

Public Works (1895) Department.

RAILWAY BRANCH.

G.O., No. 792-3R

DATED 23rd November 1895

[Despatch Abstract.]

Madurai-Panbani Railway Project. — Ordered that the report, plans, sections and estimate of the —, with a note by the Consulting Engineer for Railways, be forwarded to the Govt of India.

Forwarding with remarks, the report, plans, sections and estimate of the — with a note by the Cons^g Engineer for Railways.

BACK PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date.
	685 R		16-10-95				

FURTHER PAPERS.

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

No. 792 R., 23RD NOVEMBER 1895.

GOVERNMENT OF MADRAS:

PUBLIC WORKS DEPARTMENT.

Railway.

Read the following papers :—

From the Engineer-in-Chief, Madura-Pamban and Tinnerelly-Quilon Railway.
Surveys, dated 21st October 1895, No. 953.

ABSTRACT.—Forwarding report, plans, sections and estimate of the Madura-Pámban Railway project.

NOTE BY THE CONSULTING ENGINEER FOR RAILWAYS.

Madura-Pámban Railway Survey.

Location.—The orders given by the Madras Government were that the line should run from the South Indian Railway main line on the left bank of the Vaigai river generally following the road to Sivaganga, thence to Máná Madurai and Paramagudi, from whence two routes were to be examined either crossing the Vaigai at Paramagudi or keeping to the left bank and crossing the Vaigai at Ramnad; the Pámban channel and island to Rámésvaram to be examined but not surveyed in detail; Mr. Turner, Collector of Madura, to be specially consulted.

2. The previous history of the former surveys and the reasons given for adopting the Sivaganga route are given in the report, which, with the plans and estimate, is submitted in a very complete form.

3. The alignment from Paramagudi* to Ramnad on the right bank of the Vaigai has been chosen in preference to that on the left bank. Mr. Shadbolt, however, does not compare the advantages of a bridge across the Vaigai at Paramagudi with a causeway over the same river near Ramnad which has been strongly advocated by the Hon'ble Mr. Bliss and the Hon'ble Colonel Pennycuik.

4. I am strongly in favour of a bridge across the Paramagudi instead of a causeway near Ramnad for the following reasons:—

Mr. Shadbolt points out that the Periyakanuvayi tank has been constructed where the river originally divided into three channels; moreover, any line passing to the east of this tank crosses all the drainage nearly at right angles, and to render the line secure it should be lowered as a causeway for a distance of about $1\frac{3}{4}$ miles in three places (see Index section sheet No. 3 marked in red), if not for the whole distance.

5. The cost of a metre gauge line causeway as put in near Trichinopoly and elsewhere is about 30 per foot run as compared with the bridge which is 160 per foot run; therefore, the causeway should not exceed five times the length of any bridge it is intended to substitute. In this the Paramagudi bridge is estimated to cost Rs. 35,000

against 2,70,000 for the causeway, but I consider Mr. Shadbolt's estimate of the discharge of the river, 18,370 cubic feet per second as against Mr. Geoghegan's estimate of 36,500 cubic feet, too low and prefer increasing the 520 feet of waterway to 600 feet which at 160 is 96,000. Even thus it is only about one-third of the cost of a causeway, such as, I believe, would be necessary. There is nothing to show in Mr. Geoghegan's report how the discharge was arrived at. Mr. Shadbolt provides for bridging the channel which is here very well defined, and the existence of mud walls along the banks show that this river does not overflow its banks.

6. The length of the two lines are nearly equal, 24 miles, but near Ramnad the northern line will have to cross the drainage of the country to reach the town, while the southern line is located parallel to the drainage and follows the road, affording a good site for the Ramnad station.

7. As a minor point in the alignment near Madura, I think it will be necessary to construct the triangle, as the engine-changing station will be at the present South Indian Railway (Madura station), and the question of running through trains from Madras, or local ones from Madura, cannot be decided for some years.

8. *Gradients and Curves, Construction and Engineering* call for no remarks, except that I approve of the type of permanent-way, namely, 50 lb. rails on 70 lb. cast-iron pot sleepers.

9. The rates for stone-work of all kinds are, I think, too low considering the long lead, and they should be increased by 10 per cent. The cost of the land also appears insufficient.

10. *Traffic*.—I do not agree that either the Jalarpet-Pódanár or Cuddalore-Madura sections of the Madras and South Indian Railways, respectively, are so comparable under this head as the Májavaram-Muttupet branch which also agrees closely with this line as to its capital cost per mile. The cost of the Májavaram-Muttupet line is up to date Rs. 24,17,000, that is, Rs. 44,760 per mile. Its earnings for one year, September 1894 to September 1895 (after being opened six months), average 86 per mile week; this is 10 per cent. on the capital, which, at net receipts of $\frac{1}{4}\%$, gives $4\frac{1}{2}\%$ per cent. This may certainly be expected and, in addition thereto, is the passenger pilgrim traffic to Rámésvaram.

11. Taking into consideration the extra waterway required over the Vaigai and the low rates for stone-work, I consider the line will cost Rs. 43,000 per mile, or Rs. 43,00,000. It must be remembered that the Májavaram-Muttupet line was laid with second-hand permanent-way costing Rs. 12,500 per mile and the bridging Rs. 16,200 per mile, as against Rs. 5,000 and Rs. 23,300 per mile, respectively, in Mr. Shadbolt's estimate.

12. Mr. Geoghegan's estimate for 1887 for the southern route is here given by mile for comparison, with the remark that the former was an approximate estimate:

Rate per mile.

	Shadbolt.	Geoghegan.	Difference.
	Rs.	Rs.	Rs.
Preliminary expenses	400	1,000	+ 600
Land	1,000	4,000	+ 3,000
Construction	9,000	12,000	+ 3,000
Ballast and permanent-way	23,000	20,000	- 3,000
Stations and buildings	2,400	6,500	+ 4,100
Plant	200	2,000	+ 1,800
Rolling stock	..	8,000	+ 8,000
Establishment	4,000	5,000	+ 1,000
Total	41,200	69,500	+ 28,300

13. Mr. Shadbolt has examined the country beyond the Pámban Pass, Island of Rámésvaram, Adam's Bridge, and Manar Island.

Mr. Waring, Chief Engineer, Ceylon, has also investigated the same route:—

Comparative estimate of cost.

	Mile.	Shadbolt.	Waring.
		Rs.	Rs.
Pámban Strait Road	1	10,50,000	4,50,000
Do. Swing Bridge	..	2,00,000	..
Rámésvaram Island	20	10,00,000	9,50,000
Adam's bridge	21	2,49,00,000	2,55,00,000
Manar Island	17	8,50,000	9,50,000

The Government of India has been addressed forwarding the note and suggesting that a detailed survey should be undertaken as soon as practicable, and criticism of the project is deferred until the detailed survey has been completed.

MADRAS,
29th October 1895.

(Signed) F. R. UPCOTT,
Consulting Engineer for Railways.

ORDER—No. 792 R., dated 23rd November 1895.

Ordered that the report, plans, sections and estimate of the Madura-Pámban Railway project, together with the note by the Consulting Engineer for Railways, be forwarded to the Government of India in continuation of No. 742 R., dated 7th November 1895.

[Here enter No. 793 R., dated 23rd November 1895.]

(True Extract.)

(Signed) F. R. UPCOTT,
Joint Secy. to Govt., P.W.D.,
Railway Branch.

RAILWAY.

Govt. of {1895} Madras.

PUBLIC WORKS.

Dated November, 23rd.

Recd.

Encl.

G.O. No. 792 R., 23rd Nov. 1895.

NOVEMBER.

**Madura-Pamban Railway
Project**

Ordered that the report, plans, sections and estimate of the —, with a note by the Consulting Engineer for Railways, be forwarded to the Government of India.

No. 793 R., 23rd November 1895.

PUBLIC WORKS DEPARTMENT.

Railway.

LETTER—from

F. R. UPCOTT, Esq.,

Joint Secretary to the Government of Madras,

Public Works Department,

Railway Branch,

To

THE SECRETARY TO THE GOVERNMENT OF INDIA,

PUBLIC WORKS DEPARTMENT, CALCUTTA.

SIR,

In continuation of my No. 742 R. of 7th November 1895, I am directed to forward the report, plans, sections and estimate of the Madura-Pamban project with a note by the Consulting Engineer.

2. This project is submitted with the fullest support of this Government as it is clearly shown that it is an exceptionally cheap line to build and has much greater possibilities than the Mayavaram-Muttupet branch which already returns $4\frac{1}{2}$ per cent. on capital expended. Should it, however, be decided to make this branch a part of the main through line to Ceylon, the town of Sivaganga could be served by a branch and the main line taken more directly between Madura and Pamban.

3. With reference to this extension, I am to say that it is the opinion of His Excellency the Governor in Council that it is highly desirable that it should be constructed by the agency of the South Indian Railway rather than by a private firm.

4. This opinion has been consistently advanced by this Government for extensions of the Madras Railway, and seeing that most of the southern main lines of India are already constructed, the same policy should, it is thought, be adopted in the case of the South Indian as well as in other large companies.

5. It will be noted that letter, No. 1404 C. of 30th March 1894, from this Government, laid especial stress on the offer to Messrs. Wallace Brothers being made to cover the whole project between Madura and Colombo, including the Adam's Bridge connection, as it was considered undesirable that a private company should have concessions of short branches, leaving the construction of the least profitable and most expensive work to the Government.

6. This Government is anxious that this point should be again impressed on the Secretary of State, and I am to request that this letter be laid before him and that he be requested by telegram not to grant provisional concessions for portions of the Madura-Colombo project.

7. It is not understood whether the concession to Messrs. Wallace Brothers mentioned in paragraph 3 of despatch 31 of 1894 to the Secretary of State, was intended to apply to the whole or part of the project; if there is any uncertainty therefore about this, I am to ask that the views of this Government, as expressed above, may have full consideration, so that the South Indian Railway may have the opportunity of undertaking this highly desirable and profitable branch at an early date.

I have the honour to be,

Sir,

Your most obedient servant,

(Signed) F. R. UPCOTT,
Joint Secy. to Govt., P.W.D.,
Railway Branch.

MADRAS,
23rd November 1895.

RAILWAY.

Gobi. of. {1895} Madras.
PUBLIC WORKS.

Dated November, 23rd.

Recd.

Encl.

No. 793 R., 23rd November 1895.

NOVEMBER.

**Madura-Pamban Railway
Project**

Forwarding, with remarks, the report, plans, sections and estimate of the —, with a note by the Consulting Engineer for Railways.

**MADURA-PAMBAN AND TINNEVELLY-QUILON
RAILWAY SURVEYS.**

No. 953

10/10

From

THE ENGINEER-IN-CHIEF,

MADURA PAMBAN AND TINNEVELLY-QUILON RAILWAY SURVEYS,

To

THE CONSULTING ENGINEER FOR RAILWAYS,

MADRAS.

Dated, *between the 12th and 13th* October. 1895.

Sir

I have the honor to forward the Project for the Madura-Pamban Railway as follows.

x Plans	1. Book
Report (proof copy)	1. "
Estimate (General abstract only)	Manuscript

I have the honor to be
Sir

Yours most obedient Servant
I sent by separate parcel

E. S. Chubbuck

Engineer-in-Chief
10/10

admitted to file
Forwarded by 10/10
Received by 10/10

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MADURA-PAMBAN RAILWAY.

REPORT

ON THE

PROJECT FOR ITS CONSTRUCTION.

SURVEY OF 1895.

MADRAS.

PRINTED BY THE SUPERINTENDENT, LAWRENCE ASYLUM PRESS, MOUNT ROAD.

1895.

MADURA-PAMBAN RAILWAY.

REPORT

ON THE

PROJECT FOR ITS CONSTRUCTION.

SURVEY

OF

1895.

MADURA-PAMBAN RAILWAY.

Survey of 1895.

LIST OF DRAWINGS SUBMITTED WITH THE PROJECT.

PLANS AND SECTIONS.

						Sheet No.	
Index Plan and Section	...	...	...	Mile	0—34	...	1
"	"	...	...	"	34—70	...	2
"	"	...	...	"	70—100	...	3
Detailed Plan and Section	...	...	...	"	0—1	...	4
"	"	...	...	"	1—4	...	5
"	"	...	...	"	4—7	...	6
"	"	...	...	"	7—10	...	7
"	"	...	...	"	10—13	...	8
"	"	...	...	"	13—16	...	9
"	"	...	...	"	16—19	...	10
"	"	...	...	"	19—22	...	11
"	"	...	...	"	22—25	...	12
"	"	...	...	"	25—28	...	13
"	"	...	...	"	28—31	...	14
"	"	...	...	"	31—34	...	15
"	"	...	...	"	34—37	...	16
"	"	...	...	"	37—40	...	17
"	"	...	...	"	40—43	...	18
"	"	...	...	"	43—46	...	19
"	"	...	...	"	46—49	...	20
"	"	...	...	"	49—52	...	21
"	"	...	...	"	52—55	...	22
"	"	...	...	"	55—58	...	23
"	"	...	...	"	58—61	...	24

District. He commenced operations at the Pamban end and completed a location as far as Ramnad or a little beyond, but the work appears to have been of a somewhat crude character, and the papers were left incomplete and in some confusion.

In 1886, Mr H. T. Geoghegan, Engineer-in-Chief, Madras State Railway Surveys, was called upon to make a preliminary survey of a line from Madura to Pamban and, after considering several alternative routes which had been suggested, he decided to select a line along the south bank of the Vaigai River. The field work was carried out by Mr. Hilchris, Executive Engineer, who located a line from Madura to Ramnad where he connected it with Mr. Jenkinson's line. The Plans, Estimates, and Report were submitted to Government by Mr. Geoghegan in 1887, and are reviewed in Government of Madras General Order, No. 493 R, dated, 7th July, 1887. The distance works out to 91½ miles, and the cost to Rs. 53,09,637, or Rs. 60,324 per mile. Since this time certain proposals have been made by private firms with regard to harbour works at Pamban, and a railway to Madura as a part of the general scheme, but, so far, nothing definite has been accomplished.

Orders of Government.

Orders for the present detailed survey are contained in letter No. 3503, dated 8th November, 1894, from the Consulting Engineer for Railways, Madras, to the Engineer-in-Chief, Bezvada Madras Railway Survey. A subsequent letter, No. 3765, dated 1st December, 1894, explains that the route to be followed should take off from the South Indian Railway at a point on the north side of the Vaigai River, and should run via Sivaganga and Manamadurai to Paramakudi, from which place to Ramnad two alternative routes should be examined. In this letter the following paragraph occurs:—"It will also be desirable for the Engineer-in-Chief to cross the Pamban Channel and examine the island to Rameswaram and beyond." It is also requested that an opinion on the general question of route may be obtained from Mr. Turner, Collector of Madras, formerly Collector of Madura for many years.

Field work and Staff.

The length of the line by the route selected is over 100 miles, but as the country is open and level it was considered that a single survey party could get through the field work in one season, and accordingly only one Division was formed in charge of an Executive Engineer with a junior Executive Engineer as assistant, one Supervisor and two or three temporary subordinates.

The following is a list of officers employed on the Survey.
Engineer-in-Chief—

Mr. E. I. Shadbolt, with head quarters, at Madura.

Madura-Pamban Division—

Mr. P. Duncan, Executive Engineer.

" A. Bewley. "
and three subordinates.

The Executive Engineer arrived in Madura at the end of November 1894 and spent several weeks in getting his staff and equipment together. The actual work of marking out the line commenced in January 1895 and continued until the end of May 1895, when the party was broken up and the Executive Engineer, with one Supervisor, proceeded to Coonoor to prepare the drawings and estimates connected with the project.

Description of country traversed.

The country between Madura and Ramnad forms what, at first sight, would be taken for the valley of the Vaigai River. But closer examination reveals the fact that the formation of the ground is such as to make the term "valley" inappropriate. The natural characteristics are those of a river delta rather than an inland valley.

The fall of the ground parallel to the river amounts to about 6 feet per mile, and is fairly uniform and continuous. But, as a rule, there is no fall whatever from the sides towards the river, the slope, if anything, being in the opposite direction. This feature has

been taken advantage of to utilize the flood waters for irrigation purposes, the conditions, indeed, closely resembling those usually sought for in constructing an artificial channel. The whole face of the country is covered with shallow tanks, dependent for their supply not so much on direct rainfall as on the waters of the river. Channels are taken off at frequent intervals, deviating at a slight angle from the river and terminating in tanks in the vicinity. From these there are overflow channels to tanks more remote which receive their supply after the nearer ones are filled, and the system is continued across the country until, in times of heavy rain when the ground is saturated and all tanks are full, the excess of water accumulates in the low swampy country that extends for miles along the coast, especially on the south.

When travelling along the edge of the river the first thing that strikes an engineering eye is the absence of streams or affluents of any kind. Such channels as are crossed are artificial excavations carrying the water away from the river instead of towards it. The natural consequence of this is that the river gets smaller as it descends instead of getting larger in the usual way. At Madura it has a width of 1,400 feet; at Paramakudi, 45 miles lower, the width is reduced to 600 feet, and at Ramnad, some 20 miles farther, it divides into indefinite branches, the chief of which, about 300 feet in width, disappears into the Periya Kanmoyi or Great Tank at Ramnad. The branch which continues on directly to the sea is, after passing the tank, only 150 feet wide. A moderate flood at Madura is all absorbed in the side channels and makes an impression at Ramnad. It requires a considerable flood to reach the Great Tank, and only when there is an unusually large volume of water coming down the river does any of it get past Ramnad into the channel that leads onward to the sea. It is this fact of the dispersion of its waters over the face of the country that has earned for the Vaigai the title of "the little Nile of Madura."

The above general description applies to this tract of country as a whole, but there are of course local differences which may now be alluded to.

Madura is a town of 60,000 inhabitants. It has some broad and well-kept streets and several ancient buildings of importance and interest, the principal being the great temple of Minachi, the largest example of the kind in India. The European quarter is at the present time hardly fit for habitation, the originally open ground in the vicinity having been gradually encroached upon and covered with huts belonging to the dirtiest and most odoriferous class of the population subject to little supervision and control. The feature of the town most in evidence, and that which enters most largely into the daily life of the people, is the river bed. When not actually flooded, a state of affairs seldom lasting for more than a day or two at a time, it is a broad flat expanse of firm sand. The water lies just below the surface and is reached by a complete network of channels excavated in every direction to lead it off to fields and gardens or to provide pools for the use of washermen, dyers, bleachers and others. Here the people gather morning and evening, and here small fairs and other meetings are held. The river bed is boulevard, promenade, pleasure ground, water reservoir and latrine, all in one. It is crossed by the South Indian Railway on a bridge of 13 spans of 70 feet girders, and by the road on a handsome arched bridge, and also by a permanent stone causeway opposite the town. Near Madura there are several isolated hills in the form of bare rounded bosses of gneiss yielding splendid building stone, which can be quarried in clean-cut blocks of almost unlimited size.

Farther to the north there are some hill ranges of considerable magnitude, and from these an extent of high ground runs out towards the south-east. That portion of the line which deviates from the river in order to reach Sivaganga and returns to it at Manamadurai, lies on this high ground. It crosses several ulas, and occasionally runs through patches of thorny jungle. Laterite is available for the construction of minor buildings, and rough quartzite stone for ballast.

8748

From this to Ramnad is a region of channels, tanks, and rice cultivation, a fertile country but treeless, and desolate to the eye. No material of any kind is available, except sand from the river.

Ramnad lies at the head of the promontory of the same name at about the centre of its base, here 18 or 20 miles wide. This projection extends for some 25 miles till it terminates at Point Ramen, opposite to the town of Pamban on Rameswaram Island. It lies only a few feet above sea level and is dry and sandy throughout. Coralline limestone is met with on both coasts, and may occasionally be found inland at no great depth. It is of uncertain quality, but by careful selection might be utilized for buildings and small culverts.

The present detailed survey terminates at Toni Torai, a small village at the end of the promontory. A brief inspection was, however, made of the region beyond according to the instructions quoted on page 1. The result of the inspection was recorded in a "Note on the Construction of a Railway to connect India and Ceylon," which was submitted to Government in May 1895. Only a very brief summary of the information contained therein need be now repeated.

A through railway from Madura to Colombo may be considered in the following sections:—

	Miles.
Madura to the Coast	100
Pamban Strait	2
Rameswaram Island	20
Adam's Bridge	21
Manar Island	17
Manar to Colombo	145
	305

Across Pamban Strait there is a reef of rocks through which there is a navigable channel. The reef shows above water for a great part of its length.

Rameswaram Island is a long, narrow island, sandy and generally flat, but with dunes of blown sand attaining to some height.

Adam's Bridge is a submerged, sandy ridge from one to two miles wide between the surf lines, with a few high islands and many low ones visible at intervals. The aggregate of dry land occupies something over one-third of the entire distance. The water averages only a few feet in depth, and is apparently nowhere over 10 or 12 feet.

Manar Island is sandy and tolerably flat. It resembles Rameswaram Island.

From Manar to Colombo the line would run near the coast. The country is said to be fairly level and open.

Gauge.

The project provides for a line on the metro-gauge, that being the gauge of the South Indian Railway, of which this is a branch. The existing railways in Ceylon are on the 5' 6" gauge, but they lie, generally speaking, to the south of Colombo, and no complications would arise if the metro-gauge were to be adopted for a direct and independent line from Colombo to the north. As far as India is concerned the Madras Railway, on the broad-gauge, runs across the peninsula from Madras to the opposite coast, and the whole of the area to the south of this is occupied by the net-work of metro-gauge lines forming the South Indian Railway system. It would not be altogether impracticable to work out a fairly simple scheme for connecting Madura with the broad-gauge system, but present circumstances are entirely in favour of accepting the metro-gauge for a through line from India to Ceylon.

Madura lies on the south-west bank of the Vaigai River. When approaching it from the north, and at a few miles distance, the South Indian Railway is running parallel to the river, but opposite to the town it takes a sharp bend in order to cross, and the curve ends close to the bridge. The present line starts at the beginning of this bend and instead of following the curve continues in the original direction parallel to the river. This point, at the beginning of the curve, is situated at Mile 313.65 from Madras and is the fixed point of zero from which mileage is reckoned on this Survey. Fixed point of zero.

The distance from the zero point to the end of the terminal station at Toni Torai is 100 miles and the estimates relate to this length. The centre line has not been staked out beyond, but a survey has been made up to the extreme point of the promontory and across the strait to the town of Pamban, in order to show the position of both coasts and of the reef. Length of line.

The whole of the line lies within the Madura District of the Province of Madras. Province in which situated.

Location.

There has been considerable difference of opinion as to the best route for a railway from Madura to Pamban; but the information on record allowed of the question being settled before the commencement of the present Survey, and it was indicated in the instructions issued by Government that the line should take off on the north side of the Vaigai River, should deviate to Sivaganga, return to Manamadura on the bank of the Vaigai, and then follow the river generally for the rest of the distance, leaving open the question whether it should cross to the south at Paramakudi or lower down at a point near Ramnad.

All the above named towns must, therefore, be considered as Obligatory Points, and the laying out of the line merely involved the selection of the actual detailed location on engineering grounds. Obligatory points.

From the starting point to Tirupuvanam (Mile 13) the line runs close to the river, chiefly through rice fields. Here it bends northward and at Mile 17 gets on to higher ground which continues to Sivaganga (Mile 28). It then bends due south, passing through waste stony ground covered with thorny scrub, and strikes the river at Manamadura (Mile 39). Barren ground continues for a few miles, but before reaching Toravarayan (Mile 47) cultivated land is again encountered irrigated by channels taken off from the river. The Vaigai is crossed at Mile 52 in order to reach Paramakudi, which lies on the south bank, and little else but rice cultivation is met with from here to Ramnad (Mile 76) where the line is taken along the south side of the Great Tank in the vicinity of the public road. After passing Ramnad, the conditions change and there is no more irrigation, and for the rest of the distance the country is flat and sandy with occasional dry cultivation where the ground is favourable.

As already described, the South Indian Railway when nearing Madura runs in a direction parallel to the river till a sharp curve takes it on to the bridge, at right angles to its former direction. Two forms of junction are therefore possible. In the first case a junction might be made at the beginning of the curve to face trains coming from Madras, which would continue along the Madura-Pamban line parallel to the river without entering the curve or going into Madura at all. The alternative plan is to make the junction at Madura end of the curve facing the opposite way, so that trains coming from Madura could be turned either to the left along the South Indian Railway or to the right along the Pamban line. Junctions.

It is hardly possible to settle the matter at this stage, as the best method will depend on the traffic developed. If the through traffic on the new line proves greater than that on the existing line, to the south of Madura, it would be proper to adopt the first plan, which would suit the running of through trains from the Madras side. If the traffic is

That the line should cross the river at Paramakudi because a line of the Nainarkoil would run in a region of tanks liable to constant breaching and would be in special danger owing to its position under the face of the Ramnad Great Tank which breached in 1881 with disastrous effects. It should be brought in from Paramakudi along the south side of this tank where the embankment is of less height and could be adequately strengthened without difficulty.—

Before deciding finally, a personal inspection was made of the locality which amply confirmed Mr. Turner's views. The embankment of the Periya Kanmoyi is roughly semi-circular in form and about six miles long. Between it and the town is a low-lying water-hugged area, a mile or two in width. The original surface of the country has been much modified, but so far as can be judged by the eye it looks as if the tank had been constructed at a point where originally the river divided into three principal channels. Of these, the first now skirts the tank on the north side and is 150 feet wide. The second must have passed about the middle of the embankment and onwards near the town, ultimately joining the first before reaching the sea. It was in the vicinity of this that the last great breach occurred in 1884. The third must have run southward near the present sluice gates close to the public road through the next large tank (the Sakkarakottai Kanmoyi) and so onward to the area of swamps and flooded country about the south coast.

A line running under the east face of the tank would require 150 lineal feet of waterway across the river branch and at least 100 feet opposite to the escape weir at the north-east corner. To make full provision for passing the water which might be let down directly on to the railway by the bursting of the tank would hardly be possible. An inspection of the embankment leaves a general impression of insecurity and neglect, and, indeed, the roads, culverts, and works of all kinds in the Ramnad Zemindari share this air of ruin and decay. There can be no doubt whatever that to cross the river at Paramakudi where there is a safe and well defined channel requiring 520 lineal feet of waterway and thence to run direct to Ramnad is far preferable to taking the longer route by Nainarkoil through a region more subject to inundation and then for several miles in a most dangerous position under the high embankment of the Great Tank where at least 250 feet of waterway must be provided in any case besides an unlimited and incalculable length of opening to ensure safety against accidents. The former line has therefore been selected.

After crossing the river at Paramakudi there is a little choice of route to Ramnad and the line nearly follows the public road. Mr. Geoghegan, in his preliminary survey, preferred to keep near to the river and with regard to the Ramnad Great Tank, he remarks that the embankment is in a very insecure condition and the surplus sluices are insufficient, and as it would be dangerous to go round it he has thought it best to take the line through the middle of the tank providing an opening of 120 lineal feet to allow the water of the Vaigai to supply the portion of the tank on the south side of the railway.

This course certainly attains the object aimed at of placing the railway bank in a position where it would not be liable to injury from a sudden rush of water due to a breach in the tank, but it involves a long, high bank both in the tank and after leaving it to get down to the lower ground and it has not been followed in the present location. It is found that the ground on the south side slopes generally in the same direction as the bed of the tank and that as the embankment does not attain its full height on this side it would be more easily kept in repair. If a breach should occur the water would have a tendency to flow parallel to the railway instead of impinging on it with full force and would collect at the lowest point of the ground near to Ramnad where provision can be made for passing some of it under the line the rest, if a great depth is attained, escaping towards the channels to the north. Moreover it is believed that in accordance with recent decisions on the East Coast Railway the owners of private tanks are liable for damage caused to the railway through

their negligence and it would be rather an advantage than otherwise if circumstances compelled the authorities of the Ramnad Zemindari to take proper precautions for the efficient conservation of this important work.

Gradients and Curves.

The ruling gradient is 0.50 per cent. or 1 in 200 and it occurs chiefly between Tirupavanain, Sivaganga and Manamadurai, where high ground is traversed. For the rest of the distance the fall of the country is very uniform and alternations of level with easy grades allow the surface of the ground to be closely followed.

The sharpest curve is of 3° (radius 1,910 feet) and where grades occur on curves they are reduced to the equivalent of a 0.50 per cent. grade on the straight, the amount of compensation being calculated for broad gauge goods stock with 12 feet wheel base. Although this project is being prepared for a metre gauge line it cannot be said that the question of gauge is absolutely settled and therefore no curves have been used sharper than those allowable for broad gauge.

Construction and Engineering

The country is flat with a slight uniform fall from west to east, it is covered with shallow tanks often of considerable area and it has been impossible to avoid running through many of these. The banks will generally be low though it is occasionally necessary to raise them above full supply level. As no stone for pitching is available it is proposed, in the first instance, at least to dispense with extra protection on banks standing in water but to give them side slopes of four to one.

The line being generally parallel to the slope of the country, very little drainage is crossed and most of the minor bridges are over artificial irrigation channels taken off from the river. Except for the absence of stone it is a simple and easy line to construct, with no works of any particular magnitude.

It is proposed that the construction of Formation, Bridges, Permanent Way and sub-structure generally shall be up to the standard of a first class metre gauge line. With regard, however to station buildings it does not appear desirable to have anything on a large or expensive scale until traffic has declared itself. The estimate therefore provides for small semi-permanent structures of the type approved by the Director-General of Railways on the East Coast Railway.

As stated above a large proportion of the minor bridges are over artificial channels. It has already been explained under the head "Description of country traversed" that these channels take off at frequent intervals and receive the flood-waters of the river which are thus dispersed over the face of the country. Consequently the main channel gets smaller as it descends. The river which is 1,400 feet wide at Madura is only 600 feet at Paramakudi and as the depth in flood is much the same at both places it is seen that within the distance of 45 miles a quantity equal to eight-fourteenths of the whole has been led away elsewhere. As a matter of fact about three quarters of this portion is taken off the south side and only one quarter, or say two-fourteenths of the whole on the north side. As compared therefore with the volume of water at Madura the present line crosses only two-fourteenths of it by small bridges and six-fourteenths by the river bridge at Paramakudi. On the other hand, provision has to be made at Ramnad for spills from the Great Tank which is fed by the Vaigai, so that it is some of the same water already crossed at Paramakudi which is again encountered lower down. From Ramnad onwards the line runs in the middle of a promontory flat and mostly sandy and practically no water-courses are met with.

General character of work.

Waterway and important works.

The total length of waterway including openings of every description is 2,617 linear feet which works out to an average of 26.12 feet per mile. Foundations are easy and nowhere is it necessary to use spans of more than 40 feet.

The principal bridges are briefly noticed below full details being given in the "List of Important Bridges" appended to his Report.

Uppu Nala (Mile 21). Nine spans of 20 feet girders.

Faigui River (Mile 32). Thirteen spans of 40 feet girders. The river bed which for a few miles above this is spread out and flat is here constricted and well defined.

Spill from Ramnad Great Tank, (Mile 74). Five spans of 40 feet girders. No calculation is here possible but an opening of 200 feet in length is provided at the lowest part of the ground.

Fencing.

It is not proposed to fence the line except round station yards where the ordinary five wire fence will be used.

Permanent Way.

The type of Permanent Way in most general use on the main line of the South Indian Railway (of which this line is an extension) consists of a 50 lbs. bull-headed rail on cast iron pot sleepers weighing 70 lbs. each. In certain parts of the line the State Railway type of 41½ lbs. flat-footed rail is used in conjunction with wooden sleepers, with transverse steel sleepers, and, for a short length on the main line, with cast iron pot sleepers made specially to fit it each weighing 55 lbs. In May 1894 the Director-General of Railways circulated a note by Mr. Horace Bell on the relative advantages of steel and cast iron sleepers which elicited from Mr. Logan, Chief Engineer, South Indian Railway, a Report on the subject based on his own experience. He finds that the steel sleepers show signs of failing under the pressure of the rail and, moreover, their material is too thin to offer a prolonged resistance to corrosion. He is well satisfied with the 70 lbs. pot sleepers under a 50 lbs. rail, but thinks that the 55 lbs. pot sleepers under the 41½ lbs. rail are too light and that a 70 lbs. sleeper should be used. The opinion here given must naturally be of great weight in deciding the type of Permanent Way for the Madura-Pamban Railway.

The difference in cost between a 41½ lbs. rail and a 50 lbs. rail would come to Rs. 1,350 per mile and it is doubtful whether the extra expense should be incurred while the amount of traffic to be carried remains uncertain.

If, however, the light rail be adopted the question of the most suitable form of sleeper arises. Wooden sleepers are now obtained with increasing difficulty and the weight of authority appear to be against the transverse steel pattern. On the South Indian Railway the 41½ lbs. rail has been used with a cast iron pot sleeper specially made to fit it weighing 55 lbs., but this sleeper is considered a little too light for the work. Besides, the use of a flat-footed rail with a pot sleeper is somewhat of a make-shift and if this type of sleeper is decided on then for a rail of a given unit of weight the quantity of metal can be most advantageously disposed of in the bull-headed form of section. Taking all these matters into consideration the adoption is recommended of the South Indian Railway main line type of permanent way consisting of a 50 lbs. bull-headed rail on cast iron pot sleepers weighing 70 lbs. each.

Passenger Platforms

Passenger platforms will be 600 feet long and 40 feet wide, and will, in all cases, be flush with the rail.

Workshops.

As the line will be worked by the South Indian Railway, no separate workshops are necessary.

The country traversed by the line is essentially a region of tanks, and wells are not in general use. It will be desirable to construct wells at watering stations as affording a more certain supply than the tanks in the vicinity which may dry up. No special difficulties are anticipated in this respect.

Madura is already an engine station, and the distance to Pamban being 100 miles, this is suitable for an engine run. The opinion of Mr. Crichton, Locomotive Superintendent, South Indian Railway, has been sought for on this subject and is to the following effect:—The running shed at Madura should be increased for the accommodation of six more engines and a shed for four engines should be provided at Pamban together with a Running Room for four Drivers and houses for one Rolling Stock Inspector and six Native Firemen besides a small office and store.—The above items have therefore been provided for in the estimate.

Labour and Materials.

The conditions are suitable for the execution of work on the Petty Contract system. There are many miles of light earthwork which would be taken up by local men with small capital. Other works in which more skill and experience are necessary will be carried out by the excellent class of small contractors who make it their business to seek railway construction work in every part of India. Every Executive Engineer who is worth his salt is in touch with individuals of this class with whose capabilities and resources he is well acquainted, and, as the locality is easily accessible, men will come of their own accord with a following of subordinates and artisans ready to carry out whatever work may be allotted to them.

The labour supply should prove abundant for the population is well accustomed to perform earthwork in connection with tank and channel excavations. Besides this the inhabitants of Southern Madras generally are in the habit of travelling from their homes for employment and would readily flock to any part where large works are in progress.

Very little material is available in the country traversed. It will undoubtedly be desirable to lay the rails through at an early stage of construction, crossing water courses by diversions, in order to bring materials to the sites of works. This course will be facilitated by the general lightness of the banks and the proximity of the river which will yield an abundant supply of sand for ballast.

Building stone of the finest quality is available at or near Madura. The rock is a granitoid gneiss and occurs in isolated hills taking the form of massive rounded bosses. Slabs and shafts of almost unlimited size can be easily quarried, coming out with clean sharp faces. Stone posts about a foot square and of any required length are used everywhere in the vicinity for veranda supports, lamp-posts and other purposes.

There is a good quarry of this kind of stone at Vandiyur opposite mile 3 and close to the line. It is not much used at present as other quarries have the advantage of being connected with Madura by metalled roads, but it is very conveniently situated and may be reached by a short siding a quarter of a mile long and developed as the principal quarry for the railway.

There is laterite at Sivaganga and Manamadurai and also a rough quartzite which might be used for small buildings, but is hardly good enough for bridges. From Manamadurai to Ramnad no stone of any kind is met with but in the town of Ramnad a soft grey stone, apparently coralline limestone, is used in some of the houses. It is said to have been obtained from local quarries now worked out but similar stone can be procured from

The average of the three figures quoted above is Rs. 242 per mile per week, which differs little from the result on the Trichinopoly-Madura section. It is not asserted that anything like that rate would at once be earned on the new line but it seems likely that there would be a tendency to approach it after some years of working. In that case the gross earnings for a year would be as below :—

Ra.	Weeks.	Miles.	Ra.
242	x 52	x 100	= 12,58,400

It is presumed that the line would be worked by the South Indian Railway using its own rolling stock and receiving 55 per cent. of the takings. The net earnings would, therefore, be 45 per cent. of Rs. 12,58,400 amounting to Rs. 5,66,280. The total cost of the line being Rs. 41,77,460 this would represent a net revenue of 13.55 per cent. on the capital expenditure.

It is, however, generally considered that a line is worth constructing on its own merits if it will pay 4 per cent. on capital which, in this case, would amount to Rs. 1,67,039. If this sum be taken as 45 per cent. of the total receipts the corresponding gross earnings would have to be Rs. 3,71,328 per annum on 100 miles, equivalent to Rs. 61 per mile per week. There is little doubt that this sum would be earned from the first year of opening.

E. I. SHADBOLT,
Engineer-in-Chief,
Madura-Pamban Railway Survey.

COONNOR,
October 1895.

FORMS

TO ACCOMPANY

REPORT.

MADURA-PAMBAN RAILWAY.

(Gauge 3'-3 1/2")

100.18 Miles.

Form R. I.

Curve Abstract.

ANGLE OF CURVATURE OR RADIUS.	NUMBER OF EACH.	TOTAL LENGTH, MILES.	TOTAL CURVATURE, DEGREES.
3°— 0' (R=1,910 feet)	1	0.46	73.56°
2°— 0' (R=2,865 "	7	2.89	304.83
1°—30' (R=3,820 "	2	0.46	36.60
1°— 0' (R=5,730 "	8	2.33	123.07
		18	6.14
Straight... ..	19	94.04	
Total Length of Line		100.18	

RATIO OF CURVE TO TOTAL LENGTH OF LINE 6.13 per cent.

AVERAGE AMOUNT OF CURVATURE PER MILE 5.37 degrees.

Form R. II.

Gradient Abstract.

INCLINATION.	NUMBER OF EACH.	TOTAL LENGTH, MILES.	PERCENTAGE OF TOTAL LENGTH OF LINE.
1 in 200, or 0.50 per cent.	25	14.05	14.02
1 in 201 to 1 " 300, " 0.33 "	14	7.14	7.13
1 " 301 " 1 " 500, " 0.20 "	23	15.12	15.09
1 " 501 " 1 " 1000, " 0.10 "	37	23.00	22.96
Level	54	40.87	40.80
Total... ..		100.18	100.00.

MADURA-PAMBAN RAILWAY.

(Gauge 3'-3 1/2")

100.18 Miles.

Form R. III.

Bridge Abstract.

CLASS.	SPAN.		NO OF BRIDGES.	NO OF SPANS.	WATERWAY, L.W. FEET.
	LENGTH.	NUMBER.			
PIPES	1'	1	30	30	
	1'	2	20	40	
	1'	3	1	3	
Total...	1'		51	73	73
SLABS	2'	1	54	54	
	2'	2	12	36	
	2'	3	2	6	
Total...	2'		74	96	192
	3'	1	10	10	
	3'	2	8	16	
	3'	3	2	6	
Total...	3'		20	32	96
ARCHES	4'	1	18	18	
	4'	3	1	3	
Total...	4'		19	21	84
	6'	1	17	17	
	6'	2	3	6	
	6'	3	2	6	
	6'	4	1	4	
	6'	5	1	5	
Total...	6'		24	38	228
	12'	1	6	6	
	12'	2	1	2	
Total...	12'		7	8	96
GIRDERS... ..	6'	1	21	21	
	6'	2	19	38	
	6'	3	8	24	
	6'	4	1	4	
	6'	5	1	5	
Total...	6'		50	92	552
	12'	1	4	4	
	12'	2	4	8	
	12'	3	2	6	
Total...	12'		10	18	216
	20'	1	1	1	
	20'	2	1	2	
	20'	3	2	6	
	20'	9	1	9	
Total...	20'		5	18	360
	40'	5	1	5	
	40'	13	1	13	
Total...	40'		2	18	720
TOTAL FOR WHOLE LINE					2,617
AVERAGE PER MILE					26.12

MADURA-PAMBAN RAILWAY.

(Gauge 3'3")

100.18 Miles.

Form R, VI.

Station Machinery.

Name of Station.	Station Appliances.		Water Column.		Piping.		Water Tank.		Well.		Steam Pump.	Hand Pump.	Switches.			Crossings.			Home Signal.		Distant Signal.		Weigh Bridge.		Engine Shed.		Loco. Ashpit.		Engine Turntable.
	No.	In.	Feet	In.	Ca. Ft.	Ft.	In.	Ca. Ft.	Diameter.	Capacity.	Diameter.	No.	12 feet.	9 feet.	Total.	1 in 12.	1 in 8 1/2.	1 in 6.	No.	No.	No.	No.	No.	Number.	Capacity.	Area inside.	No.	No.	
Junction	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Madura North	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sakimangalam	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Terupuvanam	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Paramatur	2	6	800	6	1,024	12	6	1,024	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sivaganga	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Manamadura	2	6	800	6	1,024	12	6	1,024	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tonavarayan	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pesamakudi	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Manjur	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ettyal	2	0	800	6	1,024	12	6	1,024	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Ramnad	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Udachivalass	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Irumen	2	6	800	6	1,024	12	6	1,024	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mandapam	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Toni Torai	1	6	200	6	2,218	20	6	2,218	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total	8	9	3,400	...	6,314	...	...	...	...	...	...	5	...	99	99	...	99	...	99	16	81	...	...	...	...	3,600	2	2	1

3831

8-2

MADURA-PAMBAN RAILWAY.

ESTIMATE

OF THE

COST OF CONSTRUCTION.

SURVEY OF 1895.

MADRAS.

PRINTED BY THE SUPERINTENDENT, LAWRENCE ASTLEY PRESS, MOUNT ROAD.

1895.

MADURA-PAMBAN RAILWAY.

SURVEY

OF

1895.

ESTIMATE

OF THE

COST OF CONSTRUCTION.

TABLE OF CONTENTS.

	PAGE.		PAGE.
Introductory Note	iii	XII. GENERAL CHARGES— <i>contd.</i>	
Rates	iv	3. Stores	11
General Abstract	1	4. Audit and Account	"
Abstract Estimates		5. Medical and Sanitation	"
I. PRELIMINARY EXPENSES—		Articles required from England ...	12
1. Survey Expenses	2	Particulars of Cost.	
2. Plant	"	1. PRELIMINARY EXPENSES—	
3. Establishment	"	1. Survey Expenses—	
II. LAND	3	(a) Field Expenses	14
III. FORMATION—		(b) Office Expenses	"
I. Earthwork	3	2. Plant—	
IV. BRIDGEWORK		(a) Camp Equipage	15
1. Major Bridges	4	(b) Furniture	"
2. Minor Bridges	"	(c) Survey Instruments	"
V. FENCING, ETC.—		(d) Drawing Instruments	16
1. Fencing	5	(e) Tools	"
2. Road Crossings	"	3. Establishment—	
3. Mile and Gradient Posts	"	(a) Salaries	17
VII. BALLAST AND PERMANENT WAY—		(b) Travelling Allowances	"
1. Ballast	6	(c) Office Contingencies	"
2. Permanent Way	"	(d) Audit and Account	"
VIII. STATIONS AND BUILDINGS—		IV. BRIDGEWORK—	
1. Stations and Offices	7	List of Waterways	
3. Staff Quarters	8	1. Major Bridges—	
4. Station Machinery	9	No. 87 Uppu River	
Do. English Charges	10	" 195. Vaigai River	
IX. PLANT—		" 239	
1. Engineering	11	" 245	
2. Locomotive	"	" 262	
4. Station and Office Furniture	"	2. Minor Bridges—	
XII. GENERAL CHARGES—		V. FENCING, ETC.—	
1. Direction	11	1. Fencing—	
2. Engineering	"	One mile of Single Fencing.	
		2. Road Crossings—	
		Gateman's Lodge	
		Level Crossing with 24' gates.	

TABLE OF CONTENTS—(concluded)

PAGE.	PAGE.
V. FENCING, ETC.— <i>contd.</i>	Passenger and Goods Platforms. Sundry Works at Stations ...
2. <i>Road Crossings</i> — <i>contd.</i>	3. <i>Staff Quarters</i> —
Level Crossing with 12' gates ...	Staff Quarters, Sundry ...
Level Crossing with post and chain barrier ...	4. <i>Station Machinery</i> —
3. <i>Mile and Gradient Posts</i> —	Ashpit
Grade Post built into pillar ...	Water Column
VII. BALLAST AND PERMANENT WAY—	Piping
1. <i>Ballast</i> —	Water Tanks, 1,024 cu. ft. ...
Type Section and Details ...	Tank house for Engine Sta- tion
One mile of Ballast, Cost ...	Pump at Watering Station ...
2. <i>Permanent Way</i> —	Points and Crossings, one set
One mile, Weight of Material ...	Home Signal
One mile, Cost	Distant Signal
VIII. STATIONS AND BUILDINGS—	Engine Turntable
1. <i>Stations and Offices</i> —	Sundry Works
Station Buildings	

COONOOR,
October 1895.

E. I. SHADBOLT,
Engineer-in-Chief,
Madura-Pamban Railway Survey.

MADURA-PAMBAN RAILWAY (Gauge 3'-3½")

INTRODUCTORY NOTE.

The Madura-Pamban Railway is a line from Madura, a station on the South Indian Railway 33½ miles from Madras, to a point on the east coast opposite to Pamban, a town situated on the Island of Rameswaram which is divided from the main land by a narrow strait. Its length is 100 miles and it forms the first instalment of the railway which will eventually connect India with Ceylon.

The country traversed is flat, and few bridges of any importance are required so that the line will not be expensive to construct.

The following points may be noted with regard to the various heads of work included in the Estimate.

I. Preliminary.—The estimate as nearly as possible represents the actual cost of the present Survey of 1895.

II. Land.—The approximate area per mile is calculated and the different classes of land in each mile are taken from the plans.

III. Formation.—Earthwork quantities are calculated from average heights of banks. Slopes are, as a rule, taken at 2 to 1 but, as there is a great scarcity of material suitable for pitching, it is proposed that the slopes shall be 4 to 1 in the frequent cases in which the bank traverses a tank.

IV. Bridgework.—The largest bridge is that over the Vaigai River consisting of 13 spans of 40 feet girders. As no span larger than 40 feet is used on the line special designs have not been required, but all quantities have been taken from Stone's Bridge and Culvert Tables.

V. Fencing. No remarks.

VI. Electric Telegraph.—The capital cost is not included.

VII. Ballast and Permanent Way.—Provision is made for the use of 50 lb. bull-headed rails on cast iron pot sleepers weighing 70 lbs. each. This is the form most in favour on the main line of the South Indian Railway. The line will at first be ballasted with sand from the River Vaigai, which can be supplemented with a covering of stone after the rails are laid.

VIII. Stations and Buildings.—It is proposed to have small buildings of the type approved by the Director-General of Railways for the East Coast Railway.

IX. Plant.—A mileage rate has been taken based on actual expenditure on open lines.

X. Ferries.—Nil.

XI. Rolling Stock.—It is assumed that the line will be worked by the South Indian Railway, and no separate provision has therefore been made for Rolling Stock.

XII. General Charges.—Mileage rates have been taken which approximate to those representing the actual expenditure on certain open lines, especially the Bengal and North-Western Railway.

Rates.—

Information on this subject has been obtained from local sources and also from reference to the estimates of lines recently under construction. The prices of English material are derived from the quarterly abstract issued by the Director-General of Railways exchange being calculated at Rs. 18 per £ 1 sterling, equivalent to 13·3, pence per rupee.

The rates adopted in the estimate are given in the following List:—

LIST OF RATES.

	Per	Rs.
EARTHWORK	1,000 cu. ft.	5
BALLAST—		
Sand	100 "	4
Broken Stone	" "	8
BRIDGEWORK—		
Excavation, dry	1,000 cu. ft.	10
" wet	" "	40
Concrete	100 "	20
Masonry in foundations	" "	35
" superstructure	" "	45
" arching and abuts	" "	80
" coping	" "	80
" ashlar	" "	100
" bridge flooring	" "	25
Dry stone work	" "	16
Pitching	" "	10
Petty Ironwork	cwt.	15
Woodwork	cu. foot	4
Stoneware Pipes	lin. foot	2
ERECTION OF GIRDERS—		
6 feet to 20 feet	ton	30
40 "	"	45
WORK IN BUILDINGS—		
Excavation, etc	1,000 cu. ft.	5
Concrete	100 "	20
Brickwork	" "	25
Masonry	" "	30
Flooring of concrete	" sq. ft.	25
Plaster, etc.	" "	3
Roofing, country tiles	" "	25
Woodwork	cu. ft.	4
Doors and Windows, 1st class	sq. ft.	1.5
" " 2nd "	"	1
SCREY—		
Gravel, rolled and finished	100 sq. ft.	2
Metalling, " "	" "	4
Platform Fence	lin. ft.	2
Laying Permanent Way	mile	400
Erecting Wire Fence... ..	"	400
Iron Roofing, complete	100 sq. ft.	60
Ironwork, local	cwt.	51
Clearing jungle	mile	50

MADURA-PAMBAN RAILWAY.

(Gauge 3'3 1/4").

100.18 Miles.

General Abstract.

	SUB-HEADS				MAIN HEADS	
	Expenditure in India	Material from England	Total Cost	Rate per Mile	Total Cost	Rate per Mile
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
I. Preliminary Expenses.	...	...	...	...	44,000	440
1. Survey Expenses ...	7,500	...	7,500	75	...	...
2. Plant ...	3,000	...	3,000	30	...	...
3. Establishment ...	33,500	...	33,500	335	...	...
II. Land.	1,04,530	...	1,04,530	1,045	1,04,530	1,045
III. Formation.	...	...	...	...	3,32,382	3,324
1. Earthwork ...	3,32,382	...	3,32,382	3,323	...	...
IV. Bridgework.	...	...	...	...	4,81,201	4,812
1. Major Bridges ...	1,02,798	42,885	1,45,683	1,456	...	...
2. Minor Bridges ...	3,20,523	14,995	3,35,518	3,355	...	...
V. Fencing, etc.	...	...	...	...	89,865	898
1. Fencing ...	9,720	26,280	36,000	360	...	...
2. Road Crossings ...	45,410	...	45,410	454	...	...
3. Mile and Gradient Posts ...	8,455	...	8,455	84	...	...
VII. Ballast and Permanent Way.	...	...	...	...	23,30,373	23,304
1. Ballast ...	2,97,739	...	2,97,739	2,977	...	...
2. Permanent Way ...	1,29,246	19,03,388	20,32,634	20,326	...	...
VIII. Stations and Buildings.	...	...	...	...	3,62,109	3,621
1. Stations and Offices ...	1,11,664	...	1,11,664	1,116	...	...
3. Staff Quarters ...	1,11,157	...	1,11,157	1,111	...	...
4. Station Machinery ...	80,245	59,043	1,39,288	1,392	...	...
IX. Plant.	...	...	...	...	33,000	330
1. Engineering ...	12,000	...	12,000	120	...	...
2. Locomotive ...	1,000	5,000	6,000	60	...	...
4. Station and Office Furniture ...	15,000	...	15,000	150	...	...
XII. General Charges.	...	...	...	...	4,00,000	4,000
1. Direction ...	40,000	...	40,000	400	...	...
2. Engineering ...	3,00,000	...	3,00,000	3,000	...	...
3. Stores ...	30,000	...	30,000	300	...	...
4. Audit and Account ...	20,000	...	20,000	200	...	...
5. Medical and Sanitation ...	10,000	...	10,000	100	...	...
Total...	21,25,869	20,51,591	...	...	41,77,460	41,774

MADURA-PAMBAN RAILWAY.

Gauge 3'-3 1/4".

ABSTRACT ESTIMATES.

I. Preliminary Expenses.

1. Survey Expenses
2. Plant.
3. Establishment.

Particulars, Pages 14 to 17.

Sub-heads of Account.	Cost.		Rate per Mile.	
	Sub-heads.	Main Heads.	Sub-heads.	Main Heads.
	Rs.	Rs.	Rs.	Rs.
I. SURVEY EXPENSES ...	...	7,500	...	75
(a) Field Expenses ...	6,600	...	66	...
(b) Office Expenses ...	900	...	9	...
II. PLANT ...	...	3,000	...	30
(a) Camp Equipage ...	2,500	...	25	...
(b) Furniture ...	600	...	6	...
(c) Surveying Instruments ...	2,400	...	24	...
(d) Drawing Instruments ...	700	...	7	...
(e) Tools ...	300	...	3	...
Gross Total...	6,500	...	65	...
Credits anticipated...	3,500	...	35	...
Net Total...	3,000	...	30	...
III. ESTABLISHMENT ...	...	33,500	...	335
(a) Salaries ...	28,600	...	286	...
(b) Travelling Allowances ...	3,300	...	33	...
(c) Office Contingencies ...	1,000	...	10	...
(d) Audit and Account ...	600	...	6	...
Cost of Survey, 100 miles...	...	44,000	...	440

MADURA-PAMBAN RAILWAY.

(Gauge 3'-3 1/4").

ABSTRACT ESTIMATES.

II. Land.

Item.	Quantity acres.	Rate.	Per	Amount.
		Rs.		Rs.
Waste ...	849	20	Acre	16,980
Dry Cultivation ...	639	50	"	31,950
Wet ...	468	100	"	46,800
Garden or Special ...	44	200	"	8,800
Total for 100 miles...	2,000	...	...	1,04,530
Average rate per acre ...	...	52	...	...
Equivalent area per mile ...	20	...	...	...

III. Formation.

1. Earthwork.

Item.	Quantity	Rate.	Per	Amount.
		Rs.		Rs.
Banks ...	54,654,000	5	1,000 cu. ft.	2,73,270
Cuttings ...	2,219,000	15	" "	33,285
Clearing Line ...	100	100	Mile.	10,000
				3,16,555
Contingencies ...	...	5	cent.	15,827
				3,32,382

4

MADURA-PAMBAN RAILWAY.
ABSTRACT ESTIMATES.

(Gauge 3'-3 1/2").

IV. Bridgework
Particulars, Pages

1. Major Bridges.

Number.	Mileage.	Opening.			Amount.			REMARKS.
		No.	Length.	Kind.	Indian.	English.	Total.	
			ft.		Rs.	Rs.	Rs.	
87	21.49	9	20	Girders.	13,295	5,056	18,351	Uppu River.
195	52.30	13	40	"	60,290	24,887	85,177	Vaigai "
239	72.09	3	20	"	7,766	1,685	9,451	
245	74.57	5	40	"	16,312	9,572	25,884	
262	93.93	3	20	"	5,135	1,685	6,820	
Totals ...					1,02,798	42,885	1,45,683	

IV. Bridgework
Particulars, Pages

2. Minor Bridges.

Item.	Amount.		
	Indian.	English.	Total.
	Rs.	Rs.	Rs.
Cost of 257 Minor Bridges as per detailed list ...	3,20,523	14,995	3,35,518

5

MADURA-PAMBAN RAILWAY.
ABSTRACT ESTIMATES.

(Gauge 3'-3 1/2").

V. Fencing, etc.

1. Fencing.

Particulars, Page.

Item.	Quantity	Rate.	Per	Amount.
		Rs.		Rs.
Wire Fencing at 14 Stations, each 0.91 mile ...	12.74			
" " Mandapam ...	1.40			
" " sundry places ...	5.86			
Total, miles ...	20.00			
INDIAN CHARGES ...	20	486	mile	9,720
ENGLISH " ...	20	1,314	"	26,280
Total, Indian and English ...	20	1,800	"	36,000

V. Fencing, etc.

2. Road Crossings.

Particulars, Page.

Item.	Quantity.	Rate.	Per	Amount.
		Rs.		Rs.
Road Crossings with 24' gates ...	14	1,146	each	16,044
" " 12' " ...	9	894	"	8,046
" " posts and chains ...	82	260	"	21,320
Total ...	...	...	...	45,410

V. Fencing, etc.

3 Mile and Gradient Posts.

Particulars, Page.

Item.	Quantity.	Rate.	Per	Amount.
		Rs.		Rs.
Mile Posts ...	100	12	each	1,200
Gradient Posts and Pillars ...	153	35	"	5,355
Tangent Pillars ...	36	25	"	900
Numbering Telegraph Posts ...	2,000	0.5	"	1,000
Total ...	...	...	...	8,455

I. Ballast.

VII. Ballast and Permanent Way.

Particulars,	Page.
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Particulars, Page.					Quantity.	Rate.	Per.	Amount.
Item.								
Main Line ...	...	...	... Miles...	100-18	Rs.		Rs.	
Sidings :—								
Madura North.	...	...	...	0-61				
Sakimangalam	...	...	...	0-61				
Tirupuvanam	...	...	...	0-61				
Paramatur	...	...	...	0-61				
Sivaganga	...	...	...	0-61				
Manamadura	...	...	...	0-61				
Tonavarayan	...	...	...	0-61				
Paramakudi	...	...	...	0-61				
Manjur	...	...	...	0-61				
Ettyal	...	...	...	0-61				
Ramnad	...	...	...	0-61				
Udachivalsa	...	...	...	0-61				
Iruvan	...	...	...	0-61				
Mandapam	...	...	...	4-06				
Toni Torai	...	...	...	0-61				
Total ...				112-78	2,640	mile	2,97,739	

VII. Ballast and Permanent Way.

Particulars, Page.

2. Permanent Way.

Item.	Quantity.	Rate.	Per.	Amount.
INDIAN CHARGES.		Rs.		Rs.
Main Line miles...	100-18			
Sidings (see under "Ballast") "	12-60			
Total, Indian ...	112-78			
		1,146	mile	1,29,246
ENGLISH CHARGES.	112-78	16,877	"	19,03,388
Total, Indian and English ...	112-18	18,023	"	20,32,634

MADURA-PAMBAN RAILWAY.

ABSTRACT ESTIMATES.

1. Stations and Offices.

VIII. Stations and Buildings.

Particulars Pages

	Station Building.	Passenger Platform.	Goods Platform.	Platform Fence.	Name Boards.	Latrines.	Lamp Posts.	Yard and Approaches.	Gates.	Wall 6' diameter.	Poisoner's Shelter.	Goods Shed.	Total.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
...	1,500	820	.....	1,400	50	400	150	1,000	125	800	80	.....	6,325
...	1,500	820	.....	1,400	50	400	150	1,000	125	800	80	.....	6,325
...	1,500	820	.....	1,400	50	400	150	1,000	125	800	80	.....	6,325
...	1,500	820	.....	1,400	50	400	150	1,000	125	.....	80	.....	5,525
...	1,500	820	1,138	1,400	50	400	150	1,000	125	800	80	1,000	8,463
...	1,500	820	.....	1,400	50	400	150	1,000	125	.....	80	.....	5,525
...	1,500	820	.....	1,400	50	400	150	1,000	125	800	80	1,000	8,463
...	1,500	820	1,138	1,400	50	400	150	1,000	125	800	80	.....	6,325
...	1,500	820	.....	1,400	50	400	150	1,000	125	.....	80	.....	5,525
...	1,500	820	.....	1,400	50	400	150	1,000	125	800	80	1,000	8,463
...	1,500	820	.....	1,400	50	400	150	1,000	125	.....	80	.....	6,325
...	1,500	820	1,138	1,400	50	400	150	1,000	125	800	80	1,000	8,463
...	1,500	820	.....	1,400	50	400	150	1,000	125	.....	80	.....	5,525
...	1,500	820	.....	1,400	50	400	150	1,000	125	800	80	.....	6,325
...	1,500	820	.....	1,400	50	400	150	1,000	125	800	80	.....	5,525
...	1,500	820	.....	1,400	50	400	150	1,000	125	800	80	.....	6,325
...	3,750	820	5,760	1,400	50	400	150	3,000	125	.....	320	4,000	19,900
...	1,500	820	.....	1,400	50	400	150	1,000	250	800	80	.....	6,325
Totals...	24,750	12,300	9,174	21,000	750	6,000	2,250	17,000	2,000	8,000	1,440	7,000	1,11,661

(Gauge 3'-3 1/2")

3. Staff Quarters.

Particulars, Page.

	Station Master.	Station Master and Signaller.	Menials, 1 unit.	Menials, 3 units.	Menials, 3 units.	Firemen, 6 units.	Menials, 6 units.	Drivers, 3 units.	Guards, 3 units.	Waiting Rooms.	Rolling Stock Inspector.	P. W. Sub-Inspector.	P. W. Gangmen.	Total.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Junction ..	912	..	..	430	..	..	..	..	..	..	..	..	..	1,342
Madura North ..	912	..	225	..	630	..	..	..	..	..	..	..	..	1,767
Sakimangalam ..	912	..	225	..	630	..	..	..	..	..	..	..	..	1,767
Tirupuvanam ..	912	..	225	..	630	..	..	..	..	..	..	..	..	1,767
Paramatur ..	912	..	225	..	630	..	..	..	..	..	..	..	..	1,767
Sivaganga ..	912	..	225	..	630	..	..	..	..	..	..	..	..	2,079
Manamadurai ..	912	..	225	..	630	..	..	..	..	..	..	..	..	1,767
Tonavarayan ..	912	..	225	..	630	..	..	..	..	..	..	..	..	1,767
Paramakudi ..	912	..	225	..	630	..	..	..	..	..	..	..	..	1,767
Manjur ..	912	..	225	..	630	..	..	..	..	..	..	..	..	1,767
Ettyal ..	912	..	225	..	630	..	..	..	..	..	..	..	..	1,767
Ramned ..	912	..	225	..	630	..	..	..	..	..	..	..	..	2,679
Udachiavalas ..	912	..	225	..	630	..	..	..	..	..	..	..	..	1,767
Irunan ..	912	..	225	..	630	..	..	..	..	..	..	..	..	1,767
Mandapam ..	..	1,748	225	..	..	1,242	1,638	7,200	7,200	8,800	912	..	..	28,965
Tooti Torai ..	912	..	225	..	630	..	..	..	..	..	..	..	..	1,767
Along Line ..	..	..	..	..	..	..	..	..	..	..	..	..	54,288	54,288
Totals ..	13,680	1,748	3,375	430	8,820	1,242	1,638	7,200	7,200	8,800	912	1,824	54,288	1,11,157

(Gango 3'-317).

4. Station Machinery:

Particulars, Pages

[illegible]

MADURA-PAMBAN RAILWAY.
ABSTRACT ESTIMATES.

(Gauge 3'3 1/2")

VIII. Stations and Buildings.
Particulars, Pages

4. Station Machinery.

ENGLISH CHARGES.

	Water Columns.	Piping.	Water Tank.	Head Pump.	Points and Crossings.	Signal, Home.	Signal, Distant.	Weighing Machines.	Dating Presses.	Turntable.	Total.
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Junction ...	...	...	...	...	191	154	432	...	...	...	777
Madura North ...	...	...	...	...	955	154	432	456	30	...	2,027
Sakimangalam ...	...	...	...	...	955	154	432	456	30	...	2,027
Tirupuvanam ...	...	...	...	...	955	154	432	456	30	...	2,027
Paramatur ...	1,340	1,577	1,020	530	955	154	432	456	30	...	6,494
Sivaganga ...	...	...	...	...	955	154	432	456	30	...	2,027
Manamadurai ...	1,340	1,577	1,020	530	955	154	432	456	30	...	6,494
Tonavarayan ...	...	...	...	...	955	154	432	456	30	...	2,027
Paramakudi ...	1,340	1,577	1,020	530	955	154	432	456	30	...	6,494
Manjur ...	...	...	...	...	955	154	432	456	30	...	2,027
Ittyal ...	...	...	...	...	955	154	432	456	30	...	2,027
Ramnad ...	...	...	...	...	955	154	432	456	30	...	6,494
Udachivala ...	1,340	1,577	1,020	530	955	154	432	456	30	...	2,027
Irumani ...	...	...	...	...	955	154	432	456	30	...	6,494
Mandapam ...	670	500	...	...	5,348	154	432	684	30	3,668	12,236
Toni Torai ...	...	...	...	530	955	154	216	456	30	...	1,611
Totals...	6,030	6,808	4,080	2,630	18,009	2,464	6,696	7,068	450	3,888	59,043

MADURA-PAMBAN RAILWAY.

(Gauge 3'3 1/2")

ABSTRACT ESTIMATES.

IX. Plant.

1. Engineering.
2. Locomotive.
3. Station and Office Furniture.

Item.	Indian.	English.	Total.
	Rs.	Rs.	Rs.
Mileage rates are based on actual expenditure on open lines. Rate for Engineering Plant includes only Open Line Plant. The cost of plant for construction goes against the works on which it is used.			
ENGINEERING PLANT ... 100 miles @ Rs. 120...	12,000	...	12,000
LOCOMOTIVE PLANT ... 100 " @ Rs. 60...	1,000	5,000	6,000
STATION AND OFFICE FURNITURE. 100 " @ Rs. 150...	15,000	...	15,000
Total ...	28,000	5,000	23,600

XII. General Charges.

1. Direction.
2. Engineering.
3. Stores.
4. Audit and Account.
5. Medical and Sanitation.

Item.	Miles.	Rate per Mile.	Amount.
			Rs.
Mileage Rates are based on actual expenditure on Open Lines especially the Bengal and North Western Railway.			
DIRECTION ...	100	400	40,000
ENGINEERING ...	100	3,000	3,00,000
STORES ...	100	300	30,000
AUDIT AND ACCOUNTS ...	100	200	20,000
MEDICAL AND SANITATION ...	100	100	10,000
Total ...	100	4,000	4,00,000

MADURA-PAMBAN RAILWAY:

(Gauge 3'-3 $\frac{1}{2}$ ".)

100.18 Miles.

List of Articles Required from England.

Item.	Quantity.	English Cost.			Rate of Exchange.	English Cost in Rupees.	Indian Charges.	Total.	Date by which delivery is required.
		P. O. B.	Freight	Total.					
		£	£	£		Rs.	Rs.	Rs.	
Major Bridges, Girders	202 tons.	2,166	216	2,382	Rs. 18 per £ 1. or 13.3 pence per rupee.	42,885	1,010	43,895	Not known.
Minor "	71 "	757	76	833		14,995	355	15,350	
Fencing	20 miles.	1,298	162	1,460		26,290	800	27,090	
Permanent Way...	112.78 miles.	90,639	15,106	1,05,744		1,903,388	75,530	19,78,918	
Station Machinery.	...	3,116	104	3,280		59,043	820	59,863	
Plant, Locomotive	...	250	28	278		5,000	140	5,140	
Total ...	...	99,225	15,752	113,977		2,051,591	78,655	21,30,246	

3831

81

Madura-Pashan Railway Survey.

Note by the Consulting Engineer for Rys.

Location. The orders given by the Madras Government were that the line should run from the South Indian Railway main line on the left bank of the Vaigai river generally following the road to Sivagunga thence to Mana Madura and Paramagudy from whence 2 routes were to be examined either crossing the Vaigai at Paramagudy or keeping to the left bank and crossing the Vaigai at Rannad. The Pashan channel and island to Rannaswaran to be examined but not surveyed in detail. Mr. Turner, Collector of Madura to be specially consulted.

2. The previous history of the former surveys and the reasons given for adopting the Sivagunga route ^{are} given in the report, which, with the plans and estimate, is submitted in a very complete form.

3. The alignment from Paramagudy to Rannad on the right bank of the Vaigai has been chosen in preference to that on the left bank. Mr. Stadholt however does not compare the advantages of a bridge across the Vaigai at Paramagudy with a causeway over the same river near Rannad which has been strongly advocated by the Honorable Mr. Bliss and the Honorable -- Colonel Pennycuik.

4. I am strongly in favor of a bridge across the Paramagudy instead of a causeway near Rannad for the following reasons:-

3 P
Mr. Shalbolt points out that the Periya Manurani tank has --
been constructed where the river originally divided into --
2 channels--however any line passing to the east of this tank
crosses all the drainage nearly at right angles and to render
the line secure it should be lowered as a causeway for a dis-
tance of about $1\frac{1}{4}$ miles in 3 places (see under section sheet
No. 2 marked in red) if not for the whole distance.

5. The cost of a metre gauge line causeway as put in near
Trichinopoly and elsewhere is about 30 per foot run as com-
pared with the bridge which is 100 per foot run therefore --
the causeway should not exceed 3 times the length of any bridge
it is intended to substitute. In this the Perambalur bridge is
estimated to cost Rs. 95,000 against 2,70,000 for the cause-
way but I consider Mr. Shalbolt's estimate of the discharge of
the river 12,370 cubic feet per second as against Mr. Goode-
man's estimate of 26,500 cubic feet, too low and prefer increas-
ing the 500' of water-way to 600' which at 100 is 60,000. Even
thus it is ~~about~~ only about one third of the cost of a cause-
way such as I believe would be necessary. There is nothing to
show in Mr. Goodeman's report how the discharge was arrived at.
Mr. Shalbolt provides for bridging the channel which is here
very well defined and the existence of mud walls along the
banks show that this river does not overflow its banks.

6. The length of the 2 lines are nearly equal, 24 miles, but
near Rannad the northern line will have to cross the river.

of the country to reach the town, while the southern line is located parallel to the drainage and follows the road, affording a good site for the Ramnad station. 4 P

7. As a minor point in the alignment near Madura I think it will be necessary to construct the triangle as the engine changing station will be at the present South Indian Railway Madura station and the question of running through trains -- from Madras or local ones from Madura cannot be decided for some years.

8. Gradients and curves, construction and engineering -- call for no remarks, except that I approve of the type of -- permanent way namely 80 lb. rails on 70 lb. cast iron pot -- sleepers.

9. The rates for stone work of all kinds are, I think, too low considering the long lead and they should be increased by ten per cent. The cost of the land also appears insufficient.

10. Traffic. I do not agree that either the Madras -- Podanur or Cuddalore Madura sections of the Madras and South Indian Railways respectively are so comparable under this head as the Madhavaram-Mutnet branch which also agrees closely with this line as to its capital cost per mile. The cost of the Madhavaram-Mutnet line is up to date Rs. 24,17,000 that is Rs. 44,000 per mile. Its earnings for one year September 1904 to September 1905 (after being opened 6 months) average

96 per mile work, this is 10% on the capital which at net re-

ceipts of $\frac{15}{100}$ gives $4\frac{1}{2}\%$. This may certainly be expected and
in addition thereto is the passenger pilgrim traffic to Rames-
swaram. 5 P

11. Taking into consideration the extra water-way required
over the Vairai and the low rates for stone work, I consider
the line will cost Rs. 42,000 per mile or Rs. 42,00,000. It
must be remembered that the Mavayam-Mutunet line was laid --
with second hand permanent way costing Rs. 12,500 per mile and
the bridging Rs. 10,000 per mile as against Rs. 5,000 and Rs.
23,300 per mile respectively in Mr. Shadbolt's estimate.

12. Mr. Georgehan's estimate for 1917 for the southern route is
here given by mile for comparison with the remark that the for-
mer was an approximate estimate.

Rate per mile.

	Shadbolt.	Georgehan.	Difference.
Preliminary expenses. ...	400	1,000	+ 600
Land ...	1,000	1,000	+ 2,000
Construction ...	8,000	12,000	+ 4,000
Ballast and permanent way...	23,000	20,000	- 3,000
Stations and buildings. ...	3,500	6,500	+ 3,000
Plant ...	300	2,000	+ 1,700
Rolling stock ...	—	9,000	+ 8,000
Establishment ...	4,000	5,000	+ 1,000
	41,200	59,500	+ 18,300

13. Mr. Shadbolt has examined the country beyond the Pan-
ban pass, island of Rameswaram, Adams Bridge, and Manar Island.

Mr. Waring, Chief Engineer Ceylon has also investigated
the same route.

Comparative estimate of cost.

	<u>Mile.</u>	<u>Shadbolt.</u>	<u>Waring.</u>
Pamban Strait Reef	1	10,50,000	45,00,000
" Swing Bridge	0	30,00,000	
Rameswaram Island ...	20	12,00,000	25,00,000
Adams Bridge ...	21	24,00,000	25,00,000
Manar Island ...	17	35,00,000	85,00,000

The Government of India has been addressed forwarding
the Note and suggesting that a detailed survey should be un-
dertaken as soon as practicable and criticism of the project
is deferred until the detailed survey has been completed.

J. Russell

Consulting Engineer for Railways.

Madras,

Dated the 20th Octr/07.

His Excellency the Governor.

From Mr. Bliss.

From Mr. Jinnah.

They are all of great importance to the public as well as to the L. I. R. The Madras Railway Co. make its necessary branches, & then it will give up its opposition to no. 3. It cannot be allowed to block an important line of communication indefinitely.

RS

18/11/95

We had some trouble over the Madras Railway business dealt with the Sec. of State. I have therefore added some words at the end of para 5 in the draft letter to India.

Capt. Shelley the ²⁷ Agent of the L. I. R. has arrived & I follow from him that his Board are very anxious to extend their Ry system:

1. the Madras Panbani
2. Tanjore & Arcot
3. Coimbatore & Bangalore

being considered their legitimate branches -
2. Of the first I submit a draft to the Govt. of India as great uncertainty appears to exist as to the concessions granted to Wallace Bros.

The India office were unable to discover whether there had been any concession ^{at all} granted, and whether ^{if granted} it was in the whole project to Coimbatore & Bangalore & Panbani &!!

3. This Govt. said that there is no necessity for not granting the concession in part & the Govt. of India has been asked to write for information.

4. If His Excellency in Council considers it desirable and in order, a telegram might be despatched ^{to the Govt. of India} asking that such letter deprecating the division of the whole project may be full consideration -

B. Form No. 12.

No.

Government of Madras.

PUBLIC WORKS DEPARTMENT,
RAILWAY BRANCH.

To

THE SECT. TO THE GOVT. OF INDIA,

P. W. DEPARTMENT.

CALCUTTA.

Madras, November 1895.

Sir,

In continuation of my No. 742R of 7th November 1895, I am directed to forward ^{report} the plans and sections -- and estimate of the Madura-Pamban -- project. *With a note by the Comd. Engr.*

2. This project is submitted with the fullest support of this Government as it is clearly shewn that it is an exceptionally cheap line to -- build and has much greater possibility than the Mayavaram-Mutupet branch which already returns 4 1/2% on Capital *however he decided to make this part of the expended. Should it [become hereafter]*

through
[a] main line to Ceylon the town of Sivagunga *could* be served by a branch and the main line taken more directly between Madura-Pamban.

*I don't quite understand this para 2:
I am under the impression that the*

3. With reference to this extension, I am to say that it is the opinion of His Excellency the Governor in -- Council that it ~~would be~~ highly desirable that it should be constructed by the Agency of the South Indian -- Railway rather than by a private -- firm.

4. This opinion has been consistently advanced by this Government for -- the extensions of the Madras Railway and seeing that most of the southern mainlines of India are already constructed, the same policy should it

be adopted in the

6. It is not understood whether the concession to Messrs:Wallace Brothers mentioned in para 3 of despatch 31 of 1894, to the Secretary of State, was intended to apply to the whole or part of the project; if there is any uncertainty therefore about this, I am to ask that the views of this Government, as expressed above, may have full consideration, so that the South India Railway may have the opportunity of undertaking this highly desirable and profitable branch at an early date.

This Govt. is anxious that this point should be impressed on the Sec. of State - and requests that its views may be laid before him fully - and if this has not been done, that he be desired by telegram, not to give out portions of the railway, until he has considered ~~our~~ ^{the} letter alluded to.

X requested } WJ
 (X) the }

of the Keweenaw - Keweenaw
Co? would the connecting line
root it up? Just, Keweenaw
would be on a loop line, upon a
branch. I wouldn't say anything
about future direct line to
Casper or branch to Sheringham

18/11/95

18/11/95

I do not see any objection to
our making this statement.
But I do not press it.

W
21 Nov

21 Nov
I have no objection to the being
hooked in this way - But as the
main line is pointed out that, if the
line is once more direct, the probability
of a branch being in future made to Shi-
vanga is remote, & that, if Shivanga
is not provided with Railway communication,
either by the line as now estimated for, or by
a branch (from Timpuramannam?) from the
direct line south of the river, the important
Shivanga Zamindari will be left out
in the cold altogether. This wd. be a great
 pity. Hence, ^{as the} country toward Him-
maten & Kalliardevil is by no means a
barren one - it wd. be instructive to the

Para 5 has been entered
as denied by His Excellency
- I have altered the wrong
slightly as the former
letter referred to in the
note has been sent to
the Secretary of State

Sum $\frac{15}{11} 95$

His Excellency the Governor
Hon W. Bliss
Hon H. F. Johnson

Draft may be - in
serting latter part of
para 2 is written -

Free $\frac{23}{11}$

HE. 2-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-60-61-62-63-64-65-66-67-68-69-70-71-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000-1001-1002-1003-1004-1005-1006-1007-1008-1009-1010-1011-1012-1013-1014-1015-1016-1017-1018-1019-1020-1021-1022-1023-1024-1025-1026-1027-1028-1029-1030-1031-1032-1033-1034-1035-1036-1037-1038-1039-1040-1041

Madras & Co
Railway Report

No. 742 Ray 7-11-95.

A.
 C. No. 792 R dated 23.11.95-
 793



I propose to send
these papers to be printed
at the Govt. Press. Please
see communication at foot of p. 1,
Ms. A. 9. 2. 2. R. W.

Copy 980. 20792R 23/11/95 with a copy
of report submitted sent to C. A. & the
Rev sent on 20.12.95

2. ~~Refugee. a. Ch. Mas: Pambay~~
- a - ~~Exr P. W. A. A. A.~~
- a - ~~Agent S. J. Ry.~~
- a - ~~Revenue Dept.~~
- a - ~~Colonial Secretary, Colombo.~~

Copies were sent to the

No 792. R. dated 23.4.95
PUBLIC WORKS DEPARTMENT,
RAILWAY BRANCH.

THE MADRAS GOVERNMENT.

Read the following :

74 Engineer-in-Chief, Madras.
Myl. Quila Railway Survey
October 1895, forwarding
plans, & estimate of the
work proposed.
As Engr. for Ry, dated

Ordered that the reports,
plans, sections, & estimates
of the Madaya - Pamban
Ryproject, ^{together} with ^{the} ~~the~~ volu-
thereon by the Com: Engr
for Ry. be forwarded
to the Govt of India, in
Continuation of N^o 742
dated 7.4.95

From R

42. 2-7-8

Government of Madras.

**PUBLIC WORKS DEPARTMENT,
RAILWAY BRANCH.**

To

THE SECT. TO THE GOVT. OF INDIA,

P. W. DEPARTMENT.

CALCUTTA.

Madras, 23rd November 1895.

SIR,

In continuation of my No.

742 R of 7th November 1895, I am directed to forward the report plans sections and estimate of the Madura-Pamban project with a note by the Consulting Engineer.

2. This project is submitted with the fullest support of this Government as it is clearly shewn that it is an exceptionally cheap line to build and has much greater possibilities than the Mayavaram-Mutupet branch which already returns 4½% on Capital expended. ←

3. With reference to this extension, I am to say that it is the opinion of His Excellency the Governor in Council that it is highly desirable that it should be constructed by the Agency of the South Indian Railway rather than by

Should it however be decided to make this branch a part of the main through line to Ceylon, the town of Swafunga could be served by a branch and

W
21 Nov

24/11/95
JG
22/11/95

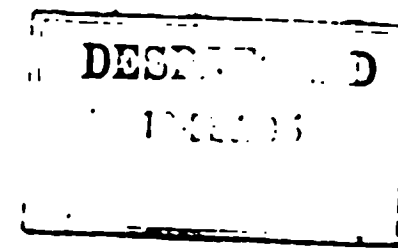
4. This opinion has been consistently advanced by this Government for extensions of the Madras Railway and seeing that most of the southern main lines of India are already constructed, the same policy should, it is thought, be adopted in the case of the South Indian as well as in other large Companies.

5. It will be noted that letter No. 1404 C of 30th March 1894, from this Government, laid especial stress on the offer to Messrs:Wallace Brothers being made to cover the whole project between Madura and Colombo including the Adam's bridge connection-as it was considered undesirable that a private Company -- should have concessions of short branches leaving the construction of the least profitable and most expensive work to the Government.

6. This Government is anxious that -- this point should be again impressed on the Secretary of State and I am to request that this letter be laid before him and that he be requested by telegram not to grant provisional concessions for portions of the Madura-Colombo project.

7. It is not understood whether the concession to Messrs:Wallace Brothers mentioned in para 3 of despatch 31 of -- to the Secretary of State, was in -- to the whole or part -- there is any un-

to ask that the views of this Government, as expressed above, may have full consideration, so that the South India Railway may have the opportunity of undertaking this highly desirable and profitable branch at an early date.

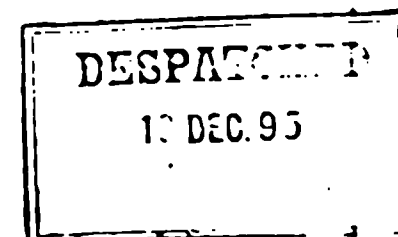


Free
1895
R.
9 P

Documents as sent?

- 1. Report & estimate to be copied*
- 2. Plans & sections over rule*
- 3. Note by Cons. Eng*

Fair despatch in R. office
on 23.11.95



Af.
No. 792 R. dated 13.11.95
793

Printed in the