

Public Works (1895) Department.

RAILWAY BRANCH.

G.O., No. 169 R

DATED 30th July

[Despatch Abstract.]

Institute at Arkonam: — Revised estimate of
Rs 5,784 for the Madras Railway, sanctioned.

BACK PAPERS.

[illegible]

FURTHER PAPERS.

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

INSPECTION REPORT—NILGIRI RAILWAY.

I made this inspection on the 14th and 15th May accompanied by the Engineer-in-Chief and the officers in charge of the different divisions.

General.—Since the date of the last inspection in May 1894, the very limited sum of two lakhs of rupees has been allotted for expenditure on works by the official liquidator. With such a small sum no great progress on works requiring a considerable expenditure can be expected. The Engineer-in-Chief has devoted the funds at his disposal mainly to such works as headings of tunnels and foundations of bridges and retaining walls, which, while requiring a less sum of money than big cuttings and embankments, take a long time to execute and require very careful supervision. Works which only needed a small expenditure to complete them have also been finished off. From a purely engineering point of view the dearth of funds has not been an unmixed evil since it has afforded opportunities to the Engineer-in-Chief and his staff to study the alignment and works in great detail, and many improvements and economies have been devised which would probably have been lost sight of in the ordinary course of construction.

The circumstances under which this railway has been and is being constructed are exceptional and it will be convenient, I think, to deal with it in five sections as under—

							MILES.
(1)	Coonoor to Runnymede	...	...	...	...	...	3
(2)	Runnymede to Hill Grove	...	...	...	...	...	3
(3)	Hill Grove to Adderley	...	...	...	...	...	3
(4)	Adderley to Kullar	...	...	...	...	...	3
(5)	Kullar to Méttupálayam	...	...	...	...	...	4½

in order that a better idea may be given of the amount of work done and of that remaining, as well as the probable time required to complete the line.

The following remarks apply to the line generally.

2. *Earthwork*.—Wherever possible, the line has been carried in cutting except on the flat portion between Kullar and Méttupalaiyam. For a rack railway it is essential that the rails should be everywhere at their correct level, and this condition of things is difficult to secure in embankments, the soil being very difficult to consolidate, and where the slope of the ground is considerable it is almost impossible to make a secure and stable bank. The cuttings, with the exception of a few heavy slips which are mentioned in the report on the different sections, have stood pretty well and will not give any unusual trouble to maintain.

3. *Revetment walls*—have been avoided as much as possible, but on such side-long ground they are of necessity pretty numerous. The foundations which are taken down well into the solid consist of face walls of masonry in lime with a core composed of large boulders set in concrete; the superstructure is usually dry rubble. The following table shows the progress :—

Total estimated number.	Finished.	In progress.	Not commenced.
45	16	10	19

4. *Minor bridges.*—A large proportion of the revetment walls being at the heads of gorges, the culvert forms part of the wall. Omitting those which are combined with retaining walls, the projected number of minor bridges is 113, and progress has been as follows :—

	Total estimated number.	Finished.	In progress.	Not commenced.
	113	60	Nil.	53

5. *Major bridges.*—In order to utilize the money at command to the best advantage, the policy has been to get all bridges founded, leaving the superstructure till afterwards. The foundation being the most troublesome part of the work and that which takes the longest time, the progress has been much better in fact than it appears: stone is abundant and of good quality and it will take but a short time to complete the superstructure. The masonry is of excellent quality. Precautions will have to be taken in the case of high piers on the 12 per cent. grade to provide against the horizontal thrust due to the train travelling up the rack. The Engineer-in-Chief proposes to increase the resistance of the pier to overturning by building in rails into the masonry. The girders will rest on cast-iron bed plates with their top surface parallel to the grade, and will be securely anchored to the lower pier or abutment, and will be left free to slide on the upper. The progress has been as under :—

Name.	Chainage.	Spans.		Height of abutments.		Height of piers.		Remarks.
		Number.	Length.	Total.	Executed.	Total.	Executed.	
1. Kaiteru ..	95	4	60	N. 12'	Comp.	(1) 36'	25'	
				S. 12'	Do.	(2) 46'	11'	
2. Holisul ..	120	1	40	N. 29'	19'	(3) 24'	24'	
				S. 27'	Comp.	..	..	
3. Runnymede ..	135	1	100	N. 16'	Do.	(1) 20'	12'	
				S. 18'	12'	..	..	
4. Coonoor ..	150	1	60	N. 30'	Comp.	..	..	Completed.
				S. 24'	Do.	..	..	
5. ..	188	1	60	N. 45'	30'	..	..	
				S. 29'	15'	..	..	
6. Ben Hope ..	223	1	60	N. 16'	Nil.	..	..	
				S. 19'	6'	..	..	
7. ..	277	1	60	N. 12'	Comp.	..	..	
				S. 12'	Do.	..	..	
8. ..	281	1	60	N. 70'	10'	..	..	
				S. 60'	23'	..	..	
9. ..	303	1	40	N. 28'	4'	..	..	
				S. 24'	4'	..	..	
10. ..	324	2	60	N. 32'	5'	(1) 30'	8'	
				S. 29'	5'	..	..	
11. Burliar ..	370	1	80	N. 8'	Nil.	(1) 45'	Comp.	
				S. 2'	Nil.	..	..	
12. ..	406	3	60	N. 12'	..	(1) 58'	18'	Abutments and one pier not commenced.
				S. 18'	..	(2) 38'	..	
13. ..	440	1	60	N. 45'	Nil.	..	..	Not begun. Pier founded; abutment found in progress.
				S. 45'	Nil.	..	..	
14. ..	466	1	60	N. 25'	..	..	..	Not begun.
				S. 25'	Nil.	..	..	
15. ..	470	2	60	N. 30'	..	(1) 48'	Nil.	
				S. 35'	..	..	..	
16. ..	474	1	60	N. 55'	5'	..	..	One abutment founded, execution of the other in progress.
				S. 55'	5'	..	..	
17. ..	525	3	60	N. 28'	3'	55'	8'	
				S. 20'	3'	51'	8'	
18. ..	545	2	60	N. 24'	16'	(1) 36'	22'	
				S. 21'	13'	(2) 46'	25'	
						(3) 36'	20'	
19. Kullar ..	565	3	60	N. 52'	15'	(1) 48'	23'	
				S. 43'	15'	(2) 46'	20'	
20. ..	585	1	60	N. 25'	Comp.	..	..	Completed.
				S. 25'	Do.	..	..	
21. ..	608	1	60	N. 28'	Do.	..	..	
				S. 29'	Do.	..	..	
22. ..	620	2	40	N. 23'	..	(1) 32'	Comp.	
				S. 28'	..	..	..	
23. Bhavanu ..	878	2	100	N. 32'	..	(1) 30'	Do.	Completed girders in position.
				S. 10'	..	(2) 42'	Do.	
						(3) 25'	Do.	

6. *Tunnels.*—There are nine tunnels on the line, but they are mostly short, the longest being 317 feet. They are all in progress except those of which the headings are through. The following table shows the progress in each :—

Number.	Chainage.	Length in feet.	Feet of heading driven.	Widening completed in feet.	Probable lining required.	Remarks.
1	176	317	Complete.	100	About 100'	Work stopped.
2	221	203	165'	50	Nil.	Do.
3	236	75	75	Commenced.	Nil.	In progress.
4	288	100	About to start.	..	Nil.	..
5	294	120	100	Nil.	Nil.	In progress.
6	372	288	112	Nil.	Nil.	Do.
7	477	151	Complete.	30	50'	Do.
8	486	279	229	Nil.	100'	Do.
9	506	60	25	Nil.	Nil.	Do.

7. *Ballast.*—In consequence of the steep gradient it has been decided to build ballast walls throughout the ghât: there is a tendency particularly on the lower portion to use stones of too small a size for this work: it is essential that only large stones should be used, the interstices only being packed with small. The space between ballast wall and side of cutting should be everywhere paved with stones except on hard rock.

The ballast is of good quality and consists of 6" of bottom ballast broken to 4" cube and 6" of top ballast broken to 1½" cube.

8. *Permanent-way.*—The whole of the rails, rack and fastenings and points and crossings are in stock, but 11½ miles of wooden sleepers are still to be purchased. The rails have now reached chain 621, or 5½ miles from Méttupálaiyam: the rack has also been fixed in position from Kullar station, chain 645, up to chain 621. This work has been very carefully executed; on curves each rail is cut to the exact calculated length and is brought to the proper curve by a rail-bending machine. At changes of gradient vertical curves are introduced which give a very finished appearance and will enable the pinion to engage smoothly with the rack at changes of gradient.

9. *Stations and buildings.*—There are four intermediate stations: Runnymede, Hill Grove, Adderley, and Kullar. Station sites are all levelled and gang-huts have been built at each. At Hill Grove and Kullar the station houses are completed, and that at Adderley is in progress. At Coonoor the station site is levelled and the goods and passenger platforms are complete, but no buildings have been begun as yet.

10. *Plant and rolling-stock.*—The remarks in the previous report still apply except that an engine has been borrowed from the South Indian Railway to work trains out to Kullar.

SECTION I.—COONOOOR TO RUNNYMEDE—3 MILES.

11. The section is nearly completed: the following works still remain :—

Earthwork cutting at chain 68.—Three-quarters finished; but a slip has occurred which will have to be cleared out, but is not, I think, likely to give serious trouble in future.

Cutting chain 94.—About seven-eighths finished; here also a slip has occurred to which the same remarks apply.

Cutting chains 98—102.—This has been commented on in a note by the Senior Government Inspector in the last report. The cutting has been taken out to formation throughout its length, but has been partially filled up again by a slip which extends far up the hill side and for a distance along the cutting of five chains. The hill side above the cutting is composed of boulders and clay resting on a rock bed, which slopes at a very high angle and crops out at a great height above the cutting. The detritus is permeated by springs and it would be practically impossible to drain it. It has not been found possible to bring the line any further out and it is proposed to meet the difficulty by building a heavy retaining wall carried well below formation and amply provided with deep holes and where necessary to cover in with arching. This would have to be done in short lengths and will take time: with luck and dry weather, perhaps eight months.

SECTION V.—KULLAR TO METTUPALAIYAM—4 $\frac{3}{4}$ MILES.

Completed.

30. Photographs are attached of a few of the more important works taken in the course of the inspection.

31. With regard to the important question of cost, the works having been done by a contractor (the late Mr R. Woolley), it is impossible to say exactly what the expenditure has been, but it may be taken roughly at from 18 to 20 lakhs of rupees: the Engineer-in-Chief estimates that 14 $\frac{1}{2}$ lakhs are still required to complete the line, making the total cost from 32 $\frac{1}{2}$ to 34 $\frac{1}{2}$ lakhs: this sum approximates very closely to the amount shown in the detailed estimate embodied in G.O. No. 1106 R., dated August 19th, 1893, which aggregated to Rs. 32,75,207.

32. As regards the time required to complete the works assuming that the necessary money is provided to push the work as much as possible, I think it could be finished in eighteen months and that it would not be wise to count on any earlier date for completion.

15th June 1895.

(Signed) F. D. FOWLER,
Government Inspector of Railways.

Note by Senior Government Inspector.

The report of the Government Inspector of Railways is satisfactory as regards the execution of the work. When funds are available, the work pointed out in paragraph 20 should be undertaken at once. Proposals to raise additional funds to complete the line are before the Government of India for their consideration.

17th June 1895.

(Signed) F. R. UPCOTT,
Senior Government Inspector.

28TH JUNE 1895, No. 432 R., PUBLIC WORKS.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Railway.

Read the following paper:—

Report on Inspection of the Nilgiri Railway, dated 15th June 1895.

ORDER—dated 28th June 1895, No. 432 R., Public Works.

Ordered that a copy of the Inspection report be forwarded to the Government of India, and to the undermentioned officers for information:—

- (1) The Engineer-in-Chief, Nilgiri Railway.
- (2) „ Official Liquidator, „
- (3) „ Agent and Manager, Madras Railway.
- (4) „ Examiner of Railway Accounts.

[Here enter No. 433 R., dated 28th June 1895.]

(True Extract.)

Under Secy. to Govt., P.W.D.,
Railway Branch.

To the Engineer-in-Chief, Nilgiri Railway.
„ Official Liquidator, „
„ Agent and Manager, Madras Railway.
„ Examiner of Railway Accounts.

Exd. T. K. Narayana Aiyangar.
Spare Copies

RAILWAY.

Govt. of {1895} Madras.

PUBLIC WORKS.

Dated June, 28th.

Recd.

Encl.

G.O., 28th June 1895, No. 432 R.

JUNE.

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INSPECTION REPORT—NILGIRI RAILWAY.

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General.—Since the date of the last inspection in May 1894, the very limited sum of two lakhs of rupees has been allotted for expenditure on works by the official liquidator. With such a small sum no great progress on works requiring a considerable expenditure can be expected. The Engineer-in-Chief has devoted the funds at his disposal mainly to such works as headings of tunnels and foundations of bridges and retaining walls, which, while requiring a less sum of money than big cuttings and embankments, take a long time to execute and require very careful supervision. Works which only needed a small expenditure to complete them have also been finished off. From a purely engineering point of view the dearth of funds has not been an unmixed evil since it has afforded opportunities to the Engineer-in-Chief and his staff to study the alignment and works in great detail, and many improvements and economies have been devised which would probably have been lost sight of in the ordinary course of construction.

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							MILES.
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(2) Runnymede to Hill Grove	...	...	...	...	...	...	3
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(5) Kullar to Méttupálaiyam	...	...	...	...	...	...	4½

in order that a better idea may be given of the amount of work done and of that remaining, as well as the probable time required to complete the line.

The following remarks apply to the line generally.

2. *Earthwork.*—Wherever possible, the line has been carried in cutting except on the flat portion between Kullar and Méttupálaiyam. For a rack railway it is essential that the rails should be everywhere at their correct level, and this condition of things is difficult to secure in embankments, the soil being very difficult to consolidate, and where the slope of the ground is considerable it is almost impossible to make a secure and stable bank. The cuttings, with the exception of a few heavy slips which are mentioned in the report on the different sections, have stood pretty well and will not give any unusual trouble to maintain.

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SECTION V.—KULLAR TO METTUPALAIYAM—4 $\frac{3}{4}$ MILES.

Completed.

30. Photographs are attached of a few of the more important works taken in the course of the inspection.

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Forwarded.

(By order.)

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RAILWAY.

Govt. of {1895} Madras.
PUBLIC WORKS.

Dated June, 28th.

Recd.

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The following remarks apply to the line generally.

2. *Earthwork.*—Wherever possible, the line has been carried in cutting except on the flat portion between Kullar and Méttupálaiyam. For a rack railway it is essential that the rails should be everywhere at their correct level, and this condition of things is difficult to secure in embankments, the soil being very difficult to consolidate, and where the slope of the ground is considerable it is almost impossible to make a secure and stable bank. The cuttings, with the exception of a few heavy slips which are mentioned in the report on the different sections, have stood pretty well and will not give any unusual trouble to maintain.

3. *Revetment walls*—have been avoided as much as possible, but on such side-long ground they are of necessity pretty numerous. The foundations which are taken down well into the solid consist of face walls of masonry in lime with a core composed of large boulders set in concrete; the superstructure is usually dry rubble. The following table shows the progress:—

Total estimated number.	Finished.	In progress.	Not commenced.
45	16	10	19

4. *Minor bridges.*—A large proportion of the revetment walls being at the heads of gorges, the culvert forms part of the wall. Omitting those which are combined with retaining walls, the projected number of minor bridges is 113, and progress has been as follows:—

Total estimated number.	Finished.	In progress.	Not commenced.
113	60	Nil.	53

5. *Major bridges.*—In order to utilize the money at command to the best advantage, the policy has been to get all bridges founded, leaving the superstructure till afterwards. The foundation being the most troublesome part of the work and that which takes the longest time, the progress has been much better in fact than it appears: stone is abundant and of good quality and it will take but a short time to complete the superstructure. The masonry is of excellent quality. Precautions will have to be taken in the case of high piers on the 12 per cent. grade to provide against the horizontal thrust due to the train travelling up the rack. The Engineer-in-Chief proposes to increase the resistance of the pier to overturning by building in rails into the masonry. The girders will rest on cast-iron bed plates with their top surface parallel to the grade, and will be securely anchored to the lower pier or abutment, and will be left free to slide on the upper. The progress has been as under:—

Name.	Chainage.	Spans.		Height of abutments.		Height of piers.		Remarks.
		Number.	Length.	Total.	Executed.	Total.	Executed.	
1. Kaitera ..	95	4	60	N. 12'	Comp.	(1) 36'	25'	Completed.
2. Holleul ..	120	1	40	S. 12'	Do.	(2) 46'	11'	
3. Runnymede ..	135	1	100	N. 29'	Comp.	(3) 24'	24'	
4. Coonoor ..	150	1	60	S. 27'	Do.	..	..	
5. ..	188	1	60	N. 16'	Comp.	(1) 20'	12'	
6. Ben Hope ..	223	1	60	S. 18'	Do.	..	..	
7. ..	277	1	60	N. 30'	Comp.	..	..	
8. ..	281	1	60	S. 24'	Do.	..	..	
9. ..	303	1	40	N. 45'	Comp.	..	..	
10. ..	324	2	60	S. 29'	Do.	..	..	
11. Burliar ..	370	1	80	N. 16'	Nil.	(1) 30'	8'	
12. ..	406	3	60	S. 2'	Nil.	(1) 45'	Comp.	
13. ..	440	1	60	N. 12'	..	(1) 58'	18'	
14. ..	466	1	60	S. 18'	Nil.	(2) 38'	..	
15. ..	470	2	60	N. 45'	Nil.	..	..	
16. ..	474	1	60	S. 45'	Nil.	..	..	
17. ..	525	3	60	N. 25'	..	..	..	
18. ..	545	2	60	S. 25'	Nil.	..	..	
19. Kullar ..	565	3	60	N. 30'	..	(1) 46'	Nil.	
20. ..	585	1	60	S. 35'	..	..	..	
21. ..	608	1	60	N. 55'	..	..	..	
22. ..	620	2	40	S. 55'	..	..	..	
23. Bhavanu ..	878	2	100	N. 28'	..	..	..	
		2	60	S. 20'	..	..	..	
				N. 24'	16'	(1) 36'	22'	Completed.
				S. 21'	13'	(2) 46'	25'	
				N. 52'	15'	(3) 36'	20'	Completed.
				S. 43'	15'	(1) 48'	23'	
				N. 25'	Comp.	(2) 46'	20'	Completed.
				S. 25'	Do.	..	..	
				N. 28'	Do.	..	..	Completed.
				S. 29'	Do.	..	..	
				N. 23'	..	..	..	Completed.
				S. 28'	..	..	..	
				N. 32'	..	(1) 32'	Comp.	Completed girders in position.
				S. 10'	..	(1) 30'	Do.	
						(2) 42'	Do.	
						(3) 25'	Do.	

6. *Tunnels.*—There are nine tunnels on the line, but they are mostly short, the longest being 317 feet. They are all in progress except those of which the headings are through. The following table shows the progress in each:—

Number.	Chainage.	Length in feet.	Feet of heading driven.	Widening completed in feet.	Probable lining required.	Remarks.
1	176	317	Complete.	100	About 100'	Work stopped.
2	221	203	165'	50	Nil.	Do.
3	236	75	75	Commenced.	Nil.	In progress.
4	288	100	About to start.	..	Nil.	..
5	294	120	100	Nil.	Nil.	In progress.
6	372	288	112	Nil.	Nil.	Do.
7	477	151	Complete.	30	60'	Do.
8	486	279	229	Nil.	100'	Do.
9	506	60	25	Nil.	Nil.	Do.

7. *Ballast.*—In consequence of the steep gradient it has been decided to build ballast walls throughout the ghât: there is a tendency particularly on the lower portion to use stones of too small a size for this work: it is essential that only large stones should be used, the interstices only being packed with spall. The space between ballast wall and side of cutting should be everywhere paved with stones except on hard rock.

The ballast is of good quality and consists of 6" of bottom ballast broken to 4" cube and 6" of top ballast broken to 1½" cube.

8. *Permanent-way.*—The whole of the rails, rack and fastenings and points and crossings are in stock, but 11½ miles of wooden sleepers are still to be purchased. The rails have now reached chain 621, or 5¼ miles from Méttupálaiyam: the rack has also been fixed in position from Kullar station, chain 645, up to chain 621. This work has been very carefully executed; on curves each rail is cut to the exact calculated length and is brought to the proper curve by a rail-bending machine. At changes of gradient vertical curves are introduced which give a very finished appearance and will enable the pinion to engage smoothly with the rack at changes of gradient.

9. *Stations and buildings.*—There are four intermediate stations: Runnymede, Hill Grove, Adderley, and Kullar. Station sites are all levelled and gang-huts have been built at each. At Hill Grove and Kullar the station houses are completed, and that at Adderley is in progress. At Coonoor the station site is levelled and the goods and passenger platforms are complete, but no buildings have been begun as yet.

10. *Plant and rolling-stock.*—The remarks in the previous report still apply except that an engine has been borrowed from the South Indian Railway to work trains out to Kullar.

SECTION I.—COONOR TO RUNNYMEDE—3 MILES.

11. The section is nearly completed: the following works still remain:—

Earthwork cutting at chain 68.—Three-quarters finished; but a slip has occurred which will have to be cleared out, but is not, I think, likely to give serious trouble in future.

Cutting chain 94.—About seven-eighths finished; here also a slip has occurred to which the same remarks apply.

Cutting chains 98—102.—This has been commented on in a note by the Senior Government Inspector in the last report. The cutting has been taken out to formation throughout its length, but has been partially filled up again by a slip which extends far up the hill side and for a distance along the cutting of five chains. The hill side above the cutting is composed of boulders and clay resting on a rock bed, which slopes at a very high angle and crops out at a great height above the cutting. The *detritus* is permeated by springs and it would be practically impossible to drain it. It has not been found possible to bring the line any further out and it is proposed to meet the difficulty by building a heavy retaining wall carried well below formation and amply provided with deep holes and where necessary to cover in with arching. This would have to be done in short lengths and will take time: with luck and dry weather, perhaps eight months.

SECTION V.—KULLAR TO METTUPALAIYAM—4 $\frac{3}{4}$ MILES.

Completed.

30. Photographs are attached of a few of the more important works taken in the course of the inspection.

31. With regard to the important question of cost, the works having been done by a contractor (the late Mr. R. Woolley), it is impossible to say exactly what the expenditure has been, but it may be taken roughly at from 18 to 20 lakhs of rupees: the Engineer-in-Chief estimates that 14 $\frac{1}{2}$ lakhs are still required to complete the line, making the total cost from 32 $\frac{1}{2}$ to 34 $\frac{1}{2}$ lakhs: this sum approximates very closely to the amount shown in the detailed estimate embodied in G.O. No. 1106 R., dated August 19th, 1893, which aggregated to Rs. 32,75,207.

32. As regards the time required to complete the works assuming that the necessary money is provided to push the work as much as possible, I think it could be finished in eighteen months and that it would not be wise to count on any earlier date for completion.

15 June 1895

Encl.

Photographs attached

Senior Govt Inspector

Note of Senior Consulting Engineer

The report of the Deputy Consulting Engineer in satisfaction as regards the execution of the work,

when funds are available the work pointed out in para 20 should be undertaken at once.

Proposals to raise additional funds to complete the line are before the Govt. of India for their consideration.

F. Russell

Consulting Engineer

Senior Government Inspector

17 June 1895

(R) Form No. 3.

N^o 432. Dated 28.6.95

PUBLIC WORKS DEPARTMENT,

RAILWAY BRANCH.

PROCEEDINGS OF THE MADRAS GOVERNMENT.

Read the following

Report on inspection of the Nilgiri Railway dated 15th June, 1895.

Ordered that a copy of the Inspection Report be forwarded to the Government of India and to the undermentioned officers for information.

(1) The Engineer-in-Chief Nilgiri

(2) & official Liquidator Nilgiri

(3) & Agent & Manager Nilgiri

(4) & Examiner of Accounts

D.O. No 433. R. of 28th June 1895

Forwarded

28/6/95

To The Engineer-in-Chief Nilgiri
 & official Liquidator Nilgiri
 & Agent & Manager Nilgiri
 & Examiner of Accounts

A.

N^o 432 R 156 28.6.95
433