case the estimate of the traffic of the large towns must, of course, be separately estimated and added, the best available methods, *e.g.*, enquiries from the merchants, &c., being applied for its estimation.

CHAPTER VI.—THE GAUGE OF DISTRICT LIGHT RAILWAYS.

During a part of last year a great controversy was carried on in some of the Indian newspapers, chiefly in the *Pioneer*, on the subject of the best gauge for frontier railways. In this correspondence the arguments for and against one gauge or another chiefly hinged around the question of the suitability of one gauge or another for the transport of troops, artillery, animals, and stores, through extremely rough country in the event of war on the North-West frontier of India. These arguments are of very little applicability in regard to the light feeder lines which form the subject of our consideration here; for here there is no question of the transport of guns, troops, horses, or sick and wounded men. India is a big country, and wars and rumours of wars on the North-West frontier seem as far away from us here as if they were happening in Europe. What we want here are little railways—*railed roads* as I prefer to term them—which will serve to convey village produce, and in return the things that villagers use and consume, as well as the villagers themselves, to and from the main line of railway. Thinking of these requirements I confess to having been personally strongly prejudiced in favour, for the purpose in view only, of the 2-foot gauge. I quite concur in the conclusions at which the Government of India have now wisely arrived that, pending the advance of the standard gauge in its wake, as necessity arises and as the finance of the country can afford it, the 2′ 6″ gauge is the right one for military use on the frontier. But I certainly believe that it would be difficult to find 50 or 100 miles of a feeder road in this Presidency, connecting a large producing and consuming area with a main line of railway, where the 2-foot gauge, if properly equipped, would not be sufficient for all the work that is ever likely to be demanded of it.

There is a current theory that there is some wonderful advantage in being able to transfer rolling-stock from one part of the country to another in the event of a sudden rush of traffic; and people holding this theory would argue that, now that the Madura Tramway Company have decided on the 2′ 6″ gauge for their lines in South India, and now that the Rajah of Parlakimedi has built his line on the same gauge, and as both places are in the Madras Presidency, therefore that gauge must be used for all other similar lines in the Presidency. But that is all rubbish; no little railed road is ever likely to borrow rolling-stock from another perhaps 500 miles away. So long as such little lines are what they purport to be, merely feeders of the larger lines, I do not care whether they are on a gauge of one foot or three, so long as their capacity is properly proportioned to the work which they are likely to be asked to do.

Still I recognise two things: firstly, the Government of India's strongly expressed wish that the 2′ 6″ gauge should be adopted whenever either the standard or the metre gauge is departed from; and secondly the probability that as traffic improves, and as years go on, and as the carts spread themselves back into the rear of the railed roads instead of competing with the trains thereon, there will be a chance of traffic so improving as to demand the larger carrying capacity which the metre gauge gives. The class of rolling-stock in use on the Barsi 2′ 6″ line gives as high a carrying capacity as is ever likely to be needed on the class of roads under consideration; and the advantage of starting off with the 2½-foot gauge is that as traffic improves waggons and engines of the Barsi class can be gradually substituted for the lighter and more economical rolling-stock of the Tezpur class, which in most cases would amply suffice for the requirements of all the traffic likely to come on these lines for the first few years. If we keep all our railed roads of one gauge there will be a better chance of selling off, to the newer lines, such rolling-stock as has become unequal in carrying capacity to the requirements of the older and progressive lines. For these reasons, therefore, though at first prejudiced in favour of the 2-foot gauge, I now favour the universal introduction of a gauge of 2′ 6″ for our railed roads in this Presidency.

A large amount of valuable information on the subject of the cost, working, and capacity of the Barsi and Morvi light 2′ 6″ railways is embodied in Ceylon Government Sessional Paper No. XXVI of 1898 which may be obtained for 35 cents

(or 6 annas, or 6 pence) from the Government Record office, Colombo. The paper consists of a report by Mr. A. G. Perman, the Traffic Superintendent, Ceylon Government Railways, who in July 1898 made a very full and careful inspection of the lines in question with a view to ascertaining how far railways of the 2′ 6″ gauge were adapted to the requirements of Ceylon which heretofore has confined itself to the use of the Indian standard 5′ 6″ gauge. Mr. Perman's conclusions will be found summed up and endorsed in a letter No. 327, Mis., dated October 5, 1898, from His Excellency the Governor, the Right Honourable Sir J. West Ridgeway, K.C.B., K.C.S.I., to the Right Honourable J. Chamberlain, J. P., Secretary of State for the Colonies. The letter in question will be found printed in Ceylon Government Sessional Paper No. XXXVIII.—1898, published, price 10 cents (2 annas, 2 pence), by the Government Record office, Colombo. Mr. Perman's conclusion about the Barsi line as summed up by His Excellency the Governor of Ceylon are as follows: "The traffic dealt with by the Barsi Railway in the year was 59,446 passengers and 45,355 tons of goods, and that the traffic that could be carried without increasing the train service of two trains each way per diem is 221,900 passengers and 217,700 tons of goods. If the train service were increased to 6 trains each way per diem, the carrying capacity of the railway would be 665,700 passengers and 653,100 tons of goods. This capacity might be still further increased by the construction of crossing stations."

Mr. C. E. Phipps, the Locomotive Superintendent of the Madras Railway, has written for the information of his Directors a valuable Note on the Barsi Light Railway, dated London, May 3, 1898, and I have no doubt that copies of this may be obtained through the courtesy of the Agent, Madras Railway Company, by *bonâ fide* interested persons or public bodies.

Through the kindness of Mr. Alexander, the Barsi Light Railway Company's Agent and Engineer, I had an opportunity recently of making a careful inspection of that line and its rolling-stock. The Barsi line certainly is what I believe by those interested in light railways in England and abroad it was intended to be, viz., a splendid advertisement of what it is possible to effect by well-designed engines and rolling-stock on the 2′ 6″ gauge. It is however very heavily overstocked, five engines worth perhaps Rs. 30,000 each being far in excess of the present requirements of the 22 miles of line. The magnificent sleeping and lavatory saloon carriage too is quite wasted on a little jungly railed road meant to carry native passengers, grain and cotton, though it would serve excellently on the section of the projected Madura district light railways which will be used by the numerous 1st-class passengers to and from Kodaikanal hill station. This car is said to have cost in England £1,144, say Rs. 18,000, and considerably more by the time it was got into running order at Barsi. The long bogie freight cars, low sided, high sided, and covered, are excellent; and our little local railed roads will doubtless be able to use some of the sort if successful after a few years of working.

On the whole I cannot accept the Barsi line, which cost the great sum of Rs. 60,000 per mile as a model for the railed roads which are the subject of this memorandum. The Morvi and Tezpur light railways which cost respectively Rs. 26,000 and Rs. 21,000 per mile are much more to be commended than the Barsi line as models for imitation by District Boards who propose to take advantage of the new legislation referred to in the preface. In appendix D I give some information about the cost of the now nearly completed Parlakimedi light railway.

CHAPTER VII.—THE ESTIMATE OF CAPITAL COST.

To this chapter are appended statements of the actual capital cost, and the cost per mile, of several narrow gauge Indian light railways, aggregating 415 miles in length. At least two of these are of a very special character, so much so that their cost is no criterion of the probable outlay necessary on the class of light lines contemplated in this memorandum. Thus the Darjeeling-Himalayan is a very exceptional mountain railway with heavy permanent-way and heavy works. The Barsi line again, which has cost more than many miles of Indian metre gauge lines have cost, has been very heavily burdened with preliminary expenses on account, I presume, of its having been floated in England, and it has from three to five times as much value in rolling-stock as other narrow gauge lines find necessary. It seems to me that, with the aid of a careful perusal of the items comprising the capital accounts of the lines referred to in the statements, and having, moreover, a more or less intimate knowledge of the conditions of several of them, I ought to be able to offer to District Boards a very fair estimate of what it *ought* to cost to build and equip a mile of railway of the class in contemplation. I shall therefore go separately through the several heads of account.

Preliminary expenses.—For survey and completion of all plans and estimates ready for work to be started. This will vary very much according to the agency employed. I have estimates before me now for three surveys of light railways along district roads, amounting to Rs. 116, Rs. 292 and Rs. 455 per mile. So much depends on the salary of the Engineer who happens to be available. Anyone out of an engineering college can make a survey, but it takes a man of experience and of judgment to make suitable designs and estimates. Preliminary expenses may vary from Rs. 100 to Rs. 500 per mile. If the existing District Board establishment is employed, without much extra expense, to collect data and make surveys to be handed over to the staff of the big railway for preparation of the design and estimates, this item ought not to cost more than Rs. 200 per mile.

Land.—The railways which we contemplate making will for the most part run on existing roads, and even where they are obliged to leave the road they will seldom go beyond the boundary of public land. Land however will be required here and there to cut off corners, as well as for stations, &c., and it is as well to set down a sum for the purpose. In a cultivated country it may run to perhaps Rs. 500 and in a jungle country to Rs. 100 per mile. Perhaps it will suffice to set down Rs. 300 per mile for land, as a safe average figure.

Formation.—In this I include bridgework, banks, cuttings, fencing, mile and grade posts, and indeed everything ready for spreading the ballast. This will vary greatly according to the state of the existing road, that is according to whether its bridges are or are not fit for the light railway traffic, whether corners have to be cut off, whether any fencing is wanted, &c. As a rule the masonry bridges of existing roads, if anything more than the merest culverts, are not good enough; the class of masonry though good enough for cart traffic being certain to crack all to pieces under the vibration of trains during the first two or three years. Large district road arched bridges of 40 to 60 feet span, which were probably in the first instance built under skilled superintendence, and which have a heavy cushion of earth over their crown, will often perhaps be found good enough, and so will girder bridges too, of the more modern types. But nevertheless there will usually be more or less expenditure on earthwork and bridging even if the existing district roads are occupied. A reference to the statement of mileage capital cost will show that from Rs. 3,000 to Rs. 10,000 per mile may be spent on these items. Rs. 5,000 is not far from the expenditure on the Jorhat, Barsi, and Dhaboi lines. We may therefore take this as a fair mean sum for the rough purpose at present in view. I noticed that it was considered necessary on the Barsi Railway to lay girders over, and clear of, the crowns of 27 arches of between 25 and 40 feet span; this of course added considerably to the cost of the line. Expenditure of this sort may frequently be saved in the first instance, a cushion of earth being used over road bridge arches, and speeds being restricted. When the time comes for increasing speeds and wheel loads the line will probably be in a position to afford to do whatever of strengthening the bridges may require. Stone paved causeways, costing Rs. 10 per running foot, may frequently take the place of bridges, even though they may necessitate the running of trains being stopped for a few days in each year.

Ballast and Permanent-way.—The cost of this item is more uniform, as might be expected, being less dependent than that of formation on adventitious circumstances. Rs. 12,000 per mile seems a very fair average figure, though doubtless the feat performed by Mr. J. deTivoli on the excellent little Tezpur Railway, of building his ballast and permanent-way at Rs. 8,248 per mile, may again be repeated by other Engineers equally keen about the excellence and the cheapness of their work.

Stations and Buildings.—These, as a rule, need only be of the humblest descriptions. The object of framing this estimate is not to ascertain how much it will cost to make a small model of a finished English railway, but how little is it possible to spend in order that while shareholders earn dividends on their capital, and that while *pari passu* District Boards are relieved of the incidence of their proffered guarantee, the people may have the benefit of an improved mode of conveyance. When people travel along district roads, in wheeled vehicles running on the road gravel, they do not expect to find pretty creeper-covered brick villas waiting for them, with all sorts of conveniences and platforms to help them to mount the carts, at every few miles. But the moment you substitute a hard smooth steel surface fit for the wheels of a certain class of hired carriage, in place of the rough gravel surface which everybody has heretofore been accustomed to with another class of hired carriage, not satisfied with the advantages they have secured, the people of the district begin to cry out for pretty and expensive station buildings and for all sorts of unwonted conveniences. I remember a case, not 1,000 miles from Tanjore, where the people, having got a convenient foot-bridge over the lines of rails at a railway station, began to bring all their influence to bear to get a roof put over the foot-bridge; forgetting that since a passenger had been quite happy with an umbrella while walking perhaps for miles along the dusty roads, he might, one would think, have managed to endure the umbrella for another 50 paces; so unreasonable are some people. Journeying for a week or ten days up the great Brahmaputra river in Assam in steamers carrying 500 to 1,000 passengers, one meets river-side stations every few miles, and crowds of people get off and come on at each station. I often noticed how not more perhaps than 50 or 100 rupees had been spent at each of these stations in the form of a flagstaff and a bamboo hut or two; and I used to think that whenever the railway up the same river valley finally gets finished, all these people will think they have a great grievance unless Rs. 5,000 to Rs. 10,000 are spent in providing platforms and latrines and all sorts of buildings and conveniences at every station. The stations and buildings on the Tezpur railway cost less than Rs. 1,000 per mile. The Barsi people found it necessary to spend Rs. 6,510 per mile; but that included staff quarters and other buildings sufficient for a line of four times the length. In my opinion Rs. 1,500 per mile is a very fair figure for the estimate now in view.

Plant.—The Jorhat, Tezpur and Darjeeling lines have all got more or less complete workshops with the usual machine-tools ready to execute all repairs. The two former lines are quite isolated from other railways, and moreover are expected to do a good deal of work in their shops for the tea estates which they serve. They are consequently equipped more expensively with plant than is at all necessary in the case of district light railways forming branches of main lines. For, as the Dhaboi line does, the lines we are considering can, with extreme ease, run even their engines on to the carriage-trucks of the main line for transport to the large workshops where repairs can naturally be executed better and more cheaply than in petty local shops. Rs. 200 per mile ought in most cases therefore to be ample for plant for permanent use on the branch line.

Rolling stock.—This is an item which naturally varies greatly with the quantity of traffic offering. Thus the Dhaboi line has been fully equipped at Rs. 3,591 per mile, and the Morvi line at Rs. 4,246, and both these lines have been working for years and paying pretty well. The Barsi line goes to the other extreme, having spent Rs. 19,590 per mile on its rolling stock. All I can say is that if the Barsi people ever bring their twenty thousand per mile worth of vehicles and engines into regular use they will be paying rattling fine dividends; I have referred to this somewhat fully in Chapter VI. I know that the Tezpur line, economically as it has been equipped in other respects, is overstocked at Rs. 7,216 per mile. The proper thing to do is to start with the least quantity of rolling stock which will satisfy the traffic; repairs, bar accidents, will be few at first; when 4 per cent. is being earned, and if traffic seems likely to increase, more can be gradually got. Thus the Howrah-Ampta line which had Rs. 1,40,605

worth of rolling stock in December 1897 when it paid 5 per cent., found it necessary to have Rs. 1,86,854 worth in June 1897 when paying 6 per cent., and it had Rs. 2,17,962 worth in December 1898 when it paid 7 per cent. The more passengers and goods that offer, the more trains, must be run, and the more vehicles and engines must be obtained. If this is done gradually, careful management is indicated and the expenditure is justified by results. I strongly advise District Boards who offer guarantees not to countenance any attempt on the part of promotors to saddle the line with an excessive quantity of rolling stock or of other English materials, on the plea that they may be wanted later on. For not only will better stock be got later on, through experience gained, but it is useless to be paying interest on material which stands rusting or cracking in the rain and sun. There always, needless to say, are English firms who are only too anxious to persuade people to buy the stuff they sell. Quite right too from their point of view, but far otherwise from the District Board's, who will be quite sufficiently liberal if they determine, in all but very exceptional cases, to limit their guarantee on the capital cost of rolling stock to Rs. 5,000 per mile, until at least 4 per cent. shall have been earned. After that, and when the incidence of the cost of the guarantee shall have been lifted from the District, the promotors of the line will doubtless, in their own interest, gauge their requirements with some sort of co-ordination to traffic offering.

General charges.—This item covers cost of upper Engineering establishment, Audit, Medical, Sanitation, &c., during construction. Rs. 1,000 per mile is a very reasonable figure for it. Naturally if men hired for the job are allowed to fool around for years drawing salaries they will do so, and small blame to them. But if they are worth paying and can get a smart job out of hand in a smart workmanlike manner, Rs. 1,000 per mile ought to cover this item.

Let us now see to what sum per mile our figures for the several items have mounted up. It will of course be realised that cases will occur in which some of the figures will be considerably higher. Land for instance if the road has to be departed from, and bridgework if a lot of new bridges must be built—

Preliminary expenses	... ...	... ...	Rs. 200
Land	... ...	... ...	,, 300
Formation including bridges	... ...	... ...	,, 5,000
Ballast and permanent-way	... ...	... ...	,, 12,000
Stations and buildings	... ...	... ...	,, 1,500
Plant	... ...	... ...	,, 200
Rolling stock	... ...	... ...	,, 5,000
General charges	... ...	... ...	,, 1,000
Contingencies, say	... ...	... ...	,, 800
		Total ...	Rs. 26,000 per mile.

This is a very fair average figure. It is not far off the cost of the Dhaboi and Morvi lines which have been running for years. It is 20 per cent. higher than the cost of the very excellent little Tezpur line. If a District Board are willing to guarantee interest on a sixty-thousand rupee line like the Barsi light railway, they are of course at liberty to do so. But I strongly recommend them to limit their guarantee to *four mile of railway fully equipped per lakh of rupees*. If more expenditure than this is wanted either the traffic prospects or patent difficulties of construction must justify it. There are always plenty of people whose interest it is to make it cost more.

The right thing to do, for the benefit not only of shareholders but also of the District Board which guarantees interest on expenditure, is not to build a fine hand-some railway equipped with every luxury, but a railed-road fully equal to carrying the traffic likely to offer itself in the first few years, and capable then of being gradually raised to a standard demanded by the improved traffic, but with no luxuries. The owner of a bullock cart plying for hire will not cover his rough wooden cart with gold leaf which in no way renders it better or stronger for the work it has to do, or enables him to earn any more, but only wastes good money which might have bought him another pair of bullocks and enabled him to earn a better living. Neither will he be so foolish, when buying a new cart, as to purchase at the same time half a dozen spare wheels to be kept in his house lest one of his cart wheels should break; when it does break it will be time enough to buy a new wheel.

CAPITAL cost of various Indian narrow gauge Railways at the end of 1898.

Heads of Account.	Joshat, 2′ 0″, 28½ miles.	Rajpipla, 2′ 0″, 29 miles.	Cooch Behar, 2′ 6″, 22¼ miles.	Barsi, 2′ 6″, 21¾ miles.	Dhaboi, 2′ 6″, 78¾ miles.	Morvi, 2′ 6″, 94¾ miles.	Tezpur, 2′ 6″, 20 miles.	Darjeeling, 2′ 0″, 61 miles.	Howrah Amta, 2′ 0″, 30 miles.	Howrah Sheakhala, 2′ 0″, 20 miles.	Ranaghat Krishnagar, 2′ 6″, 20 miles.
Preliminary expenses	388	14,655	9,764	1,07,815*	86,926	18,134	1,969	72,000	66,578	10,427	123
Land	6,131	..	10,774	22,151	..	1,172	8,656	20,267			
Formation	81,469	1,16,428	93,296	20,028	4,07,299	6,98,627	49,112	10,17,014	5,86,837	39,470	6,03,800
Bridgework	65,245	3,25,462	92,130	13,504							
Fencing	10,594	10,654	1,050	1,130							
Ballast and permanent-way	3,16,748	3,47,805	2,70,657	3,04,740	9,50,800	11,48,088	1,64,964	7,07,043	1,36,962	67,471	87,545
Stations and buildings	89,463	69,039	48,603	1,41,600	2,61,204	53,055	19,832	4,86,966	1,36,962	67,471	11,738
Plant	55,099	8,289	11,608	12,990	8,489	14,295	17,888	1,44,137	11,000	17,388	1,20,163
Rolling stock	2,14,790	1,51,288	1,57,875	4,25,645	2,83,960	4,00,225	1,44,328	5,56,985	3,82,027	1,64,835	..
General charges	41,388	62,245	69,248	99,332	1,40,199	1,02,847	6,895	2,77,631	..	..	..
Total ..	8,74,510	11,03,070	7,75,925	18,15,925	20,87,743	24,36,764	4,13,448	31,99,032	11,24,713	6,09,892	7,22,508

Note.—In nearly every case the total capital expenditure is somewhat larger than that shown above, on account of stores in stock, money at credit in Banks, and in one case a ferry, the cost of which is immaterial for the purposes for which this statement has been prepared.

* Includes interest during construction Rs. 46,620.

COST *per mile* of various Indian narrow gauge Railways at the end of 1898.

Heads of Account.	Joshat, 2′ 0″, 28½ miles.	Rajpipla, 2′ 0″, 29 miles.	Cooch Behar, 2′ 6″, 22¼ miles.	Barsi, 2′ 6″, 21¾ miles.	Dhaboi, 2′ 6″, 78¾ miles.	Morvi, 2′ 6″, 94¾ miles.	Tezpur, 2′ 6″, 20 miles.	Darjeeling, 2′ 0″, 61 miles.	Howrah Amta, 2′ 0″, 30 miles.	Howrah Sheakhala, 2′ 0″, 20 miles.	Ranaghat-Krishnagar, 2′ 6″, 20 miles.
Preliminary expenses	14	506	438	9,005	469	192	98	1,412	..	..	..
Land	214	..	484	1,020	..	18	433	397	1,896	626	6
Formation	2,884	4,015	4,193	1,224	5,172	7,412	2,456	19,941	19,561	17,963	25,191
Bridgework	2,310	11,361	4,140	3,274							
Fencing	371	351	46	600							
Ballast and permanent-way	11,113	11,993	12,166	14,000	12,074	12,182	8,248	13,583	4,656	3,369	4,377
Stations and buildings	3,166	2,380	2,185	6,510	3,317	664	992	9,548			
Plant	1,935	284	595	600	108	884	1,433	10,429	384	375	688
Rolling stock	7,604	5,228	7,905	19,560	3,691	4,246	7,216	1,43,729	11,064	3,242	6,006
General charges	1,460	1,940	2,393	4,566	1,760	1,091	345	9,445	..	..	..
Total ..	30,056	38,037	34,873	60,480	26,511	26,863	20,672	62,588	37,490	30,470	36,119

CHAPTER VIII.—PROBABLE WORKING EXPENSES.

It goes without saying that the proportion of working expenses to gross earnings is likely to be very much higher on a short line than on a long one, because the qualifications of the heads of the Engineering, Traffic, Locomotive, and Accounts Departments must approach a certain standard, and must be remunerated at certain minimum rates, whether the line be 50 miles long or 500. On a 500-mile line, the remuneration of these officers may amount to Rs. 4,000 per mensem, but it would be folly to expect to get men qualified to give their whole time to the performance of, and to satisfactorily perform, the corresponding duties on a line one-tenth of this length at one-tenth of these salaries. Men of the class willing to take Rs. 400 for all the duties would almost certainly, though lack of knowledge, allow things to drift until the cost of repairs became abnormally high, if the whole service did not break down.

Hence the great advantage of agreeing, if possible, with the main line of railway, of which the short district line would form a branch, for its management of the branch, either at actual cost price or at some agreed proportion of total earnings. A very common arrangement is for the main line to agree to work the branch at the same percentage of working expenses to gross earnings as obtains throughout the entire system including the branch line. Sometimes "maintenance of way, works and stations" is excluded from the accounts in calculating the percentage, actuals being charged for this item, especially during the first few years after opening before banks and ballast have had time to settle down into a more or less permanent condition of stability. Another arrangement is for the main line to work the branch at some agreed percentage 50, 55, or 60, of gross earnings, and to give a rebate on traffic brought by the branch on the main line sufficient in amount to enable a dividend at some agreed rate to be paid by the branch line. See Chapter XI.

On an analysis of the published accounts of the Morvi 2′ 6″ railway, I find that the several items of working expenses work out as follows for twelve half-years:—

Head of Revenue Account.	Mean figures for 12 half-years.	Highest and lowest for each item, in any half-year.		Worst half-year.	Best half-year.
		Highest.	Lowest.		
Maintenance of way, works and stations. Per cent.	11·50	18·56	9·19	18·57	9·19
Locomotive expenses .. .. .. ,,	17·50	22·91	13·48	16·65	13·48
Carriage and waggon expenses .. .. .. ,,	2·00	4·95	1·53	3·23	1·74
Traffic expenses .. .. .. ,,	11·00	12·72	9·29	12·72	9·29
General charges .. .. .. ,,	9·50	12·73	7·46	12·73	8·64
Special and miscellaneous .. .. ,,	0·50	1·57	0·03	0·34	0·11
Total .. ,,	53·00	..	..	64·24	42·45
Balance, Net Earnings .. .. ,,	47·00	..	..	35·76	57·55

Thus it would appear that with reasonable care a 2′ 6″ railway, from 80 to 100 miles long, can perfectly well be worked by its own staff for 53 per cent. of gross earnings, provided that the traffic brings in Rs. 80 to Rs. 100 per mile per week. But naturally, if such a line is worked by the superior staff of the main line to which it forms a branch, "general charges" will be reduced, and also probably some of the other items can be more economically worked, such for example as repairs and renewals of rolling-stock, &c.; so that it does not seem by any means unreasonable to expect a reduction of at least 3 per cent. from the Morvi mean, 53 per cent.; in other words, that the parent line should agree to work the branch at 50 per cent. of gross earnings.

The average percentage of working expenses to gross earnings is naturally much higher on a short 20 or 30 mile line, especially if revenue has to be saddled with Director's fees, and with commission to managing agents. Thus for example the Howrah-Ampta and Howrah-Sheakhalla 2-ft. lines are costing nearly 60 and 70 per cent. to work, though they have been as low as 53 and 67 per cent., respectively.

CHAPTER IX.—THE LEGAL POSITION OF DISTRICT BOARDS IN THE MATTER OF GUARANTEEING INTEREST FOR RAILWAYS.

As capitalists, would-be-promoters, and boards themselves are more or less ignorant of the precise value of a district board's guarantee of interest on money raised for light railway or tramway construction, I propose to give an account of the gradual growth of the present legal position of Madras District Boards in regard to guaranteeing interest on loans raised by them, or in regard to offering guarantees to promotors, for making railways in their districts. I am disposed to doubt whether the members of district boards are generally very clear as to their position, and I am pretty sure that the investing public and the banks have little idea of the value of the security which such boards are in a position to offer. The present powers of district boards in this Presidency grew up around the district of Tanjore, and their growth is very interesting; but, except in Tanjore, these powers have been lying dormant. I hope by exciting interest in them to bring about their resuscitation.

In January 1878 Mr. H. S. Thomas, Collector of Tanjore and President of the Local Fund Boards, made certain proposals which, being referred to the boards for opinion in Government's Financial Department Order, No. 606, dated the 1st April 1878, were accepted by them, and were finally approved by Government for the district of Tanjore. Mr. Thomas opened his argument by pointing out that local boards are apt to lose sight of the fact that the first cost of making a road and its bridges is a minor matter compared with their upkeep for all time, and that the maintenance allowances of a district are apt to be permanently swelled from year to year until in the end the local funds are seriously hampered thereby. He pointed out that railways are a form of road which not only pay for their maintenance, but also give some interest on the original cost of their construction, and that if local boards can convert some of their roads into railways they will be working in the direction of relief from the permanent drain of maintenance. He showed that the funds thus set free from the main roads are the payments of agriculturists, and they will thus be available for purely agricultural purposes, to wit village roads; and that whereas main roads are now maintained at the cost of local agriculturists they will, if converted into railways, be maintained at the cost of all classes of the general public who make use of them. Mr. Thomas instanced a certain 8 miles of road which had cost Rs. 30,300 to make fit for cart traffic, and which cost for maintenance Rs. 4,880 annually—sums which at 4 per cent. would have justified a capital expenditure of Rs. 19,000 per mile, a sum sufficient, as we now know, to make a cheap light 2-foot railway. He stated that roads generally throughout the district cost Rs. 8,000 per mile to gravel and Rs. 550 per mile per annum to maintain; whereas wherever a sufficiently cheap light railway is made it will probably maintain itself, while the saving of the cost of maintenance will justify the district in offering a substantial guarantee.

Turning now to the question of funds, Mr. Thomas said that the district of Tanjore had its road cess fixed by law at present at one anna per rupee of the land assessment; but only, as a matter of fact, found it necessary to levy 9 pies, and that the 3 pies which remained unlevied might be made leviable by a new order of Government. He proposed that this 3 pies or one farthing assessment should be set aside and applied to the development of railway communications in the district, pointing out that from the two railways which already passed through the district the agriculturists had undoubtedly benefited to the extent of more than three pies per annum per rupee of assessment. He proposed that, on the guarantee of this set-apart revenue, loans should be raised, either from the Government of India or in the open market, for the construction of railways; and he showed that if a rate of 3 pies were levied on the agriculturists inhabiting a belt 25 miles on each side of the then existing 1,475 miles of railway in the Madras Presidency, the resulting income, the average land cess being Rs. 2-12-11 per acre, would be Rs. 10½ lakhs per annum—sufficient at 4 per cent. to guarantee interest on 1,000 miles of light railway at Rs. 26,500 per mile.

Mr. Thomas concluded his statesmanlike memorandum by suggesting that as fast as railways were constructed by the local board of Tanjore, by the financial method proposed, their cost should be transferred to Government as soon as possible, the reimbursement being utilised for the further extension of the light railway system.

In criticising Mr. Thomas' scheme the Board of Revenue remarked that the latter part of it, suggesting the levying of a general railway cess, did not commend itself to them or call for discussion; but that they looked upon his scheme for his own district as worthy of early and careful consideration, and as likely to lead to great results in improving the condition and adding to the wealth of the country. When one thinks of the great benefits which the districts of the Presidency might have derived during the last 20 years if a broad scheme of the sort suggested by Mr. Thomas had only been given practical effect to, one cannot help regretting that the Board of Revenue and the Government of the day should not have seen their way to a more liberal view of his proposal.

Practical action was however taken later on when Mr. E. F. Webster, Collector of Tanjore, addressed the Board of Revenue in his No. 1811 of the 20th April 1880, asking that a Gazette Notification might be issued regularly authorizing the levy of the additional tax, and this was done under the authority of G.O., No. 1201, dated the 17th June 1880.

Mr. Thomas' special 3-pie railway cess had however meanwhile been collected, and had by 1879 amounted to about Rs. 83,000 per annum, and had up till then been, and was for several years afterwards, allowed to accumulate. Observing this, the Government of India, in their Financial Dept. letter No. 2842, dated the 3rd August 1882, commented on the great delay which had occurred in applying the Tanjore accumulations to the purpose for which they had been levied; and soon afterwards Mr. H. E. (now Sir Henry) Stokes, at that time Collector of Tanjore, addressed the Board of Revenue, in his No. 2258, dated the 6th November 1882, on the subject of the various railways which, up till then, had been proposed for the equipment of the district. In considering how the proceeds of the special cess might best be applied towards securing these railways, he pointed out that there were certain formidable obstructions which must be removed by legislation before the district funds could be employed in giving a guarantee of earnings to a Railway Company; for though there was nothing in the Local Funds Act IV of 1871 against it, yet by section 8 (India) Act XI of 1879, local authorities are prohibited from borrowing money upon, or *otherwise charging* their funds, except as provided by the Act and Rules. Mr. Stokes suggested that this obstacle might be removed by legislation.

In commenting on these suggestions the Board of Revenue, in their Resolution No. 2855 of the 21st November 1882, entirely concurred in Mr. Stokes' arguments in favour of utilising the proceeds of the special cess by way of guaranteeing interest on private capital subscribed for the proposed railways in preference to sinking it in their construction, and expressed the opinion that the necessary special legislation might easily be provided by adapting the provisions of sections 6 and 7 of the Local Authorities' Loans Act, XI of 1879, to interest guaranteed on private capital. In approving the Board of Revenue's support of Mr. Stokes' proposal, the Madras Government in G.O., No. 171, Financial, dated January 26th, 1883, resolved to address the Government of India with a view to the suggested amendment of the law. This they did in their No. 172 of January 26th, 1883; and Act XI of 1879 was subsequently amended by Act XV of 1885 which provided that nothing in the previous Act should be deemed to affect the power conferred on any Local Authority by any special enactment "to charge its funds by guaranteeing the payment of interest on money to be applied to any purpose to which the funds of the Local Authority can legally be applied." Later on the Madras Government passed a Bill, called the Local Authorities' Loans Act of 1886, so far relaxing the provisions of Act XV of 1885 as to enable local boards to raise funds for the construction of light railways *with the assistance of a guarantee of interest from the Imperial Government*, in lieu of the direct agency of the local board itself. But the Government of India declined to assent to this Bill, on the grounds that, on a reference to the Secretary of State, Lord Cross had refused to accept the principle involved therein, that the credit of the Government of India should be pledged in such cases. A perusal of the Secretary of State's Despatch on the subject, No. 80 Ry., dated July 28th, 1887, is instructive. Lord Cross wrote as follows:—

> While there is much to be said in favour of adopting all legitimate means for promoting works of this description, it must be borne in mind that the principal object which it was sought to attain in Act XV of 1885 was to enable local bodies interested in the development of their particular districts to undertake, on their own responsibility, and without any guarantee of Imperial funds, works of public utility, and particularly branch railways, as fully explained by Sir Theodore Hope in his statement when the Act was passed by your Excellency's Council on the 2nd October 1885. The views then expressed on behalf of the Government of India were so entirely at variance with those embodied in your Excellency's letter under reply and so fully commend themselves to me that it will be desirable to repeat them here. Sir Theodore Hope said: 'Throughout India a very large number of small branches are wanted to our great trunk lines, and the need of them is being constantly pressed upon us by local authorities, commercial administrations, and others, with great urgency. At the same time, it is obvious that we cannot, out of Imperial funds, construct such branches or give guarantees to companies to construct them. If such branches are to be constructed at all the funds for guarantees must be paid in some way totally distinct from the Imperial Government,—in fact from sources which lie to hand in the local and municipal resources of India.' Any such departure therefore from the provisions of the Act as that suggested in your letter, would be clearly opposed to the original intention of the measure, and I regret therefore that I am unable to accord my sanction to the proposal you have submitted to me . . . . . I am unable to see sufficient ground for altering my opinion that it would be most inexpedient to commence a system of Government intervention in cases of this kind, or to apply the guarantee of the Secretary of State in the manner suggested.

The result was the passing of the Madras Act, called the Local Authorities' Loans Act No. I of 1888, under which the Local Government, with the previous sanction of the Governor-General in Council, may authorise any local authority, either severally or in conjunction with any other local authority, to charge its funds or any part thereof by way of guarantee for the payment of interest on, or by the creation of a fund for the repayment of, money expended or to be expended on any work or for any of the purposes to which such funds might be by law applied.

In communicating assent to the Act in Despatch No. 14 L., dated the 28th June 1888, the Secretary of State said:

> Care must of course be taken that the local funds assigned by way of guarantee under section 3, are not of such a character as might interfere with, or have to be reserved for, purposes of Imperial or Provincial taxation.

Legislation having advanced so far, negociations were then entered into with the South Indian Railway Company with a view to their raising the necessary capital in England for the Mayavaram-Mutupet Railway, and in forwarding the correspondence on the subject for an expression of the Government of India's views with his Despatch No. 1 Ry., dated 10th January 1889, the Secretary of State invited attention to his previous Despatch No. 80, just quoted, and explained that, though not specifically mentioned in that despatch, the intention that such funds should be raised locally by local boards was one which was always present in his mind. The Government of India, in their reply No. 120 Ry., dated September 6th, 1889, recognising the objection incident to the raising of a sterling loan on the district board's account through the South Indian Railway Company in England, and recognising also that the Tanjore Board would probably have to pay highly for an Indian loan, proposed to accommodate them with an Imperial loan at $4\frac{1}{4}$ per cent. to be repaid in 30 years.

The Secretary of State replied in Despatch No. 121 Ry., dated 7th November 1889, expressing his willingness to assent to the course proposed, but "on the understanding that the amount so advanced shall be treated as a part of, and not as an addition to, the annual sum allotted as expenditure on railways from borrowed money." It is not easy to understand the object of this stipulation, for the measure of the incidence of the inconvenience of borrowing is not the *amount of* the sum borrowed, but the *interest on* that sum; and if Imperial resources are relieved of liability for part of that interest by its being underwritten by a local board empowered so to do by special legislation, it is difficult to see wherein lay the Secretary of State's objection to excluding the sum proposed to be lent from the sanctioned annual limit of borrowings. However, the Government of India did not see fit to dispute the matter, but contented itself with expressing regret to the Government of Madras that under the condition imposed it would be impossible to advance the necessary loan from Imperial funds, and suggesting that the only alternative was for the local board to raise the money in India on the best terms practicable.

In their letter No. 18, dated 4th March 1890, the Government of India informed the Secretary of State that, as it would be at least four years before they could bring the Mayavaram-Mutupet Railway into the regular railway programme, they had informed the Government of Madras that the only resource was that the Tanjore Board should raise a loan in the open Indian market. The Secretary of State's assent to this action was communicated in his Despatch No. 48 Ry., dated the 24th April 1890.

But by this time a new scheme had suggested itself to the Government of Madras; and, wiring to the Secretary of State on May 26th 1890, the Government of India supported the proposal that the Madras Government out of its provincial balances, and the local board out of its accumulated cess, should contribute equal shares towards the capital necessary to build the railway, and this course was assented to by the Secretary of State, by wire dated 17th June 1890. The history of this decision will be found recorded in G.O., No. 825 R., dated the 10th June 1890. By that time the local board's accumulation of the railway cess had amounted to nine lakhs, the annual accretion being Rs. 85,000. The financial position when work was begun will be found recorded in G.O., No. 425, Financial, dated the 6th June 1891.

Ultimately the 54-mile Mayavaram-Mutupet metre gauge railway was constructed and, up to the end of 1898, was found to have cost the sum of 24·97 lakhs, of which the Madras Government had provided 12·35 lakhs out of its provincial balances and the Tanjore District Board 12·62 lakhs out of its accumulated railway cess. The railway is worked by the South Indian Railway Company and the share of net profits accruing half-yearly to the two partners, Government and the Local Board, is divided proportionately to their share in the capital expenditure. Still the Tanjore District Board continues to accumulate its railway fund, and the latest estimate gives their balance as likely to be 12·51 lakhs, or sufficient to build 25 miles of additional railway, at the end of the year 1900,—a very remarkable instance of successful finance by a local body and one which might well be followed in other districts.

Thus the Tanjore Board not only owns a half share in 54 miles of railway, and within two years will possess capital sufficient to buy out its partner. The net profits of the 54 miles of railway are now just one lakh per annum. The receipts from the special railway cess are just over one lakh per annum. If therefore the Tanjore District Board should see fit to utilize its capital to buy out its partner, the Provincial Government, and to devote its income of two lakhs per annum to interest at 4 per cent. on a loan, it could raise a sum of Rs. 50 lakhs, or enough to construct about 100 additional miles of railway. As an alternative, it might raise money on a first mortgage of its railway, and for this purpose trust money may legally be employed under clause 20 (*e*) of the Indian Trust Act, 1882. Its railway earnings might then be utilized to form a sinking fund for the amortization of the loan.

Early in 1897 the Madras Government applied to the Government of India for permission to enable the Tanjore District Board to go on the market for money for further extensions on the security of the special railway cess, and of its share of the net receipts of its railway. The reply however was to the effect that—

> As local boards are at present constituted, their local revenue and expenditure are not financially independent of and separate from the general revenue and expenditure of India, so that a guarantee given from them would not be distinguishable in its effect from a guarantee from general revenues. The Secretary of State has fixed a limit of railway construction on guarantee of general revenues which is operative for three years from April 1st, 1896, and against this limit arrangements have already been fully made. There is, therefore, no room in the programme to accept any further construction on the terms proposed by the local board and recommended by the Government of Madras.

As, in view of the correspondence which had taken place in 1887, this decision seemed somewhat surprising, the Madras Government addressed the Government of India in a letter No. 661 R., dated the 15th September 1897, fully accepting the principles enunciated above, as being nothing more than a paraphrase of those embodied in the Statute 33, Geo. III, C. 52, S. 40, and a recital of the responsibility of the Government of India for regulating the total burden of taxation to the capacity of the tax-payer, but expressing itself as anxious to secure a reconsideration of the question and to satisfy the Government of India that the scheme would not to any appreciable or material degree affect the general resources of the Empire, or throw any ultimate responsibility on the Imperial or Provincial treasury.

After reciting the history of the passing of the successive Acts above referred to, and explaining the precise character of the Tanjore railway cess, and that the 3-pie enhancement of the land-cess is a light burden to which the people of Tanjore, one of the richest districts in India, have become accustomed, and as to the incidence of which there have never been any complaints, the letter went on to say,—

> The revenues raised under the Madras Local Boards Act are not available for any purpose beyond the district in which they are raised. They cannot, therefore, come to the aid of the general Imperial or Provincial taxation to meet any outside emergency. Nor by utilising the cess in the manner proposed will Provincial revenues to any appreciable degree be even indirectly exposed to the disadvantage that it will thereby be made more difficult to lighten the contributions paid by Provincial to Local * * * * . Nor is there any reason to suppose that the produce of the cess could be more advantageously devoted to other objects within the purview of the local board; for roads and communications, though quite as essential to the well being and development of the district as are education and sanitation, do not receive at present an adequate or proportionate share of the general fund; and in Tanjore the railway cess scheme was introduced expressly for the purpose of substituting, in certain parts of the district, railway communications for roadway communications, inasmuch as, on account of the special character of the soil of the district and the peculiar conformation of its surface, the construction and maintenance of efficient roads is most difficult and expensive. Under the Act (section 95) it devolves as a legal duty on the local board to maintain adequate communications, and they are merely replacing one mode of communication by another. It may perhaps safely be postulated that the Government of India would never think of interfering if it were proposed that the enhanced land cess should be devoted to the construction and maintenance of ordinary roads. A railway, moreover, has this supreme advantage over a road, if constructed at a reasonable cost in a district where metalled roads can be kept up only at a disproportionate cost, that the railway may be expected to pay at least for its maintenance, if not for interest upon the outlay incurred upon it.

The attention of the Government of India was next invited to the discussions in the Supreme Council when the Act of 1885 was being passed—discussions which were relied on as showing that it was at that time the Government of India's declared policy to allow local bodies to apply part of their revenues to the development of railway communications *outside* the Imperial railway scheme.

It was next pointed out that under Madras Act I of 1888 there is no legal liability affecting either the Provincial or the Imperial treasury beyond the power vested in the Governor-General in Council, in the event of default of a local board to meet its guarantees, to attach the funds made subject to charge on account of any engagement entered into under section 3 of the Act. Finally the Government of India were asked to withdraw their prohibition and to permit the board to raise the proposed loan.

In their reply No. 303 R.C., dated the 5th March 1898, the Government of India said that, after further consideration of the matter, they were prepared to recommend to the Secretary of State that the district board should be permitted to undertake the proposed extensions as an addition to the railway programme, the funds required for the purpose, in addition to any available balances at the disposal of the board, being raised by debentures running for a term of not more than twenty years on the security of the Mayavaram-Mutupet Railway and of the receipts from the railway guarantee cess; the Government of India reserving the right to take over the extension at any time on twelve months' notice by assuming any liabilities in the form of debentures which the board might have undertaken in order to raise the money, and on repayment of any further amounts which the board might have spent out of balances at their disposal. It was stipulated that the form and conditions of the debentures should be approved by the Government of India, and it was explained that although it was not intended to enforce the purchase condition under ordinary circumstances for a period of twenty years at least, yet that as in the progress of railway construction a time might arrive when it might become inconvenient to maintain a short line of this kind as a separate interest, it was necessary for the Government of India to reserve the power of extinguishing this separate interest if at any time it should, in their judgment, become inexpedient to maintain it. Shortly after, the Government of India issued a very important Resolution No. 3210-A., dated the 22nd July 1898, which I quote below:—

> The Government of India have noticed that in some cases district boards, acting under the provisions of Acts by which they have been constituted, have guaranteed the payment, out of their revenues, of interest on capital raised for the construction of railways or other public works

within the districts. Under the existing relations between Imperial and Provincial finances on the one hand and between Provincial and Local finances on the other, the ordinary effect of such a guarantee is that the whole liability for its fulfilment has ultimately to be borne by Imperial revenues. An exception to this arises in cases where there is a margin between the actual rate of cess levied by the board concerned and the maximum rate leviable under the law. This margin can then be utilised for the levy of a special cess, the proceeds of which would either by means of a separate guarantee fund or otherwise be available for meeting any demand on account of the guaranteed interest. But where a district board already levies cess up to the maximum legal amount, the liability on account of the board's guarantee must, in effect, be passed on to Provincial funds, either directly or by the transfer to Provincial of charges hitherto met from local funds; and in the same way the responsibility for a guarantee from Provincial revenues must ultimately be passed on to Imperial revenues, since under present conditions Provincial revenues cannot meet the guarantee, except for a short time, otherwise than by obtaining an assignment from the general revenues on account of it.

2. In the circumstances above explained, it appears to the Governor-General in Council that such guarantees should not be given in cases which do not come within the exception above referred to, except by the special consent of the Government of India, and at a rate of interest to be approved by them. The considerations governing the granting or withholding of consent and the rate of interest to be paid would in each case be those by which the desirability of a direct guarantee from general revenues and the rate of interest to be guaranteed would ordinarily be determined.

I propose now to make an attempt to clearly summarise the whole position.

The Act referred to by Mr. H. S. Thomas as authorising the levy of a road cess at not more than one anna in the rupee of land assessment was the Madras Local Funds Act, 1871. Under clause 4 (i) of the Madras Local Boards Act No. V, 1884, the earlier Act of 1871, ceased to apply in any district on the later Act of 1884 coming into force in that district by notification under its clause 2 (2). Act V of 1884 created district boards, consisting of a President and 24 members, and taluk boards consisting of a President and 12 members (taluks are to districts as baronies to counties). The Act creates district funds and taluk funds and clearly defines the sources from which both are derivable, *e.g.*, balances, tolls, taxes, fees, sales, fines, contributions, &c., &c. An important part of the taluk fund consists of a contribution from the district fund of half the proceeds of the taxes levied by the district board in each taluk. The control of Government over the disposition of the funds, which must be lodged in approved banks or treasuries, is exercised through the Presidents by whom all cheques must be signed, and who are ordinarily the higher Government Civil Officials of the district, except in cases where right of election of their President has been specially granted by Government to districts and taluks. The chief source of district taxation is a cess not to exceed one anna per rupee of annual rent value of land in all districts in the Presidency (except Malabar, South Canara and the Nilgiris, in which maximum cess is fixed at 2 annas).

Chap. IV of the Act defines the duties and responsibilities of Local Boards as follows:—

(i) Construction and upkeep of means of communication.
(ii) Planting and preserving of trees on public lands.
(iii) Construction, repair and management of buildings, and general arrangements in connection with disease, hygiene and sanitation.
(iv) Education.
(v) Famine relief.
(vi) Other measures of public utility.
(vii) The payment of their servants.
(viii) The payment of all expenses incurred in connection with the objects of the Act.

The Act also provides for the establishment of village unions, which are entrusted with the disposal of certain funds under the control of the taluk boards, and which have been invested with certain responsibilities and duties. But we have no concern with either taluk boards or unions in the present connection, and are interested only in district boards.

It seems scarcely necessary to say that all the proceedings of the district boards are conducted under the strict supervision of responsible servants of Government, *i.e.*, the Collectors of districts, who, even in cases where an intelligent community has been specially permitted by Government to elect its own President and has not elected the Collector, have very full powers of general supervision under the Act. The

proceedings of each of the district boards of the Presidency and of its taluk and village boards are reviewed annually in the Local and Municipal Department of Government in great detail, and these reviews are freely at the disposal of the press and of the public. The following facts and figures abstracted from the reviews of all the boards in the Madras Presidency for 1897–98, will be of interest in connection with the subject now under consideration. In the twenty-one districts of the Presidency, the district income varies from $1\frac{1}{2}$ to 13 lakhs of rupees per annum representing taxation at the rate of from 2 to 5 annas per head of population. Omitting one exceptional district, the Nilgiris, the land cess varies from 1 to $5\frac{1}{2}$ lakhs, of which the district board's share is one-half. From $\frac{1}{2}$ to $1\frac{1}{2}$ lakhs are spent by each district on the maintenance of between 500 and 2,000 miles of road per district, at a cost for the best class of roads of Rs. 100 to Rs. 300 per mile per annum.

In the correspondence recited above it has been made clear that district boards may pledge their resources with a view to paying or guaranteeing interest on loans raised from the public for the purpose of constructing railways. But they must not do so if thereby the Imperial or Local Government would be rendered liable for expenditure on any of the objects, *e.g.*, road repairs, mentioned in Chapter IV of Act V of 1884. If however, having adequately provided for these objects, there should be a margin between their total expenditure and the full amount of the taxation which the law empowers them to levy, they are at liberty to levy ordinary cess up to the amount of their expenditure, and to levy the margin as a special cess the proceeds of which would, either by means of a special guarantee fund or otherwise, be available for any demand on account of guaranteed interest. In this way rich Tanjore, finding that a levy of 9 pies suffices to provide for all expenditure contemplated in Act V of 1884, levies also the additional 3 pies, that is, up to the one anna authorized by law, and sets it aside as a special railway cess.

Still it may sometimes be within the power of a local board to limit its expenditure to absolute necessities so leaving perhaps one pie, perhaps two, as a margin for the purposes of a special cess. Thus, for example, suppose that a certain main road, leading to the railway from an important town of the district, carries such heavy traffic as to demand an expenditure of Rs. 300 per mile per annum for its maintenance, and suppose that the district board determines to lay rails on this road and so to reduce the cost of its metalling to Rs. 100 per mile per annum. They would in such a case be quite justified in setting aside the amount so saved as a special cess to go towards guaranteeing interest on the cost of the railway. For it can scarcely be held that having railed the road at great expense they are under obligation to the public to continue to maintain it fit to enable carts to compete with their own railway. The road is the district board's property and if they choose to give it a good surface of sleepers and steel rails in place of a bad surface of gravel, who is to say them nay? It is not as if the public would have to pay more for the use of the railway than for the use of carts, for it is common knowledge that the cost of freight by railway is less than that by carts; a few individuals may continue to find it cheaper to send their goods by carts, but we must consider not individuals, but the community; and why should the community be forced to maintain a road with a good gravel surface for a few individuals when, for the benefit of the whole and at great expense, a far better surface of steel has been provided? Except in the very exceptional case of a grand trunk road intended for the march of armies, or of a road in which more districts than one are interested, a district board will be perfectly justified in declining to spend another rupee on a road once it has converted it into a railway. Its maintenance as a feeder for village to village traffic to pass alongside of the railway, may perfectly well be delegated to the taluk boards, in order that the district board's resources may be free for the purpose of guaranteeing interest on the cost of the railway. But, to meet the objection of the Government of India as expressed in resolution No. 3210 A., dated 22nd July 1898, it is necessary that the amount so saved should not be amalgamated with the general cess, but should be separately shown, ear-marked as it were and set apart, as a special railway cess. It may be that on consideration a district may find other items amongst its expenditure which it may see fit to do without, and on which it is not actually incumbent on it by law to spend money, and which it estimates as of less general utility than a railway. The cost of these items too may legitimately be set aside and ear-marked as part of the special cess.

It is to be feared, however, that very few of the twenty-one districts of the Presidency will be found to be so fortunately situated as Tanjore in being able to effect all the objects contemplated in the Act and yet have a margin within the total sum leviable by law. I therefore suggested some time ago that local boards might by special legislation be given the power, to be exercised or not as they might see fit, of levying an extra 3 pies over and above the maximum now leviable by law, for the special purpose of a railway guarantee fund. As explained in the preface this is one of the provisions of the Bill, to amend the Madras Local Boards Act, which has been read in the Legislative Council. If that Bill should pass into law, local boards in this Presidency will find themselves invested with a new power which, judiciously applied, may result in very great advantage to communications throughout their districts.

In the statement at the end of this chapter, I have shown what may be done with the aid of a 3-pie assessment in each of the twenty-one districts of this Presidency. Omitting the Nilgiri district which is exceptional, there is not a district which cannot, if it chooses, have 30 to 50 miles of light railway at Rs. 25,000 per mile, and some may have over 100 miles. Now it is very important to realize that, provided only such lines be selected with judgment so that they may be certain to pay, the 3-pie cess will, after a while, become available for guaranteeing interest on further extensions, and so on; because *ex-hypothesi* the first line will pay not only working expenses but interest on its cost also; its net proceeds, therefore, may be made to take the place of the special cess, as its own guarantee. Or the first railway, when it has proved itself a complete success, may be sold to Government or to the Railway Company of which it forms a feeder. Or as already suggested the first railway may be mortgaged and the money so raised may be utilised for extensions.

It seems unnecessary to point out what fine scope for development is afforded by this new power with which the revised Act proposes to invest local boards, supposing them to elect to avail themselves of it. Many of them will at first object to levying the extra cess. But they will be wise to realize that not only will it be in their power, as above explained, by the judicious selection of a paying line, to cause the cess to cease in a few years; but, what is of far greater consequence, by cheapening the cost of travel and of freight and by equalizing prices all round, to secure greater benefits for their districts than can possibly accrue from the mere saving of the cost of the special cess.

STATEMENT showing the assets of District Boards, and of District Funds as distinguished from Taluk and Union Funds, and the effect possible with an extra 3-pie assessment.

No.	District.	Total assets for the year 1897-98.	District Board's share of the assets.	District Board's share of land cess.	Total expenditure from district funds.	District fund expenditure on communication, new works.	District fund expenditure on communication, repairs only.	Result from a special 3-pie land cess.	Capital which could be raised on the security of a 3-pie cess, 4 per cent.	Miles of 2-ft. railway at 25,000 per mile.
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	
1	Anantapur	1,32,987	57,508	48,037	60,153	5,180	8,432	24,000	6,00,000	24
2	Arcot, North	4,61,946	2,13,039	1,48,618	1,92,940	15,379	23,679	67,000	16,75,000	67
3	Arcot, South	4,53,832	2,18,983	1,46,008	1,51,771	13,213	20,078	67,000	16,75,000	67
4	Bellary	2,60,535	2,16,329	1,43,879	1,20,301	3,018	40,963	47,000	11,75,000	47
5	Canara	3,28,647	2,06,863	66,081	1,49,090	20,800	34,938	33,000	8,25,000	33
6	Chingleput	2,61,954	1,55,161	76,076	1,14,411	118	62,759	38,000	9,50,000	38
7	Coimbatore	5,10,806	2,52,035	1,03,118	2,15,387	1,033	46,115	62,000	15,50,000	62
8	Cuddapah	3,44,473	1,85,904	1,09,284	1,46,114		19,626	46,000	11,50,000	46
9	Ganjam	3,65,068	2,03,550	1,26,236	1,47,717	2,440	52,252	63,000	15,75,000	63
10	Godavari	9,87,264	3,71,493	2,11,067	3,13,676	30,461	81,766	105,000	26,25,000	105
11	Kistna	7,16,045	3,44,017	2,57,394	3,11,569	27,958	138,744	128,000	32,00,000	128
12	Kurnool	7,47,791	3,85,946	1,80,237	2,97,691	18,777	77,581	82,000	20,50,000	82
13	Madura	7,14,734	3,39,347	1,29,408	3,43,505	39,734	136,523	69,000	14,75,000	59
14	Malabar	6,54,879	3,59,203	1,19,408	1,37,999	3,426	66,241	62,000	15,50,000	62
15	Nellore	4,79,179	2,20,950	1,23,119	1,70,976	15,672	66,099	49,000	12,25,000	49
16	Nilgiri	2,04,327	2,04,327	13,168	28,338	1,393	6,795	4,000	1,00,000	4
17	Salem	4,45,870	2,45,211	1,27,489	1,51,466	7,393	43,073	44,000	11,00,000	44
18	Tanjore	13,23,132	9,36,684	2,82,345	6,32,971	1,19,216	1,12,755	141,000	35,25,000	141
19	Tinnevelly	4,53,816	2,69,770	1,30,142	2,29,971	11,230	1,08,033	65,000	16,25,000	65
20	Trichinopoly	3,65,885	2,00,164	83,163	1,72,945	8,636	78,626	42,000	10,50,000	42
21	Vizagapatam	8,80,831	1,98,404	1,38,343	1,85,024	8,025	74,591	69,000	17,25,000	70

CHAPTER X.—PROCEDURE WHEN A ROAD TO BE RAILED HAS BEEN SELECTED.

I shall now endeavour to indicate the proper procedure for adoption by a district board when it has resolved to enter on a light railway policy, and has selected a road to be railed.

1*st*.—A careful statement should be prepared of the probable quantity of goods and of passengers likely to use the railway. A list should be made of all towns of 5,000 inhabitants and over, and of all important villages of over 1,000 inhabitants within 5 or 6 miles on either side. Statistics should also be given of the existing cost of transport, on the average, per maund or per ton; the Indian railway regulation maund 82$\frac{1}{4}$ lbs., and the regulation ton 2,240 lbs., being used. Then as good an estimate as circumstances permit should be made of the probable traffic likely to be exchanged between the towns (all under 5,000 being omitted). This can only be done by referring to existing statistics if any are available, by counting actual traffic at selected points for a few days, by enquiries amongst merchants, and perhaps in some cases by application to the authorities of the main line of railway for particulars of goods and passengers booked at certain of its stations. Then to get rural earnings. From the taluk maps and taluk and village census statistics a census should be prepared of the population of a belt alongside of the railway at the time of the last census, and an allowance should be made, based on whatever information may be available, for percentage of increase since then. It will be sufficient if the census belt be taken 5 miles wide on either side of the proposed alignment, because density will not differ very much whether, for the purpose of estimating the probable receipts from the rural population, the belt be taken at 8 miles wide or at 12. In all cases allowance should be made for the increased activity of trade and of movement which is certain to follow the opening of a branch railway. When the best estimate possible has been made of traffic likely to spring up between the large towns, an allowance for earnings from the rural population may be made on the basis of one rupee per head of population from a belt 8 miles wide to begin with, increasing gradually to 12 miles in the first 8 years after the railway is open. To the rupees so calculated as rural earnings must be added a sum for town earnings which may be based on a rate of $\frac{1}{4}$ anna per mile for each passenger likely to travel and 1 anna per mile for each ton of goods. (The figures got as the average for 10 half-years on the Morvi line were 0·280 annas per passenger mile and 1·245 annas per goods ton mile.) The result gives total probable earnings, and from this, for the purposes of the first rough traffic estimate, 60 per cent. may be deducted for probable working expenses, and the balance will give net profits. This figure divided by the length of the railway will give profits per mile, which, sought for in the table at the end of chapter IV will indicate, in the column under a suitable heading for interest likely to have to be paid for the raising of the capital, the sum per mile which the Board may if it pleases spend on the railway without much risk of loss. It will then be for the Board, on a due consideration of the estimate of capital cost given in chapter VII, and of the quantity of rolling-stock necessary to carry the traffic estimated, to determine whether to make the cheapest railway that will suffice for the traffic but capable of gradual improvement as earnings may warrant, or whether they will afford themselves the luxury of a highly finished handsome railway, right away.

2*nd*.—The next thing to be done is to order the district board engineer to make an accurate survey, with levels, of the existing road, showing all its curves and bends and drawings and particulars of its structures as well as the boundaries of the public land. A scale of 400 feet = 1 inch horizontal will suffice for plan and section, and 40 feet vertical for the section. The district engineer as a rule should not waste time in doing any more than this, because he will usually not be a railway expert. But he should be prepared to stake his reputation on the accuracy of the plans, because the object of preparing them is that the whole scheme and estimate may be based on them when subsequently framed by an experienced railway man.

3*rd*.—The authorities of the trunk line of railway, of which the proposed railed-road is to form a branch, should next be asked to be good enough to prepare an estimate, on the basis of the district board engineer's plans and sections, and they should be referred to this memorandum for information about the class of railway that is desired, and should be informed fully as to the estimated traffic, and as to the rough figure to which it is proposed, if practicable, to confine expenditure. As the district engineer, if worth his salt, will of course have furnished the fullest particulars, with drawings and sections of all existing waterways, or flood-gaps, along the road, and with sections obtained from pits or borings showing the character of foundations, the railway engineer ought really not to require to go out into the field at all. Should he be obliged to do so, the fact will merely indicate the incompleteness of the information furnished by the district board's engineer. The district board must of course be prepared to pay the bill furnished by the railway Administration for the cost of preparing the estimates, including such drawings as may have been found necessary. All this is presumed to be covered by the allowance for preliminary expenses.

4*th*.—The board has next to consider how the capital may be raised. If the new clause of the Madras Local Board amendment Bill, passes into law, they will have it in their power to offer as security for interest on the debentures and as a sinking fund, a special railway cess to be levied up to 3 pies, if necessary, per rupee of the district assessment. A reference to the table at the end of chapter IX, will show how many miles of railway each district in the Presidency can have for its money, if it chooses, by levying the whole of the 3-pie cess. But if the proposed railway is of only half the length given in that table, it will not be necessary to raise more than half of the 3-pies, and as much over as will suffice for a sinking fund for the amortisation of the debentures. Indeed if the projected railway and the benefits likely to be derived from it are confined to one or two taluks, and if the 3-pie assessment levied in those taluks is sufficient for the purpose, the district would I consider be justified in levying the cess in those taluks alone. Having in general meeting, as per the provisions of the Act, deliberately put on the special railway cess, the district will be in a position to borrow the money it requires, as soon as it shall have obtained the permission of Government to do so, on the security of the cess. The security is as good as a Government guarantee, and this is certain to be recognised by the capitalist when, after a little while, he shall have become familiar with the idea. It ought certainly to rank at least no lower than the Municipal loans of our great cities. It ought, one would think, to be considered a good enough investment by native gentlemen in the district interested, who now habitually invest their spare funds in 3 per cent. or 3$\frac{1}{2}$ per cent. Government paper. But as already explained it is not open, pending legislation, to trustees.

5*th*.—The next step for the board to take will be to address Government, laying the whole of the facts and figures before it, including the estimated saving of maintenance charges on the road proposed to be railed, and to ask for permission to enter into negociations for the raising of a loan on the security of the special cess. As an alternative, and if there are firms of promoters to the fore who are prepared to forego the security referred to, and to undertake the construction and working of the railway on other terms, such as an annual subsidy equal to the estimated cost saved on road up-keep, the permission of Government should be asked for these promoters to be dealt with. It has now to be considered whether the line had better be made under the Tramways Act or under the Railway Act. Of the two the promoter will probably prefer the Railway Act, because, under that Act, he is more independent of the detailed control of the district board. The board, however, will probably prefer the Tramways Act, and I recommend that they insist, as a rule, on working under that Act, because reference once a week or so to the distant Government of India is thereby rendered unnecessary and they can do all their business with their own Government with the minimum of friction and correspondence.

6*th*.—Should a district board come to terms with a firm of promoters, the latter may be given a fairly free hand, provided that the guarantee is one of gross earnings. If on the other hand the guarantee is one of interest on capital outlay, the outlay must be strictly confined to the estimate agreed to by the board, and to such capital expenditure as may afterwards be mutually agreed to as necessary. If again the

guarantee is one of net earnings, it will be most advisable that the working agency should agree to work the line for a certain percentage of gross receipts. This can seldom be arranged unless the working agency is the administration of the neighbouring main line of railway.

7th.—I strongly recommend that, whenever it is possible to do so, the agency of the main line of railway be availed of, not only for the subsequent working but also for the first construction of the railed-road. For this there are many reasons; the effectiveness of Government control, the probability that the staff is entirely reliable and of high character; the interest which the main line has in the earnings of the branch; the available technical knowledge, whether Engineering, Traffic, Locomotive, or Audit; and the absence of all concern with PROMOTION MONEY.

8th.—If it should be decided to raise a loan in the form, say, of debentures redeemable after 20 years, money spent in advertising is money well spent, and the larger the area in which the advertisements are read the better will be the chance of getting the money at a reasonable rate. It would be folly to confine enquiries for money to the very restricted market of Madras; Calcutta and Bombay should also be tried. The advertisement, which will probably occupy half to three quarters of a column of a newspaper, should contain the fullest particulars of the position of the board, of its decision to levy the cess, of Government's authorization to the levy of it, and of everything likely to tempt the public to subscribe to the loan. The advertisement should be in the name of the board's President. I am confident that as this form of investment becomes better known it will be more and more largely availed of.

One district in this Presidency, that of Tanjore, already, as explained in Chapter IX, possesses a half interest in 45 miles of railway, and may if it pleases become possessed of the entire 45 miles as sole owner. It is conceivable that when the district comes to the public for a loan for extensions, security in the form of a first mortgage on the existing railway may possibly be looked on with greater favour by the investing public than the security of the special cess. Should the net receipts of the railway then suffice for the purposes of a sinking fund, the levy of the special cess might cease once there seemed no more railways, or railed-roads, to be made.

It stands to reason that, provided good value is secured for the money, it is advantageous to a district to utilize its own resources as far as possible in the construction of its own railway. Thus the officials who have a far more intimate knowledge of the castes, trades and tribes which inhabit the district, and who often can bring more influence to bear on these people than a railway engineer is in a position to exercise, may be of great assistance in collecting and in organizing labour, skilled and unskilled, for stone quarrying, brick making, lime burning, earthwork, &c. They will probably also be cognizant of sources of supply of lime, stone, &c., lying out of the ken of the railway engineer, and can bring the localities to his notice. Again it is possible that there may be good indigenous timbers for sleepers and other purposes, and that the District officials may be able to organize, or at least to facilitate the organization of, arrangements for cutting and for carrying it.

The railway engineer has no interest in doing anything of this sort; all he cares for is to get his railway finished out of hand and well finished, and it does not concern him in the very least where his material comes from so long as he gets it quickly, cheap, and of good quality. The District Board therefore will be wise if, in the early stages, it makes full enquiry into all such matters.

CHAPTER XI.—BRANCH LINE TERMS.

With a view to the encouragement of private persons and companies to undertake the construction of branch or feeder lines of railway, the Government of India have published the following terms which they are prepared to offer for the construction of branch lines, usually not exceeding 100 miles in length. The concessions are not applicable either to the larger or more important branches or to mountain branches, for which separate negotiations are in all cases necessary. The terms quoted below will be found, together with the memoranda therein referred to, in Government of India Railway Construction Circular No. 514-R.C., dated the 17th April 1896.

Resolution.—Branch lines forming feeders, whether to State lines worked by the State or to railways worked by companies, will ordinarily be made by the main line administrations, who shall have a prior right to construct them.

The Government of India will from time to time publish a list of branch lines for the construction of which they are prepared to receive tenders.

They will consider and dispose of any application for the inclusion in the said list of any other line which can properly be described as a branch or feeder line, and which does not, except in special circumstances, exceed 100 miles in length.

2. Proposals for the construction of branch lines under this Resolution must conform to the following terms and conditions:—

(i) Applicants must satisfy the Government that they are in a position to command substantial financial support.

(ii) The gauge to be adopted must be approved by the Government in each case.

(iii) The proposed railway shall be subject to the provisions of all Acts of the Legislature applicable to Indian railways.

(iv) The proposed railway shall be built in accordance with the fixed and moving dimensions for the time being prescribed by the Governor-General in Council, and on plans and estimates that have been approved by that authority. The route of the line, the situation of stations, and other similar details, shall be subject to approval by the Government.

(v) The line, while under construction, shall be inspected when and so often as an inspecting officer appointed for that purpose by the Government may consider desirable with a view to ensure the construction of the line up to the standard agreed upon.

(vi) Inasmuch as these railways are chiefly required for the development of country hitherto deficient in means of communication, and the anticipated profits may not therefore at once be fully realised, the Government of India are prepared to give financial assistance as set forth below. Proposals for financial concessions may be made in one or other of the following alternative forms:—

(*a*) It may be stipulated that after the opening of the railway for traffic the Government shall guarantee out of the revenues of India a fixed yearly minimum dividend in rupees on the actual expenditure charged in the capital account of the branch railway company as entered in rupees in the company's books in India, with such share of the surplus net profits as may be agreed upon. The minimum dividend to be guaranteed in each particular case will depend upon consideration of the circumstances, but for the present no offer will be entertained that requires a guarantee exceeding 3 per cent.; or

Under (*a*) the company will receive an absolute guarantee of interest at a rate not exceeding 3 per cent. and a higher return if the net earnings of the branch are sufficient to pay more than the guaranteed dividend.

(*b*) It may be provided that a payment be made to the branch company by the main line to the extent necessary, together with the branch company's share of branch earnings [see section (6) of paragraph 3] to give the branch company a dividend of $3\frac{1}{2}$ per cent. per annum on the actual expenditure charged in the capital account of the branch railway company as entered in rupees in the company's books in India; provided always that the payment so made to the branch company shall in no case exceed the net earnings of the main line from traffic interchanged with the branch. This rebate will be granted from the first earnings of revenue by the branch, such payment being calculated at the close of the year, payments on account, however, subject to adjustment being permissible at the close of the first half of each year. The net earnings of the main line from traffic interchanged with the branch are assumed to bear the same proportion to the gross earnings of the main line from such traffic as the net earnings of the whole system including the branch bear to the gross earnings thereof. If the net earnings of the branch line equal or exceed $3\frac{1}{2}$ per cent. on the actual expenditure as above, the whole of such earnings will go to the branch company.

Under (*b*) the company will receive a dividend of $3\frac{1}{2}$ per cent. provided that the amount of the net earnings from local and interchanged traffic be sufficient, and a higher return if the net earnings of the branch from its own traffic be sufficient to pay a higher dividend.

In either of the above cases (*a*) or (*b*) if the capital is raised in sterling, the capital to be entered in rupees in the company's books in India shall be the actual amount realised in rupees from time to time by the several remittances of funds to provide for expenditure in India, together with the sterling outlay from time to time in England converted into rupees at the average rate of exchange obtained by the Secretary of State for his remittances during the half-year preceding that in which the outlay shall have been incurred, and the capital expenditure in rupees on which the interest is from time to time to be calculated for the purposes of the guarantee or rebate, as the case may be, shall be the total outlay whether in India or England up to any such time as thereto charged.

(vii) The general character of the supervision and control that will be exercised by the Government over the branch railway, apart from the provisions of the Railways Acts and the preceding provisions of this Resolution, shall be as follows:

(*a*) No capital expenditure by the branch railway company will be allowed as between the Secretary of State and the company unless the prior sanction of the Secretary of State shall have been obtained. The company shall have no power to increase its share or stock capital without the sanction of the Secretary of State or to borrow money except within a fixed limit and on specified conditions.

(*b*) The branch railway company, if required, shall keep capital accounts and statistics in forms approved by the Secretary of State; and shall render, free of cost, all accounts and statistics required by the Government. The accounts and books will be subject to audit on behalf of Government.

(viii) Funds for the execution of new works, properly chargeable to capital, found necessary after the branch railway has been opened to public traffic shall be provided by the branch railway company. Such works and their cost shall be agreed upon between the branch railway company and the main line administration before they are put in hand. In the event of any difference of opinion arising between the branch railway company and the main line administration as to the necessity for and the cost of any new work, the matter shall be referred to the Director-General of Railways as arbitrator, and his decision shall be final.

(ix) The rates and arrangements in force on State railways in the matter of services rendered to all departments of the State shall apply.

3. The following are the principal additional concessions admissible for branch or feeder railways for the construction of which tenders may be invited:

(1) The Secretary of State for India in Council, or the Government of India, respectively, will permit the charge of interest at a rate to be agreed upon in each case during construction to the capital account of the railway under the terms of the Indian Railways Act of 1894 (57 and 58 Vict., Chapter 12), or the Indian Railway Companies Act X of 1895.

(2) The land required for the construction of the branch railway will be provided free of cost. Such grant shall not include land required for quarrying, ballast, brickfields and kindred purposes.

(3) Electric telegraphs and telegraphic appliances will be supplied and maintained by the Government of India at the usual charges for such works.

(4) The results of existing surveys will be made available free of charge. When desired, fresh surveys will be made by the Public Works Department of the Government of India of any branch railway on the applicants depositing the estimated cost thereof in a Government Treasury, on the understanding that no preferential claim to a concession is thereby established. If permission be eventually given for the construction of the line, the actual cost of all such surveys, as well as of those made at the cost of Government, may be included in the capital cost of the railway. No responsibility will be accepted by Government for the accuracy of any survey, plan, estimate or other information supplied.

(5) The branch railway may be constructed by the main line administration, and will be maintained and worked by that administration during the full currency of the contract to be entered into for the purpose, at a fixed ratio of expenses to earnings in each half-year. The ratio will, when the branch railway is of the same gauge as that of the working railway, usually be that obtaining on the whole system as from time to time existing including the branch railway, but will not exceed 50 per cent. of the gross earnings of the branch from all sources, and will be inclusive of charges for the use of the main line rolling-stock.

(6) Such expenses on account of the Board of Direction of the Branch Line Railway Company as may be incurred with the sanction of the Secretary of State may be charged—

(*a*) during construction to the Capital Account of the Branch Line Company;

(*b*) after opening, and until the minimum dividend under paragraph 2 (vi) (*a*) or (*b*) is received by the Branch Line Company, as part of the working expenses to be met out of the stipulated percentage of the earnings of the branch taken by the working railway;

(*c*) and thereafter out of the general receipts of the Branch Line Company.

(7) Railway materials for the branch railway will be carried over State lines at the special rates prescribed for such materials belonging to State railways.

4. The Government of India reserve the right to purchase all such branch railways at the expiry of 21 years, or at subsequent intervals of 10 years on 12 months' notice, the purchase price being 25 times the yearly average net earnings not including rebate payments, of the 3 years preceding the purchase, with a maximum price of 120 and a minimum of 100 per cent. of cost price on a rupee basis.

5. The Government also reserve—

(i) The right to fix and vary from time to time the classification of goods, and maximum and minimum rates for each class of goods, as well as of passengers; and

(ii) a general control in respect to the number and timing of trains.

6. Applications for concessions to construct branch railways under the terms of this resolution should be submitted, in the form prescribed by Memorandum A, hereto attached,* to the address of the Secretary to the Government of India, Public Works Department.

7. Applications for fresh surveys to be carried out on the terms detailed in condition 3 (4) above should be submitted in the manner prescribed by Memorandum B, hereto attached, to the address of the Secretary to the Government of India, Public Works Department.

* *Not reproduced.*

CHAPTER XII.—JOINT STATION TERMS.

When a branch line enters the station premises of the main line of railway, it almost necessarily makes use of many of the works which are the property of the main line. The only alternative is for the branch line to keep up its own separate yard and staff, merely transhipping passengers and goods across from one line to the other. The joint arrangement will usually be the most convenient and economical, and it is generally arranged that the accounts of the branch line shall be debited with a certain proportion of staff, and of interest on cost of works, used jointly. The problem is how most fairly to fix the proportion.

The principles usually held in India to govern the proportion are those embodied in the Government of India Traffic Circular No. XII, Railway, dated the 13th August 1889, which concludes by reminding Railway Administrations of the whole-some principle that railways are made for the development of the country and that excessive charges levied for permitting a new line to have a right of way over or alongside an existing Railway, should be discouraged. It was laid down in this circular that when a new railway effects a junction with an existing line, the new railway should, as far as possible, utilize existing accommodation and should pay a fair charge for the use of that accommodation. Attention also was invited to an agreement which had recently been concluded between the Railway Companies for the joint use of a certain station in which it was settled that, after deducting a proportion of the joint station expenses for the through traffic of the owning railway, the balance of those expenses should be divided between the owning and the using companies in proportion to the weight of traffic of each railway using the station. The agreement referred to is known as the Poona Joint Station Agreement dated 11th January 1889, and may usefully be abstracted as follows. It is now the usual model for similar agreements elsewhere.

A schedule having been made out of the actual cost, or the agreed estimated cost where actuals were unknown, of existing works and premises to be used in common for joint purposes by both railways, it was agreed that all new capital works mutually agreed to as necessary from time to time should be added to the schedule and carried out by the company owning the station. It was also agreed that each railway should provide and maintain at its own cost all its own exclusive accommodation. It was agreed that an account called the joint station expenses account should be debited with the cost of all the station staff; also with 5 per cent. interest on the cost of the capital works contained in the schedule above referred to, whether originally contained therein or subsequently added by mutual agreement; also with expenditure on new minor works, or on minor additions or alterations, or on revenue account for renewals and maintenance, as well as with all expenses incurred by the owning company in the proper working of the station. It was also agreed that, in consideration of the through traffic of the owning line in which the branch line was not concerned, one-fifth of the joint station account should be debited to the owning line, the remaining four-fifths being divided between the two lines in proportion to the weight of traffic, through and local, of each railway using the joint station.

These are the main features of the Poona Agreement, but it of course contains numerous other detailed provisions about various matters incidental to the use of the joint station, and if a reference to these is necessary it will be found in an enclosure to the Government of India's Circular No. XII, Railway, of 1889 above referred to. Some such an agreement as this will usually be necessary for the use of the junction station on the main line by railways of the class now contemplated, to be promoted, constructed, or guaranteed by District Boards.

CHAPTER XIII.—FEEDER ROADS.

Whether a District has been supplied with railways by the aid of the State or through the medium of a State guaranteed company, or whether it has pledged or otherwise utilized the District Board's collections for the purpose, one of the most obvious duties of the board is to encourage the construction of, and the good main-tenance of, feeder roads to the stations of the railway by every means in its power. My experience in most Presidencies and Provinces in India tells me that, for some occult reason or other, the force of which is undoubted though the reason thereof is to the ordinary mind difficult of conception, District Authorities, whether the Civil Officials or Local Boards, require a great deal of pressure before they can be induced to see that it is for the good of their district as a whole that the railway through it should be looked on as the primary highway and that all efforts should be made to extend the benefits of that highway as far as possible, if indirectly, into the outlying parts of the district, by devoting the available district funds to those roads, by preference, which feed railway stations. Stations cannot always be planted down precisely when those interested in the district would like to see them planted: for there are reasons of traffic-working which make it desirable to plant them at reasonably uniform distances apart, and there are sometimes engineering reasons why they should not be located at places otherwise desirable. This should be recognized by the Civil Officials and by the District Authorities, and all the resources available for the purpose ought to be devoted to making access to and from the stations, from the country and from the big towns and villages, as easy as possible; even to the extent if necessary of neglecting other roads serving no such purpose though they may not enable carts to compete with the railway. District Authorities sometimes act as if they thought that the Railway has interests divergent from those of the district, and is therefore a lawful object to be scored off, by neglect to supply it with feeders. As if it were not the best thing possible for the greatest happiness of the greatest number of people in the district that the journey from the peoples' fields to the big market should be made to cost as little in cart hire and railway freight as possible.

So long ago as 1863, the Government of India circulated the following order on the subject—an order which may now again, after the lapse of a quarter of a century, be read with advantage by District Authorities in this Presidency and else-where in India. It will be found in Madras Government, Financial Department, G.O., Nos. 171–172, dated 27th November 1873:—

Observations.—The Governor-General in Council, in connection with the undertaking of the construction of State Railways and the progress some of these works have made, has again considered the great importance of constructing ordinary feeder-roads both in British territory and in the adjacent Native States. In the original alignment of railways, the geographical features of the country must be taken into account, and it usually happens that, after a good supply of water has been obtained, and the requirements of numerous towns on the general line of country traversed are met, many other places which ought to be accommodated are left at a distance from the railway, and without sufficient means of access to it.

2. Soon after railway enterprise was commenced in India, the officers of the Guaranteed Companies perceived that their new traffic stations needed connection with the principal towns in their neighbourhood, by means, either of roads constructed direct from the railway stations to the established markets, or by new roads joining the station yards to the old lines of communication. The Guaranteed Companies urged the question on the Government, and in some cases acquired land and made roads at their own expense. Objections were raised to this mode of procedure, and moreover the formation of roads, distant from their railway, did not appear to be a legiti-mate field for the expenditure of the shareholders' guaranteed capital. After some discussion the Government of India, with the sanction of the Secretary of State, determined to relieve the Guaranteed Companies of this duty, and decided that the Government should undertake the construction of all railway feeder-roads. New feeders were then from time to time made, the cost of which was met from imperial funds. But in the year 1870, when it was resolved that the power and responsibility of the Governments of Presidencies and Provinces, in respect to expenditure in some civil departments, might with advantage be enlarged, it was recognised that the construction and maintenance of local roads were fit objects for the beneficial exercise of provincial control; accordingly, the duties in connection with this matter, together with an assignment of funds, were then made over to Provincial Governments.

3. The supreme Government now retains the responsibility for the provision and maintenance of the railway system throughout India, and leaves to the Provincial Governments and Administrations that of the provision of roads. It will no doubt be recognized by the Local Governments that their funds, available for expenditure on the construction of roads, cannot, in parts of the country bordering on lines of railway, be better applied than by the formation of railway-feeders. The completion of these minor works will bring the advantage of railway communication close to the homes of the people, and, as no share of the cost of the railway itself will be borne provincially, His Excellency in Council believes that expenditure on such roads will afford a more effective and economical result than outlay in any other direction.

4. The Governor-General in Council has agreed to pay interest on loans from Native Princes received for the purpose of railway construction, and new railways are being opened both in their territories, and in those of other Native States, especially in Rajpootana. His Excellency in Council trusts that these Princes will follow the example of the British and His Highness the Nizam's Governments, and endeavour to secure to their subjects the full advantage to be derived from that proximity to the railway, which affords means of free access to travellers, and facilitates the development of trade. Princes and Chiefs, who have been hitherto unable to co-operate with the British Government in leading railways through their dominions, will, it is hoped, devote sufficient funds for the construction of roads. Political Officers should explain the importance of railway feeder-roads to the Native Governments with whom they are connected, and endeavour to obtain their active co-operation with the British Government in improving communications.

5. On the Guaranteed Railways this subject has been so frequently discussed, that it is unnecessary now to recall the attention of the Consulting Engineers to the Government of India on Guaranteed Lines; but the Engineers in charge of State Railways having been so much employed in overcoming the difficulties immediately connected with their undertakings, have perhaps not yet considered, in a sufficiently broad manner, how the distribution of local traffic will be affected by the opening of their railways. These officers are in a position to form valuable opinions, and after they have examined the vicinity of the line, and consulted the influential residents, Native and European, they should place themselves in communication with the Civil and Political Officers, and should either assist in the preparation of a report or should themselves submit a statement showing in what direction, and approximately at what cost, lateral feeder-roads may be led to the railway stations, so that the local trade and the traffic receipts of the railway may reciprocally gain full benefit from the opening of new lines of railway.

The attention of District Boards had previously been called to the same subject in Madras Government, Financial Department Proceedings, No. 131, dated the 21st August 1872:—

His Excellency the Governor in Council has had under consideration the subject of opening out communication with the lines of railway now under construction in this Presidency. In many cases engineering considerations have been sacrificed and additional outlay incurred with the object of serving certain supposed commercial centres, and it is clear that the subsidiary roads should be projected and taken in hand simultaneously with the line of railway they are intended to serve.

2. His Excellency, therefore, resolves to call upon the President of the Local Fund Board of each district concerned, in communication with the Superintending Engineers, to forward, with as little delay as possible, for the information of Government, a report accompanied by a sketch illustrative of the measures that have been taken or may be proposed for opening out communication with the several proposed railway stations.

It seems to me to be perfectly obvious that when the whole of the conditions of the communications of a district are suddenly changed by the passing of a new railway through it, a wise administration will recognize the change, and from an entirely new standpoint will face the problem of connecting the areas of production and consumption, as easily as possible and at the minimum cost for transit, with the great trading centres to which the railway leads. The result will be that the funds of a District which are available for the purpose will in the first instance be spent in connecting up all railway stations with existing roads, and later, in maintaining, improving, and extending those roads.

When a district is itself largely interested in the financial success of a railway, by reason of either owning it or having guaranteed it, this obvious duty becomes also a matter of self-interest. A Railway Manager on the other hand, ought to see that it will usually be of greater benefit to his shareholders or to his owners, whoever they are, to help the construction of feeder roads by quoting the lowest practicable rate for the carriage of metal or gravel for them, than to get a higher rate for a few train loads of gravel carried.

APPENDIX A.—LIGHT RAILWAYS ON PROVINCIAL ROADS IN ASSAM.

Note by Mr. F. J. E. Spring, Consulting Engineer to the Government of India for Railways, Assam, dated Shillong, 31st July 1896.

Since coming to Assam, I have had two or three conversations with the Chief Commissioner on this subject. I have also taken the opportunity more than once, when reporting on the Jorhat and Cherra lines, of expressing the opinion that the province would be wise to inaugurate a definite light railway policy.

2. In this opinion I am confirmed by a recent inspection of the Tezpur Tramway; and having through the courtesy of Mr. W. Skinner just received a statement of his Company's capital expenditure, I am in a better position than heretofore to handle the subject intelligently. I offer therefore the following observations for the Chief Commissioner's consideration.

The following is a statement of the cost of about 217 miles of the principal 2′ 6″ gauge railways of India:— (See page 21, Chapter VII.)

3. It appears, therefore, that 2′ 6″ gauge railways can be built, fully equipped for all traffic, at from twenty to thirty thousand rupees per mile, the cheapest constructed as yet being in Assam.

4. It will be useful now to endeavour to form an opinion what each of the items will cost if care be taken to keep down all unnecessary outlay, and if circumstances are favourable. I shall therefore examine each sub-head separately.

5. *Preliminary Expenses.*—These may apparently vary from Rs. 100 to Rs. 500 per mile. On broad and metre gauge State lines the figures are usually higher, running from Rs. 500 to Rs. 1,000. The cost of this item is practically that of the survey and of the preparation of plans and estimates. For light railways, intended to be laid on existing district roads, surveys and plans will usually be already in existence, and the existing Public Works establishment can in most cases prepare the estimates without much extra expense. I would therefore judge that, on the average Rs. 200 per mile will amply suffice to cover the cost of *Preliminary Expenses* in Assam.

6. *Land.*—Land will usually have already been taken up for the road utilised. Extra plots may however be required here and there for stations and for cutting off bends. I judge that in a rice country Rs. 400, and in a jungle country Rs. 100 will usually amply suffice to pay for all land. An average of Rs. 200 may be taken for the purpose of this estimate.

7. *Formation.*—This includes the cost of banks and cuttings, of bridging, and of fencing. Where an existing road is everywhere utilised there will be little need of additional banks or cuttings, except where bends are cut off and where stations are necessary. The cost of bridging will of course vary greatly, according to the manner in which waterways have been crossed on the road. If the road is already bridged with masonry bridging at most of the minor waterways, the major waterways, now probably crossed by ferry boats only or by bamboo bridges, will need to be lightly bridged, usually on screw piling of much about the same character as that used on the Companyganj Sylhet road. This would ordinarily cost, I think, about Rs. 150 to Rs. 200 per lineal foot, for use as a railway only, not for a road. No fencing need be used anywhere. The cost of the three items which go to make up the cost of formation may I think be taken at from Rs. 2,000 to Rs. 4,000 per mile, and this seems to me to be a very liberal estimate. An average of Rs. 3,000 may be taken for the present.

8. *Ballast and Permanent Way.*—We are on sure ground here, and need not go farther than the Tezpur Tramway for an example of model permanent way for a light railway in Assam. We may therefore set this down at Rs. 8,500 per mile. Some of the other lines given in the table have cost a good deal more for this item—from eleven to thirteen thousand; but they have far heavier traffic than Assam is likely to have for many years, and they have heavier rails and are sand ballasted. In Assam all that is necessary is that the sleepers should if possible be *Nahor*, or *Uriam*, and that during the rains the earth boxing should be well grassed over.

9. *Stations and Buildings.*—These need only be of the humblest description. The allowance covers not only all sorts of buildings but also workshops, store-yards, ashpits, turntables, points and crossings, &c. Rs. 1,500 per mile ought on the average to suffice.

10. *Plant.*—Rs. 500 per mile ought to be ample. The extra cost of plant on the Tezpur line is due to the shops being designed to do a lot of tea garden machine work.

11. *Rolling Stock.*—The cost on the Tezpur line seems unduly high. Indeed the line is sufficiently stocked for double its length. Rs. 4,000 per mile ought to be sufficient for any line from 20 to 40 miles long. The Gaekwar's lines at Rs. 3,400 per mile are admirably stocked.

12. *General Charges.*—The cost of this item will chiefly depend on the cost of special staff, and of the housing of them, and of the audit of accounts. In the case which we are considering, viz., the construction of railways on existing roads in Assam under the P.W. Department, Rs. 500 per mile ought ordinarily to suffice.

13. We have now arrived at the following summary of the probable average cost per mile of 2′ 6″ gauge railways in Assam on the surface of ordinary roads:—

Preliminary Expenses	...	... Rs. 200	Plant
Land	...	... „ 200	Rolling stock ... ... Rs. 500
Formation		... „ 3,000	General Charges ... ... „ 3,400
Ballast and Permanent Way ...		... „ 8,600	Contingencies, say ... ... „ 500
Stations and Buildings ...	...	... „ 1,500	... ... „ 200
			Total per mile ... „ 18,000

14. I undertake to say that under favourable circumstances, and with a well thought out programme of speedy and economical construction, and with good arrangements for continuity of expenditure and of English supplies, Assam may provide herself with an admirable net work of thoroughly sound, business-like, 2′ 6″ gauge lines, on her existing roads, at from eighteen to twenty thousand rupees per mile. I shall therefore base my estimate of the financial advantages of such a system upon the latter figure.

15. Geographical conditions in Assam and in the Chittagong division of Bengal are such that lines of the sort we are now considering, that is light, cheap feeders on existing roads, will usually vary in length from 20 to 40 miles. Indeed with a speed of 10 miles per hour, the most appropriate speed for such lines, a day's run for an engine would be about 70 or 80 miles, so that their economical length would perhaps be but little over 35 miles. It seems likely that for anything of about 50 miles in length and over, in a country traversed by a metre gauge trunk line, it would be just as well that the feeder should be on the same gauge as the trunk line.

16. When a day's run is the length of the line and back again, only one engine need be in steam at a time. When traffic doubles itself the work can be done by two engines; each starting from its own end of the line, and giving the opportunity for a morning's run out and an evening return to the inhabitants of both ends of the district. This sort of working is most economical, and I think that such lines ought to be worked for, at most, 66 per cent. of gross earnings, to begin with.

17. It would be worse than useless were I to pretend to make any sort of an estimate of what a line of this sort might be expected to earn, in a district considered by the Local Administration to be ripe for such expenditure. I can only point out, in a very general way, that as the working expenses of a railway usually cover all outlay on repairs and maintenance, all future Provincial expenditure upon the upkeep of such roads would close, once a line commences to pay. It would have been very badly selected if it did not earn 50 per cent. in excess of expenses, that is if it was not worked for 66 per cent. of gross earnings.

18. Now to consider the important subject of the provision of funds for the construction of this class of light railways. I gathered in conversation with the Chief Commissioner that he was at one time, or is now, prepared to set aside half a lakh per annum for capital outlay on such lines as these; in particular on the extension of the Cherra-Companyganj tramway to Chattack — an extension very badly wanted. It seems to me that half a lakh a year might be very much more advantageously spent in the shape of a Provincial guarantee of interest at 3 per cent. upon a loan from the Imperial Government. Sixty thousand rupees a year would, at 3 per cent., secure a loan of 20 lakhs for the Province, and this at Rs. 20,000 per mile would suffice for 100 miles of 2′ 6″ railways on existing provincial roads.

19. This is no new principle. Before Sir C. Elliott's Lieutenant-Governorship, Bengal used to guarantee to the Imperial Government interest at 4 per cent. on all her railways. On her open railway mileage alone Bengal during the five years 1881—85 paid interest to the Imperial Government at the average rate of Rs. 14,17,800 per annum. Half a lakh a year does not seem an excessive sum for Assam to contemplate paying.

20. The province might, I think, very well undertake the construction of three or four such lines aggregating 20 lakhs worth, spreading expenditure over, say, the next five years at 4 lakhs per annum. The outgoings for interest would then rise gradually from Rs. 6,000 in the first year to Rs. 60,000 in the sixth year. And as all this time the railways would be gradually developing, and a margin would be left of earnings over expenses, it might be that the nett loss to the province would rise less rapidly, and that the amount by which the annual loss fell short of the Rs. 60,000 per annum which the province is considered to be able to stand might be hypothecated for use as interest on further borrowings.

21. This seems to me to be a fine scheme, well worthy of experiment in a new and only partially developed province like Assam, where population and trade will expand instead of contracting, as years go on, and where the absence of a permanent settlement makes it possible, from time to time, for Government to take a fair share of the increase in value of land and everything else.

22. The Local Boards being relieved from the burden of maintaining so large a mileage of existing roads, would be able to turn their attention to feeders to the railway stations of these light railways.

23. When I estimate that the little lines could be worked at 66 per cent. of gross earnings, I suppose them to be worked by cheap local managers. But they could be worked more cheaply, probably at 50 per cent., wherever they happen to form branches of the Assam-Bengal trunk line, as at the commencement it is most desirable that they should do. The trunk line could well afford to work them cheaply in consideration of the traffic they would bring to the trunk itself. Later on when the trunk line is in a solvent condition, it will probably be in a position to give rebates on all traffic passed on to it.

24. Appropriate roads will suggest themselves better to the Assam Administration than to me; but I may just mention the Sibsagar road, the Nowgong road, the Sylhet-Fenchuganj road, the Hingajia road, all important feeders of the Assam-Bengal Railway, and, if I understand right, all bridged and properly aligned.

25. I need scarcely point out that to bury one's capital in work from which, except through the clumsy expedient of toll bars, it is impossible to recover anything, is a very different thing from using one's credit to borrow money for works which may reasonably be expected to pay all working and maintenance charges, and something over towards interest besides. Assam seems to me to be essentially the country for some sort of forced development of this sort. A glance at the country at both sides of the Jorhat and Dibru-Sadiya railways shows how fast the development of the country follows the construction of judiciously selected railways. It does not follow that expenditure in this direction is not remunerative, because the accounts of the working of it show little or no surplus after interest charges and working expenses have been paid. The remuneration is to be looked for in the land revenue side of the Provincial balance sheet, and in other directions, and not merely in the railway balance sheet.

APPENDIX B.—OPINIONS OF EXPERTS.

The following demi-official and official correspondence will be read with interest:—

From—The Consulting Engineer for Railways, Madras.
To—The Consulting Engineer for Railways, Bombay.
Dated—7th October 1897.

I have put forward, for the acceptance of Government in this Presidency, a policy of building 2′ 6″ famine branch railways, to penetrate tracts liable, perhaps at interval of eight or ten years, to scarcity, but so sparsely populated that in ordinary years no railway on either the broad or the metre gauge would be likely to pay working expenses.

I have drawn illustrations from the Gaekwar's and other 2′ 6″ railways in your circle, but am not in a position to do so as freely as I could wish, for want of precise information.

I should be very much obliged if you could kindly send me the Capital and Revenue accounts and the Inspection reports, say for four or six half-years, for each of the 2′ 6″ lines within your circle.

I should also be greatly obliged if you could find time to write me a note upon the subject, expressing your own opinions as to their value and convenience, and affording me any information which may suggest itself to you as likely to supply me with arguments for the adoption of a like policy in parts of this Presidency.

From—The Consulting Engineer for Railways, Bombay.
To—The Consulting Engineer for Railways, Madras.
Dated—Mahableshwar, 21st October 1897.

* * * * * *

I have the highest possible opinion of 2′ 6″ gauge railways for India *in suitable positions*. By "suitable positions" I mean places where the line is not likely ever to become part of a through line on another gauge and where the normal traffic is such, per mile per week, that a metre gauge could not live on it. There is, in my mind, no doubt whatever that a 2′ 6″ line can live and pay interest on capital on a weekly traffic on which a metre gauge would not pay working expenses, and I think the Morvi Railway shows this quite clearly.

But if the full gain of a 2′ 6″ line is to be obtained, the line must be treated reasonably and not unduly hampered by things suitable only for a line with heavier traffic; for instance, some of the chief advantages of a 2′ 6″ gauge are (*a*) a lighter and narrower substructure, (*b*) its capacity to accept (i) sharp curves, (ii) steeper gradients than are suitable to a line of wider gauge. If then you go and make a 2′ 6″ gauge on a plan and with gradients and substructure suitable for conversion to another gauge, you are deliberately throwing away some of the chief advantages of the gauge and needlessly burdening the capital. This policy I look upon as entirely unsound.

The permanent way I would keep heavy, though I am bound to admit that the Morvi Railway original 19 lb. rails and small sleepers have stood in the most marvellous way.

I cannot imagine a better line, if fairly treated, for many parts of India than a 2′ 6″.

From—The Consulting Engineer for Railways, Madras.
To—The Agent, Madras Railway Company.
Dated—22nd October 1897, No. 3293.

In connection with the question of the expenditure annually in this Presidency of part of the so-called "Famine Insurance" grant, it has been suggested that it might be well once for all to agree to the adoption of a definite policy for the construction and working of light 2' 6" gauge steam railways. The idea is that it is often the very tracts which are most liable to famine, which are least able to afford to pay working expenses and interest of a railway on the larger gauges in ordinary years; and that therefore it is worth considering whether tracts of this sort might not, with great advantage, be provided with shorter or longer feeder lines, leading for the most part on to the main trunk lines, and laid as a rule on the district roads at a cost of from twenty to thirty thousand rupees per mile.

2. There are already in India several examples of successful light railways, some of them worked independently, like those in Assam, and others, like the Gaekwar's lines, worked by the broad gauge parent or trunk line. I enclose for your information a copy of a note upon the subject which I wrote for the Government of Assam, and you will perhaps have seen in the advertisements in the Calcutta press that a large firm are advertising for subscribers for the formation in Assam of several light line companies of the sort advocated in the note.

3. On laying my proposals for the adoption in this Presidency of a similar light line policy before the Government of Madras I was met by the objection that break of gauge is a factor which must on no account be left out of consideration, and I was instructed to take you into consultation on the subject and to invite you to give Government the benefit of the expression of your views on the subject.

4. Perhaps you are not aware that the Bombay Baroda and Central India Railway have no separate shops for the Gaekwar's lines; they use an ordinary carriage dock to wheel a 2' 6" gauge engine or vehicle on to a broad gauge truck, and so transport it for repair to the main shops at Bombay whenever more is wanted than can be conveniently done under the supervision of the foreman at the junction.

5. The chief advantage, as it seems to me, of substituting a cheap and effective system of steam-driven vehicles for the bullock vehicles of the country is that the latter are forced to ply for hire back of the narrow gauge railway, and so for all famine purposes the tract is more efficiently served. On the main track from the trunk railway to the local, inland, centre of trade, an efficient service is substituted for a less efficient one, and at a cost which will presumably be at least sufficiently low to prevent the taxpayer being burdened with maintenance and interest.

6. An expression of your own views, and of those of any of your heads of departments whom you care to bring into the consultation, will be very valuable, especially on the subject of the evils of a break of gauge (a break which by the way exists at present between the carts and the railway).

7. The aim of the new policy would not be to make narrow gauge links across tracts of territory between existing railways, or to occupy lines of country which there seemed any likelihood of ordinary railways ever tapping, but to more efficiently equip existing roads from inland trade centres to stations on existing railways through which the trade of these centres passes at present.

8. Any remarks you have to offer on the subject of the terms which seem to you to be reasonable for the working of such branch light lines by the trunk line administration will greatly aid me in advising the Government of Madras in reference to this important matter.

From—The Agent and Manager, Madras Railway.
To—The Consulting Engineer for Railways, Madras.
Dated—Madras, 8th December 1897, No. 1025/1127.

I have the honour to reply to your letter, No. 3293 of the 22nd October 1897, and in doing so I will chiefly confine my remarks to paragraphs 3, 6 and 8 of your letter.

The points referred to in the other paragraphs of your letter have already been ably dealt with and they seem to require no further discussion.

Some years ago I held very strong views on the subject of break of gauge on Indian railways, but as the Madras Railway has come into closer touch with metre gauge railways, I have had occasion to modify my views and I do not hesitate to say that at the present time I regard break of bulk in the transfer of traffic at junction stations as a very small evil.

On the Madras Railway, we connect with, perhaps, more metre gauge junction stations than any other standard gauge railway in India, and after long experience in the management of those stations, I am bound to say that the actual transfer of traffic between the wagons of the two gauges is accomplished with but little difficulty and without any serious loss of time.

As a rule, the labour at transhipping stations is in the hands of contractors, but when trouble has been brought about by contractors failing to pay their men or from other causes, the Company's stationmasters have been able to step in and carry on the work and I do not remember when trouble of this kind has arisen that there has been more than a day or two's delay at any station during the last fifteen years.

Traffic is transhipped at Guntakal, Renigunta, Arkonam, Bangalore City, Katpadi and Erode stations; and, except at Guntakal, the arrangements for transhipping are controlled by the Madras Railway Company.

I have the pleasure to send you a letter from the Company's Traffic Manager on the subject of providing light feeder railways and I forward also for your perusal and information copies of some of the enclosures to the Traffic Manager's letter.

Much would depend upon the position and alignment of the railway to be constructed in the matter of terms for working, but I have the authority of my Chairman for stating that we shall view favourably the construction of light railways as feeders to the Madras Railway and that we shall be prepared to work such railways on the lowest possible terms.

From—The Assistant Traffic Manager, Madras Railway.
To—The Traffic Manager, Madras Railway.
Dated—Jalarpet, 4th November 1897, No. 1511 C.

On this railway where the line has systematically avoided centres of trade, the construction of light railways is the remedy for this evil. That we have lost much revenue in the past and we are still losing owing to this error, has been the regret of years.

The benefits derived from these light railway feeders are manifold to the public, Government and railway; and from a railway point of view, it must without a doubt encourage passenger and goods traffic.

The introduction of the standard gauge for instance to Salem and Kolar will be a financial failure, but the light railway feeder at so small a cost as Rs. 20,000 per mile will, I am sure, yield the guaranteed interest in the first year and yearly developments will make it a financial success. There would be no extra cost for supervision and the subordinates will be low paid men, so that the cost of maintenance will be small.

With the knowledge we now possess and the experience to back it, we can safely and very strongly urge the adoption of the light railway system to all centres of trade. The traffic to the Kolar Gold mines may disappear and other railways have been, and are, absorbing traffic that once was ours; it is the light railway feeders that must in the future be the limbs for our help.

The cheaper rate and the absolute security to passengers and to goods from thefts and rain in railways must increase traffic. The greatest annoyance and expense in carting is that the merchant is in the hands of untrustworthy "agents" and "dallauls" who seek every opportunity of fleecing merchants who, as a rule, never leave their godowns. Considering these disadvantages, the merchant hesitates to send goods unless he has a large margin of profit to cover all these charges and losses, but with the goods taken from and delivered at his door, confidence is gained and the whole aspect of trade is changed for the better. The light railway feeders can do this and more, directly and indirectly.

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From—The Assistant Traffic Manager, Madras Railway Company.
To—The Traffic Manager, Madras Railway.
Dated—Gooty, 26th November 1897, No. 3223 T.

Provided the aim of the new policy is strictly confined to the limits laid down in paragraph 7 of the Consulting Engineer's letter and is not made use of as a means to extend existing narrow gauge lines to the further detriment of the broad gauge railways, as has, to so large an extent, been done already, I think that the policy of feeder lines on or along existing trunk roads is one likely to develop a district and one that might be given a trial. Each case would of course have to be decided on its merits; and where it can be shown that a narrow 2 feet or 2' 6" feeder would pay and a broad gauge would not, I would certainly advocate a narrow gauge feeder in preference to none at all. The break of gauge is undoubtedly an objection, but I do not consider it an evil that would seriously operate against the success of the line or prevent goods and merchandise being sent by it; as it has, I think, been shown over and over again, that the public and merchants care very little about break of gauge provided it means a cheaper freight charge.

The Barsi tramway line from Barsi town to Barsi road station on the Great Indian Peninsula has been a great success. It is a 2′ 6″ gauge line and runs on the district road. The traffic is much heavier than anything we could hope for, but the details of cost of construction, maintenance, etc., of the line, would possibly, if obtained, be a useful index to what the cost of such a line in Southern India is. It would also be interesting to know how the line is affected by cart competition.

With regard to trade centres in the neighbourhood of the Madras Railway to which such light railways might advantageously be laid, I have made enquiries and so far as I can judge from very imperfect information, the only two places on this division which would offer any chances of success for a light line are Wondalli off Raichur and Vaimpalli off Yerraguntla.

Wondalli—Forty-five miles east of Raichur has three gold mines two belonging to the Hyderabad and Deccan Company (Limited) and one to Wondalli Gold Mines Company. All three mines are working, but at present are very much handicapped by cost of carting from Raichur station which roughly is Rs. 8 a ton for coal and general goods, and Rs. 20 a ton for machinery. The ultimate success of the line would of course depend on the success of the gold mines. The coal and most of the machinery and general goods come from Singareni and Bombay, so that the line would not be of much direct assistance to this railway except as contributing to the general prosperity of the district.

Vaimpalli—About 26 miles south of Yerraguntla is a large centre of trade. It contains some 5,000 or 6,000 inhabitants and the prospects of a feeder line are, I think, worth enquiring further into. The Collector, Cuddapah, has instructed the Tahsildar to send me full details of the trade of the place, and on receipt I will let you have them. *Proddatur*, 8 miles from Renigunta, and *Jamalmadugu*, 13 miles from Proddatur, are also important trade centres.

From—The Traffic Manager, Madras Railway Company.
To—The Agent and Manager, Madras Railway, Rayapuram.
Dated—3rd December 1897, No. C. 4422 A. & M./30918.

[Your No. 10225/11330 of 27th October 1897.]

With reference to my informal conversation with the Consulting Engineer and yourself on the 2nd instant, on the subject of light railways, I would first draw attention to G.O., No. 2018, dated 17th October 1881, and G.O., No. 3479 W., dated 4th December 1883, in case that the deliberations of the committee of Government officers which then enquired into the subject may have been lost sight of.

2. Under the conditions laid down in paragraph 7 of the Consulting Engineer's letter, I see no objection whatever to 2′ 6″ railways being constructed in connection with the standard gauge because, so long as they do not link up the standard and metre gauges, such lines would, in my opinion, act as feeders, rather than leeches like certain metre gauge railways which at present exist. There should, however, be essentially the condition that the 2′ 6″ gauge lengths are not to be linked up between the standard and metre gauges.

3. As far as the difficulty of transhipment is concerned, it would, in my opinion, be easier to transfer traffic from a 2′ 6″ gauge to a standard gauge than in the case of standard and metre gauge lines, because a 2′ 6″ line and vehicles could be much more easily twisted into convenient positions in existing standard gauge yards, and greater facilities for transhipment would, therefore, be more easily obtained while the 2′ 6″ line would more or less take the place of bullock carts. As far as possible, I consider that light railways should be constructed in such a manner as to be easily transferred elsewhere, in the event of it being proved that a standard gauge line might, with advantage, replace them.

From—The Agent and Manager, Madras Railway Company.
To—The Consulting Engineer for Railways, Madras.
Dated—Madras, 23rd February 1898, No. 10225 B./159.

With reference to correspondence on the subject of light railways, ending with your letter No. 3784 of the 11th December last, I have the honour to enclose for your information an extract from my Board's letter No. 968, of the 28th ultimo, containing their views.

11. *Construction and working of light 2′ 6″ gauge railways.*—I have submitted to the Board the correspondence, referred to in paragraph 7 of No 2341, on the subject of the construction and working of light 2′ 6″ gauge railways. There can be no doubt that a cheap and effective description of light railways is very desirable—taking off from the main line in every direction where the service would be profitable and of manifest advantage to the regions served. This is a very different thing from break of gauge on a continuous arterial route—such as that at Guntakal for instance. Such branch light feeder lines would be of great value, and enable the Company to provide for the wants of various tracts which are not served by existing lines. The transhipment of goods and passengers at the stations on the main line where the branch would take off is a matter of easy contrivance, and the Company could carry it out without any difficulty. These 2′ 6″ feeders could work in connection with the standard guage main line without the smallest objection.

APPENDIX C.—NOTE ON PROBABLE TRAFFIC EARNINGS.

By Mr. F. Palmer, Engineer-in-Charge, Moghalserai-Gya Railway.

For estimating traffic earnings the main feature considered has been the density of population. Investigations made (not yet completed) seem to prove that, excepting special items of traffic, such as coal, through traffic, etc., which can be separately estimated, the earnings of a railway varies with the density of the population it runs through. The examples taken have been (1) the Loop Line of the East Indian Ry., (2) the Patna-Gya Branch, E.I. Ry., and (3) the Delhi-Umballa-Kalka Ry.

(1) The Loop Line has been opened for many years and the feeder roads, tracks, etc., in the country served have probably been located and altered so as to bring in all, or nearly all, of the traffic available. Omitting the largest towns, the earnings of which should be treated as distinct from those of the country generally, the receipts at ordinary stations between Khana Junction and Luckeeserai are equal to a sum of 1 rupee per head of population within a tract 6 miles wide on either side of the line, or 12 miles in all. For instance the earnings at Gushkara are about Rs. 58,000 per annum; the population of the neighbourhood is 500 per square mile and the length of country served by the station 9½ miles—500 × 9½ × 12 (miles broad) = Rs. 57,750.

Similarly at Sultanganj with a population of 559 per square mile, and Jamalpur with a population of 859 per square mile, the actual earnings are about Rs. 92,000 and Rs. 74,000, respectively, as compared with—

	Length served.	Width taken.	Density.	Calculated traffic by the formula.
	MILES.	MILES.		Rs.
Sultanganj	13½ ×	12 ×	559 =	88,042
Jamalpur	7 ×	12 ×	859 =	72,156

Of course there are very large variations due to various causes, all of which can be more or less defined; but speaking generally, and omitting for separate estimation the traffic of large towns and other special traffic, it may be said that the earnings of an established line are approximately a rupee per head of population over a strip 12 miles broad of the country served.

(2) The Patna-Gya line may also be said to have its means of access will developed, and the traffic statistics for this piece of line, running through a population of about 700 per square mile, show almost exactly the same results as the Loop Line.

(3) The Delhi-Umballa-Kalka Railway, on the other hand, has only been opened for 5 years, and it may be safely said that feeder tracks, etc., have not been fully made, and that the line has not yet reached its highest development. The amount of earnings go to prove this, for it has gradually been increasing until, in 1895, the receipts averaged a rupee for head of population over about 9 miles width of country, excluding items of exceptional traffic such as the Thanesar Méla and rather higher than average takings at Karnal and Panipat.

The increases have been so steady year by year that there can be no doubt that this line will eventually earn in the same ratio to the population (which varies from 290 to 500) as the earnings of the older sections, namely, the Loop Line and the Patna-Gya Branch. It should be pointed out that only the stations between Delhi and Umballa, excluding these two places, have been taken, as it was thought desirable to omit for separate estimation the earnings of the two large stations and of the Simla through traffic.

The country through which the Moghalserai-Gya Railway will run has an average population throughout of about 400 per square mile. With the information gained by statistics of the three sections of the East Indian Railway above mentioned, it is not extravagant to estimate that the new line will at once earn two-thirds of its ultimate development, when it is remembered that the Grand Trunk Road, with its existing feeders, lies close alongside over a great portion of the length. That is, it will earn a rupee per head of population for a strip of 8 miles wide of the country traversed. The length is 126¼ miles and the earnings therefore should be—

(126¼ × 8 × 400 × 1 Re.)	Rs.	4,04,000
To this should be added the earnings of the Saseram population, 25,000 × 2 Rs. ...	,,	50,000
And the through earnings between Moghalserai and Gya, which may be safely taken as	,,	100,000
A total of	Rs.	5,54,000

Taking working expenses, and interest on rolling-stock to be provided by the East Indian Railway, as high as 40 per cent., the net receipts will amount to Rs. 3,32,400 equal to Rs. 3·6 per cent. per annum, on the estimated capital cost; and in a few years, with the country more fully opened out, the earnings, on the data given above, should reach—

(126¼ × 12 × 400 × 1 Re.)	Rs.	6,06,000
Saseram	„	75,000
Through traffic	„	1,25,000
	Total Rs.	8,06,000

This with expenses at 40 per cent. would yield a dividend of Rs. 5·2 per cent. per annum on the capital outlay. When it is remembered that Rs. 8,06,000 of total traffic means earnings of only Rs. 122 per mile per week, it will be seen that the estimate of dividend is not too sanguine.

APPENDIX D.—THE ESTIMATE OF THE PARLAKIMEDI LIGHT RAILWAYS.

In reply to my enquiry as to the probable cost of the Parlakimedi light railway, now nearly completed under an Order issued by this Government under the Tramways Act, published in the *Fort St. George Gazette*, dated the

Mr. J. R. Sandford, the Engineer-in-Charge, writes to me as follows:—

You will note from the abstract of our estimate that the cost of the railway will be about Rs. 23 599 per mile and this includes the cost of our one big bridge—that over the Mahendra Tannia river near here which with its approaches will cost over Rs. 60,000 and thus add about Rs. 2,500 per mile to the cost of the ordinary line. This bridge might have been done without by using the present road bridge, but the Rajah preferred that the road bridge should be left as it is and certainly the new line is more direct than the one originally proposed. The ordinary line therefore has been constructed for about Rs. 21,000 per mile.

This, I think, works out very well considering the country passed through and the very large number of water-ways all with deep foundations which have to be provided. At the same time we have given no quarters for staff and there is no workshop. Besides this, rolling-stock is far too scanty as my estimate was cut down to the smallest number, though three engines were allowed to be purchased which is out of proportion to the stock we have to work. We shall have only twenty wagons and six of those were made of old materials for us in Waltair to serve as ballast wagons. We have only two carriages—a composite (upper and lower classes) and a lower class, so that in case of a hot axle or derailment or any small defect our train service must stop. With only twenty wagons too, very little can be done in the way of goods traffic. An extra Rs. 2,000 per mile would give us all the stock we want to begin with and even that, not including the big bridge, would keep our cost well within Rs. 25,000 per mile.

We have to pay compensation for land which is not included in my figures, but it may be taken at Rs. 1,000 per mile at least. Compensation for about 7 miles has been settled and it comes to Rs. 10,000, but this is excessive as the land is all good and much of it Inam.

Taking everything into consideration I do not think less than Rs. 25,000 per mile should be put down for any light railway in a reasonably easy country and fully equipped with good rolling-stock and then free liberty must be given to use the edge of existing roads wherever they come in conveniently leaving a clear 15 feet for traffic with 10 feet at bridges and culverts.

Our engines, as no doubt you will understand, with so much 1 in 100 to get over are very powerful and therefore extra expensive. For a line with better gradients there would be some saving under this head. Another item in which perhaps we have been more liberal than would be necessary elsewhere is in our special class saloon which is 34 feet long and will cost over Rs. 9,000, but it will be for the present the Rajah's State carriage. All our rolling-stock is particularly good and could hardly be improved upon.

A very full description of the Parlakimedi Light Railway will be found in the supplement to *The Indian and Eastern Engineer* for August 1899.

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