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Local & Munl. (1896) Department.

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G.O., No. 1917 Z

DATED 14-10-96

INDEXED.

[Despatch Abstract.]

South Indian Railway

Recording G.O. P. W.D. communicating ~~to the Agent for necessary action~~ the Senior Government Inspector's report of inspection of the —— for the half-year ended the 30th June 1896.

BACK PAPERS.

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

FURTHER PAPERS.

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

[L. & M. 500—18-8-96.]

Local & Munl. (189) Department.

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SUBJECT.

South Indian Railway.

Comp. to the Agent for necessary action the Senior Government Inspector's report of inspection of the —— for the half-year ending 30.6.96.

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BACK PAPERS.

G.O.	No.	Department.	Date.

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RAILWAY.

Government {1896} of Madras.

PUBLIC WORKS.

Local & Municipal Dept.
G.O. No. 2732

Recd. 5 OCT. 96 } 1896.

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G.O., No. 785 R., 15th September 1896.

SEPTEMBER.

South Indian Railway

The Senior Government Inspector's report of inspection of the — for the half-year ended the 30th June 1896, communicated to the Agent for necessary action.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Railway.

Read the following paper :—

SOUTH INDIAN RAILWAY.

(Metre Gauge.)

Mileage = 1,104 *miles.*

Inspection Report of Mr. C. W. HODSON, Senior Government Inspector of Railways, for the half-year ending 30th June 1896.

The inspection was made by me between the 20th July and the 1st August 1896. The Acting Chief Engineer (Mr. F. F. Smith) was present throughout the inspection, and the Superintending Physician (Dr. Oliver) during the greater part of it, and the Resident Engineers and Assistant Traffic Managers and Assistant Locomotive Superintendents joined the inspecting party over the respective districts. The Agent (Captain Shelley, R.E.) and the Traffic Manager (Mr. Stenson) also accompanied the party from Trichinopoly to Madura on the 27th July 1896.

2. **General.**—The line is well maintained, and the road usually in good running order, with the exception that sufficient attention does not seem to have been directed to the rail-joints. These have been allowed to get into a slack condition, from which it will be very difficult to work them up again. The stations and yards were clean and neatly kept, and all had evidently been well brushed up for the inspection. It is to be hoped that they will be equally well kept for the benefit of the public.

3. **Banks and Cuttings.**—These are neat and well kept, and apparently of full section. The grass is kept off the ballast, and even off the top of formation, which is, I think, rather a pity as it helps to consolidate the bank and check dust. But the aloe fencing is allowed to grow too close to the formation, chiefly in the Madura district, and should be prevented from spreading over much.

4. **Bridges and Culverts.**—The maintenance of the bridges and culverts is well attended to, and the condition of the timbering is good, except in a few isolated instances where renewals have been temporarily delayed in connection with the strengthening operations.

5. The following bridges are badly cracked, apparently from settlement of the foundations, viz. :—

10	feet	girder	bridge	at A. 36/3	on Arkonam branch.
10	,,	,,	,,	at A. 36/6	on ,, ,,
10	,,	,,	,,	at 220/1	on Máyavaram-Mutupet railway.
20	,,	,,	,,	at 220/2	on ,, ,, ,,

but they have been effectively shored up with timber struts, and are carefully watched. Proposals are under consideration for rebuilding them, but I would suggest that it would probably suffice to turn an eight-foot arched culvert, with invert, within the 10 feet spans, if it be found that this would not constrict the waterway too much.

6. Considerable attention is being directed to the maintenance of the ironwork of the girder bridges. A considerable number of girders have been painted recently, and others are in hand. A special subordinate is entertained for the better inspection and repair of girderwork, and for the strengthening operations, and where defects such as loose rivets have been found they have been put right. The overhead bracing of the Whipple Murphy girders has been completed.

7. Much damage has, however, evidently resulted from want of care, or the use of unsuitable materials, in the past. For example the girders of the Devanuddy bridge, near Negapatam, which have recently been taken out of the road, are very badly corroded ; although apparently well covered with tar or pitch, the corrosion has gone on under the tar, and some of the plates are nearly eaten through. This action is apparently not an unusual one under tar, so all ironwork so painted should be carefully inspected, and if necessary scraped, before another coat is applied. It may be guarded against by boiling a little quick lime with the tar in order to remove moisture and free acids.

8. Cross sleepers are being substituted for the old longitudinals wherever practicable, both as a portion of the strengthening operations where this will enable weak cross girders to be dispensed with, and also in the ordinary course of renewals where the longitudinal timbers are badly split or otherwise defective. A list of the bridges which it is proposed to cross sleeper, including those already done, is attached as appendix F. Some of the bridges which have been cross sleepered in the past, particularly some on the Máyavaram-Mutupet line, have a very poor "top"; but more care is evidently being taken now, and at the last bridge which has been done, viz., that over the Vaigai, near Madura, there is little fault to find.

9. **Girder strengthening.**—With the exception of continuing to substitute teak cross sleepers for the longitudinals resting on the weak T-iron cross girders on the Vaigai and other similar bridges, nothing has been done since the date of last inspection towards the strengthening of the remaining girders, but the necessary calculations and estimates for the work are now well in hand, and it is hoped that they will soon be ready for consideration.

10. The present state of affairs is as follows. The small span girders enumerated in the inspection report for half-year ending 31st December 1894, which were undoubtedly weak by the Board of Trade standard, have been strengthened, some up to that standard and some up to the standard of the Government of India. Small spans with weak cross girders resting on the bottom flange still remain, and it is proposed to bring these up to the Government standard by drawing the main girders in nearer together and thus shortening the cross girders, for all spans up to about 20 feet, where this will not infringe standard dimensions, and by adding plates or providing new girders for the rest. In some of the larger spans it is proposed to add intermediate piers, where the waterway will permit this.

11. But the larger question still remains to be decided, viz., how far the new Government of India standard is to be applied to old girders which do not as yet show any sign of weakness, and which in most cases are nearly, if not quite, up to the old Board of Trade standard. It has been roughly estimated that to bring up the whole of the girders on the South Indian Railway to the Government standard for 'O' class engines would cost over Rs. 11,00,000 ; and it would imply either cutting about and patching, or else condemning and replacing, a large number of girders which apparently are well up to their work. The question arises whether such tinkering may not in many cases leave the girders really no stronger than before ; and, further, whether it is worth while to incur such a large expenditure of time, money and trouble merely to comply with a theoretical standard as set forth in a "rule" which is by no means universally approved, and is still admittedly imperfect and likely to be modified before long. It is believed that this "rule" was originally put forward for guidance in designing future girders, and as such it is generally accepted for adoption ; but its rigid extension to girders designed in the past is strongly objected to by many, and with good reason.

12. It appears to me that the plan which should be recommended for the sanction of Government is that all girders which are not more than, say, 20 per cent. weak under *existing* rolling stock, according to *either* the Government or the Board of Trade rules, may be allowed to remain in use without alteration for the present, and with no restriction other than that those which are more than, say, 10 per cent. weak should be specially inspected and reported upon periodically (say every two years). All that are below standard by more than the percentages suggested above (or such other percentages as may be decided upon) should be strengthened up to the full Government of India standard (not merely for actual engines, but for the heaviest possible

type permissible under standard dimensions) if this can be done at reasonable expense. If, however, such strengthening is considered unnecessary or undesirable from any cause, the special case should be dealt with either by a restriction in speed, or by prohibition against the use of certain classes of engines, and should be specially reported to the Government of India.

13. As an example, take the case of the Whipple Murphy girders on the South Indian Railway. These are of various classes, viz. :—

150 feet,	28 spans	with pin connections	and 13	with rivetted joints.
120 „	22	„	„ 8	with „
100 „	41	„	„ 7	with „
70 „	—	„	„ 2	with „
65 „	—	„	„ 6	with „

Those with pin connections are somewhat weak in certain parts as shown in appendix G (which has been furnished by the Chief Engineer, South Indian Railway, and has not been checked by this office). It will be seen that the weakest members of the 150 feet spans are below standard by the following percentages (calculated on existing areas), viz. :—

Member.	Percentage below Government standard.	Percentage below Board of Trade.
Top boom	10	22
Bottom boom links	17	12
Web tie-bars	29	1
Cross girders	28	*Nil.*
Rail-bearers	9	*Nil.*

Now it is impossible to strengthen the web tie-bars at all without taking the whole girder to pieces; and although additional plates might be "gummed on" to the top boom, and additional tie-bars added to the bottom boom, still it is certain that unless the girder could be freed entirely from all strain, these additions would not be of any appreciable benefit in relieving the stress in the existing members. The main girders are in excellent condition, and show no sign of weakness. The same applies to all the other pin-connected Whipple Murphy girders; the only signs of weakness which have yet been found are the single flawed link in the 120 feet girder at mile 92/3, referred to in paragraph 12 of inspection report for 30th June 1895 (which has been remedied by adding an extra tie-bar alongside of it which will take up the tension if the flawed one ever really fails), and certain minute marks on a few of the stirrups which suspend the cross girders, which are believed not to be flaws, but the worst of which (at Pennair bridge 17 × 100 feet at mile 105) has been remedied by a supplementary arrangement of hanger bolts which is neat and effective.

14. I therefore think that the main girders of these bridges of 70 feet span and over may well be left unstrengthened. The cross girders can be comparatively easily strengthened by adding extra plates, top and bottom, and as they are of small depth this method will probably be effectual. The rail-bearers are practically up to the prescribed standard, but being in some cases of less depth than the cross girders require small brackets under them, as the rivets at their ends are found to work loose. The horizontal bracings also are in some cases insufficiently rivetted to the platform girders, and this should be remedied; it can easily be done. When the above have been completed, the present restriction of speed (20 miles an hour) might perhaps be relaxed, but the girders should be periodically examined and reported upon by the Chief Engineer. If the stirrups show any further sign of weakness, the extra hangers can be easily added; and as the longitudinal timbers wear out, they should preferably be replaced by cross sleepers.

15. The six spans of 65 feet girders at the Adyar bridge are, however, of bad design and workmanship; and although they are up to Board of Trade requirements and are theoretically only slightly under the Government of India standard, still the Chief Engineer proposes to condemn them entirely and get out a new set of girders for the bridge. In this proposal, I concur. In the meanwhile a 20 miles speed restriction is in force, and should remain so.

16. Another point which has not yet been settled is the manner in which the Government rules should be applied. The Government of India apparently have declined to specify how the calculations should be made, preferring to leave such

details to the Engineers concerned. Consequently, the calculations made by the South Indian Railway Engineers are vitiated by the fact that they have neglected the effect of the fixation of the ends of the cross girders, which in some cases at least (*e.g.*, the small girders up to 30 feet span on the Erode branch) is fairly complete, and capable of being made more so; and also that of the continuity of some of the main girders (*e.g.*, those on the Negapatam line, and the 63 feet girders obtained from the Madras Railway). Also the wind pressure has been taken as a vertical distributed dead load equal to the horizontal pressure on the vertical exposed surfaces as laid down in Government of India No. 1369 R.C. of 13th December 1892. This it certainly cannot be, but, on the other hand, the method proposed in the Technical Section papers, Nos. 44 and 44 A, gives results usually much in excess of what are ever likely to occur. It is understood that these latter papers only express private opinions, and it is highly desirable that the Government of India should authoritatively promulgate the procedure it desires to be adopted.

17. A girder which may require strengthening, and has not yet been investigated, is the group of 40 feet girders which serve instead of a pier on the viaduct over the Madras Railway at mile 270 B near Rénigunta.

18. **Level crossings.**—The gate lodges near Egmore have been fitted with electric bells by which the gatekeepers are supposed to be warned and to warn each other of the approach of trains. That even this precaution, however, is not sufficient to prevent accidents is proved by an accident which occurred at the gate near Trichinopoly on the date of inspection, when the gatekeeper is said to have been asleep and to have left a white hand signal lamp outside his hut, while the gate lamps were unlighted; consequently a train ran through and smashed the gate.

19. In a few cases semaphore signals are provided to protect the gates, but this course is costly. What is required is a simple device by which a red signal shall be shown on the gate post at all times, except when the gate is closed and locked across the roadway. This can be effected by arranging that the act of shooting the bolt in that position shall move, to "all right," a signal weighted so as to show "danger" under all other circumstances.

20. There are many quadruple gates, but I only noticed one in which the gatekeeper could actuate all the leaves simultaneously, and this did not work satisfactorily as the leaves were connected by single wire-ropes, with consequent troubles due to slackness and expansion. The system patented by Mr. Fred. Reilly (late Executive Engineer, North-West Railway, Saharanpur) by which the leaves are rigidly connected by rods, is much superior and by no means costly, and its adoption has been sanctioned in Government of India No. 556 G., dated 17th February 1894 (communicated to the Agent, in Consulting Engineer's No. 665 of 27th February 1894).

21. Of the less important level crossings there are two classes, viz., those which are guarded by gate-keepers, and those which are not. The former are marked by a T-shaped signal, painted red, so that drivers or officials in passing trains can tell whether the gatekeeper ought to be present or not. The others have a self-closing device consisting usually of a swinging bamboo, which, however, does not always work efficiently.

22. **Fencing, &c.**—The whole of the main line from Madras to Tuticorin, together with the old Great Southern India line from Negapatam to Erode, and the branches to Arkonam and Tinnevelly, is supposed to be fenced, but the frequency of cattle accidents proves that the fencing is by no means efficient. It is in fact mostly aloe fencing, which is necessarily full of gaps, and though a large portion of the live fence has been supplemented by wire, still much more remains to be done in this direction. An estimate for an aggregate of about $11\frac{1}{4}$ miles has been submitted for sanction by the Agent, but has been returned for revision of rates and for reconsideration of the allocation, which was mainly made to capital, only the original cost of planting the original line of aloe cuttings being charged to Revenue. It appears to me that Revenue should bear the entire cost.

23. It is said that an excellent live fence can be made of a thorny shrub, largely used for fencing fields in the neighbourhood of Erode and locally known as the "Kiloray thorn." It seems to grow well in very dry soil and to require little watering or attention, and I would suggest its being tried in the neighbourhood named,

and if found successful, its use might be extended elsewhere. But this should not interfere with the gradual substitution of wire for the aloe all along the main line.

24. The extensions to Dharmavaram and Nellore which were constructed by the State, and the Máyavaram-Mutupet Railway which was built from joint District and State funds, are not fenced at all except at stations. The former run through a sparsely-populated country and hardly seems to require fencing. The latter runs through a well cultivated district, abounding in cattle, but there are as yet few night trains, and I am assured that cattle accidents are not more frequent on it than on the so-called fenced section.

25. Boundary stones are being fixed along the Arkonam branch to demarcate land claimed by the railway, but it is not clear on what authority this claim is based. Such operations should be carried out in conjunction with the Revenue authorities, or the result will be useless and misleading.

26. At Chetput some squatters have been allowed to erect huts within railway limits, as marked by the boundary stones and said to be shown by the plans. This is doubtless due to the fact that, from motives of economy, only a portion of the station plot has been fenced. There is now a difficulty in getting the squatters to move. The Civil authorities should be consulted.

27. **Ballast.**—The ballast generally is good; usually clean laterite gravel, and is being covered with broken stone to keep down the dust.

28. On the Villupuram-Dharmavaram section, sand or fine gravel has been largely laid, and with the steel pea-pod sleepers makes a most excellent road. Orders have, however, been issued to replace it by broken stone, and the work is in hand and a great deal has been done. Unless the sand or gravel contains salts likely to corrode the sleepers with undue rapidity, I venture to think that this procedure is a mistaken one. Broken stone will never make such a good road with steel sleepers as coarse sand or fine gravel does, and the difference both in noise and jolting between the two classes of road on this section is most marked. Moreover, if stone is unavoidable, on account of the presence of salts in the gravel, then it should be broken much smaller: what is being used is understood to be specified to go through a $1\frac{1}{4}$ inch ring, but very little of it would do so.

29. **Permanent-way.**—The whole of the main line from Egmore to Tuticorin has, with the exception of about $2\frac{1}{2}$ miles between mile 253 and 256 (just south of Trichinopoly), and about 10 miles between mile 414 and 425 (exclusive of Kadambúr station), been relaid with 50 lb. steel B.H. rails and pot sleepers. The balance is still 40 lb. F.F. rails on wooden sleepers. The indent for the material required to finish this relaying has been unduly delayed, for financial and other reasons, and should be sent forward without further delay.

30. The pot sleepers at first obtained for the above were cast with two recesses each for wooden cushions, but it is found that these cushions are by no means effective and require very constant attention and renewal; so the last pots supplied have been made without these recesses. Cast iron cushions have been made locally, and substituted for the wooden ones near Trichinopoly, and, as they are found to answer, it is proposed to introduce them over the whole line. Some two millions will be required, weighing over 1,100 tons.

31. The condition of the last relaid portion is very good, but that of the earlier relaid portions is by no means so excellent as is to be expected with this class of permanent-way. The joints have been allowed to go down, and the rails have probably become hogged, and much trouble will be necessary to get them straight again. Special attention should be given to remedy this defect and to avoid it in future.

32. The Tinnevelly branch is still laid with 40 lb. F.F. rails on creosoted pine sleepers. Ordinary renewals are being made, as required, with steel $41\frac{1}{4}$ lb. F. F. rails and pingadu sleepers, and the latter have been already put in at most joints. The Máyavaram-Mutupet Railway was laid with second-hand 40 lb. rails on new pingadu sleepers. Both these sections are in as good order as can be expected from such classes of permanent-way, except that the joints are slacker than they should be.

33. The line from Negapatam to Erode, with the exception of the portion from Tanjore to Trichinopoly (which has been relaid as it forms part of the South Indian Railway main line), is still laid with the old G.S.I.R. type of 68 lb. iron D. H. rail on pot sleepers. The joints are bad and many of the rails, particularly between Negapatam and Tanjore, are showing signs of wear, and it will not be long before relaying will have to be undertaken. It is under consideration to adopt a rail of slightly different section to that used on the main line, as this does not make a good fit with the 68 lb. pots which, though old, are still fit for many years more.

34. The Villupuram-Dharmavaram section is laid with $41\frac{1}{4}$ lb. steel F.F. rails and steel pea-pod sleepers with stamped lugs. The length between mile 344 and 373 was originally laid with 40 lb. iron F.F. rails; these are being relaid with $41\frac{1}{4}$ lb. steel at the rate of about a quarter of a mile per month; about 22 miles still remain. The condition of this steel road is certainly superior to that of any other portion of the South Indian Railway, although only five men and a mate are entertained for lengths of 3 miles.

35. The Nellore-Pákala Section is laid with $41\frac{1}{4}$ lb. steel F.F. rails. The sleepers are sometimes steel pea-pod with rivetted lugs, and sometimes a cast iron composite plate known locally (but erroneously) as the Denham Olpherts. The former are corroding badly, and are distinctly inferior to the stamped lug type used on the Villupuram-Dharmavaram Section. The latter are complicated, easy to break, and difficult to maintain, and are much less satisfactory than their prototype, the original D and O sleeper, found so good on the East Indian and other Railways. Ordinary renewals are effected with the same class of sleeper as is removed; I think this should be stopped, and nothing but good pingadu sleepers used for renewals on this section, unless a good cast iron pot for F.F. rails can be devised as suggested in the inspection report for the half-year ending 30th June 1895.

36. The usual statement showing the renewals of rails and sleepers on the South Indian, Pondicherry, and Máyavaram-Mutupet Railways during the half-year ending 30th June 1896 are attached as appendices A and B. Two other statements showing the length of different kinds of permanent way and lengths in main line still remaining to be relaid with 50 lb. rails on 30th June 1896 are attached as appendices C and D.

37. **Station—Buildings, Platforms, &c.**—A great improvement is noticeable in the state of affairs indicated by the remarks in paragraph (9) of the last Inspection Report. Very considerable trouble had evidently been taken to clean up all the stations and buildings. In some cases this was carried to excess, *e.g.*, tubs from the waiting rooms had been sent to be painted, and not got back again nor replaced temporarily by others, and in the zeal for cleanliness floors were flooded and latrines freshly tarred and unusable. It is good to ensure that there shall be a general cleaning up at least twice a year, but it would be better to know that the standard so set up is maintained when no "Inspection" is in progress. Iron rods with brass knobs are provided at most stations for hanging notice boards, and at some of the stations a portion of the wall had been plastered so that notices could be pasted up neatly; of the two methods, however, I prefer the former.

38. The ticket windows leave much to be desired. Some have passages so narrow that a fat man can hardly get through, and many have barricades so high that a man with a bundle must abandon it, at the risk of losing it, while he is getting his ticket. Many windows have no ledges, or, if they have ledges, are so badly made that small change can easily be dropped and lost. Some are inconveniently high and others absurdly low, and very few indeed are really satisfactory in all respects. I was informed that a list of inconvenient ticket windows is being prepared, and a type pattern for future use being made up, and I would suggest that effective action should be expedited. Absolute uniformity is not required, but general convenience is.

39. Attention to little details in the waiting and refreshment rooms is very desirable. In a good many cases the windows have been cut in two, so that the upper part can be opened while the lower part remains closed; this is an excellent arrangement and should be generally adopted. More care should be given to the drainage of bath rooms. In some cases there is none at all, or what formerly existed has been choked up; in others there is not sufficient slope, and sometimes the slope is the wrong way. The furniture is often arranged irrationally, so that a passenger makes a puddle when using the bath and has to stand in it when using the other appliances. In

one case (Tanjore) the puddle extended over the greater part of the waiting room. Catches to prevent doors and windows slamming are very necessary but often omitted; a tower bolt at the foot of that leaf of a door which opens first is a weariness to the flesh, and usually out of order. These and other petty matters can be put right gradually at the time of annual repairs, if the staff are trained to look out for them.

40. The use of tar has been carried to excess in the past, and as it is very difficult to eradicate it now it will probably have to be used in the future more largely than would otherwise be considered desirable. But I think a line should be drawn at waiting rooms, and that where these have, as at Panruti, been already tarred, they should now be scraped, plastered, and colour-washed.

41. The *latrines* are of various types, but a maximum of tar and a minimum of decency is common to all except those of the Pákala-Nellore section. The latter are of the Horbury type, and I would strongly recommend that this class of latrine should be adopted wherever new ones are required. The type most used on the other sections is a walled yard, heavily tarred, sometimes provided with troughs, rarely with squatting stones, hardly ever with partitions, and the floor usually very inefficiently sloped for drainage. All were absolutely clean on the arrival of the inspection train, but their condition, if used freely, must be terrible to contemplate. The Agent has already promised to take the matter up.

42. Most of the stations are provided with urinals and privies for Europeans, which must be a great convenience, but might be better ventilated. If the interior were frequently white-washed, instead of being tarred, they would not appear so dingy and suspicious as at present.

43. The *platforms* are well kept and usually adequate. Many of them are well shaded with over-hanging trees; this should be encouraged, and the cutting of these trees for the telegraph wires should be forbidden. It is much easier to move a telegraph post than to grow a nice shady tree.

44. The old type of *waiting-shed* is being gradually supplemented or superseded by light corrugated iron sheds of about 25 feet span, which are neat and efficient.

45. The *watering arrangements* generally seem good and sufficient except that the older tanks are often considerably below the height now considered desirable, and that the water columns are rarely located between the tracks.

46. **Accommodation for the Staff.**—More quarters seem to be required at several of the principal stations. It is understood that the matter is under consideration, but cannot be settled till the scheme for the new engine runs is decided upon. This however hardly applies to Negapatam.

47. A practice seems to have grown up of allowing the staff to build excrescences on to their quarters at their own expense, and even to sell these to their successors. This is most objectionable, and should be put a stop to. Possibly it is due to insufficiency of accommodation, and, if so, the remedy is likely to be costly.

48. In the design of quarters more care should be exhibited in anticipating the reasonable requirements of the occupants. For example, the new bomb-proof buildings at Pákala are very defective; they have plain solid walls, with much too few doors and windows; the latter much too small, and the former often in inconvenient places, *e.g.*, in the middle of the room instead of near the corner. No recesses for shelves or almirahs, which are so convenient in small rooms and through which supplementary doors or windows can be knocked if required. Too few side rooms and bath-rooms; and in some cases small rooms, which might otherwise be suitable as bath-rooms, cannot be used as such because, having been marked "godowns" or "stores" in the plan, they have not been provided with drains. The doors, having no sills or rising hinges, are about $\frac{3}{4}$ inch clear of the floor, which must be uncomfortable in a dust storm. Attention to such details cannot be too strongly impressed, not only on those who design buildings, *but also on those who build them*, and I cannot but think that by the use of cheaper materials, less massive construction, and greater attention to details, much more comfortable quarters could have been built without incurring greater expense.

49. **Station-yards.**—Many of these, particularly on the older sections of the line, are of very inconvenient type, and, although many have been altered, more still remain to be modified.

50. Shunting lines are rare even at the larger stations where a great deal of goods marshalling has to be done, and I only found one trap-siding to prevent engines coming out of the locomotive yard on to traffic sidings without authority, and the use of this one (at Pákala) was evidently not understood, for it was kept locked against the trap.

51. Many stations are on gradients steeper than the 1 in 500, laid down in Circular No. 6 of 1893. It is presumed that that circular is not retrospective, but that the necessity for safety sidings at such stations can be decided upon by the circumstances of each particular case, in which the prevalence of high winds is almost as important as the gradients. Many of these stations have dead ends for goods traffic turning out of the loop, some of these face against the gradient, and others might easily be altered to do so, and thus (with special regulations) serve as traps to prevent loose vehicles running away. But prevention is better than cure, and all loose vehicles at such stations should be chained down to the rails, and sprags kept ready for use when shunting is in progress (see paragraph 64).

52. Speaking generally I concur in the opinions already expressed by the Government Inspectors of this circle that short slip sidings laid off the main line are a source of danger; and I consider that they should never be so laid if there is the smallest probability of a train at speed being turned into them; in such cases they had better be laid off the loop, and hand-shunting and cutting off of vehicles on the main line *absolutely prohibited*. At stations, however, below steep gradients where there is real danger of trains getting out of control, a *catch* siding long enough to stop a run-away train may be required, and if this is provided and all trains stopped dead at it there would be little danger in laying the slip siding below it off the main line.

53. **Signals.**—The signalling system of the South Indian Railway is at present in a state of transition, and it is desirable that a definite policy should be adopted as early as possible, and worked to in future. Originally most of the stations of the older sections were provided with so-called distant signals only, but no so-called home signals. The former are usually 1275 feet outside the facing points from which they are worked. About November 1890 this was brought to the notice of the Government of India which ordered home signals to be provided. This has been done at 36 stations out of 84, the signals being of the usual Indian type, fixed either on or close to the platform and worked by the stationmaster. About 41 stations on the older portions of the line still remain unprovided with such signals and an estimate amounting to Rs. 20,832 for the same was recently submitted by the Agent.

54. In the meanwhile, however, the rapid increase of fast traffic on this and other railways has shown the necessity for the introduction of interlocking in the near future, and as this practically implies that the home signals must be at the points, the question is therefore under consideration as to whether any more home signals should be erected at the platforms; and, further, whether for the sake of uniformity and safety, those already erected should not now be moved to the points.

55. Again, orders were issued in 1895 that all distant signals should have notched arms, but the meaning of the notching was not explained. Consequently notches were cut in the arms of all the so-called distant signals (and not a few others). It has subsequently been found that on the absolute block system in use on the South Indian Railway (the use of following trains having recently been forbidden), the so-called distant signals are, under the provisions of Rule 101, to be considered *stop signals*, and therefore the notches are all being now filled up again.

56. It is evident therefore that there is considerable uncertainty as to the meaning and use of the different signals, and a reference on the subject was made in the Agent's letter No. 441, dated 25th May 1896. This has been passed on for the orders of the Government of India, and when the reply has been received, I consider that it would be well for a meeting of the local railway officers and Government Inspectors to be held to consider the whole question, and decide on a definite system of signalling.

57. The arms of all distant signals have been counterweighted so as to fly to danger in the event of a failure of any connection, but only a few of the home signals are as yet so counterweighted. The Agent has however issued orders for this to be done, and I recommend that those signals which are not actually on the platform,

but are worked by a more or less extended system of rods or wires, should be counterweighted first. In doing so it must be remembered that they must fly to danger in the event of a failure of *any* connection; also that when the spectacles are on the same side of the pivot as the arm is, a heavier counterbalance is required than when they are the opposite side; also that the connecting rods of some signals are so light that they buckle unless they actuate the counterweight by tension.

58. I noticed a new form of home signal where two lamps are required, as the spectacles of both arms form the counterweights to those arms, and are consequently on opposite sides of the post. This is hardly an economical arrangement.

59. The arms of many of the home signals could be put down below the caution position (45°), and when so lowered they show a white light; this should be remedied by fixing a proper stop. The adjustment of several distant signals was defective, and that of their lamps is rendered more difficult by the fact that most of the spectacles show a little white between the red and the green; this should be stopped out. Some of the distant signals have too large a back light.

60. Other forms of signals in use such as ground or tall discs, point-indicators, and gate signals; but none of these have yet been counterweighted so as to fly to danger. From the note to Rule 69 it would appear that point-indicators need not be so weighted.

61. Ground discs have been fixed at the outer facing points of all stations, but it is not clear what good purpose they are supposed to serve. They are mere point-indicators, to show which way the points are set, and are by no means efficient ones for they do not show whether the switches are tight home, and they are sometimes so loose that they would show a right signal, even if the points were quite wrong. There is a difficulty also about the colours of the lights, red and white being objectionable, when exhibited to in-coming trains, and purple being not sufficiently distinctive. In my opinion these ground discs are utterly useless so far as the drivers of in-coming trains are concerned, and that it would be better to use them only in the trailing direction as mere indicators by which the stationmaster can see whether the pointsman has obeyed his orders or not. To do this they should be obscured from the view of entering drivers, and be so placed as to be clearly visible by the stationmaster from the platforms, and if so used, there would be no objection to white and green lights being used for the straight and loop roads respectively. The opinion of the Agent and of his officers is invited on the subject.

62. Simple interlocking apparatus has already been erected at one end of Villupuram, and has been ordered for one end of Tiruvallúr, and in my opinion will shortly be required at some of the other junctions. It is also desirable that it should be introduced at various stations through which the fast passenger trains run without stopping, particularly at those where other trains are crossed. In designing these installations it would seem to be quite unnecessary to go in for expensive English systems of working all the points and signals from a single cabin; it will suffice to let the points and distant signals be worked at the facing points, provided that the stationmaster can control and detect the same from the platform.

63. This however need not interfere the grouping of points, so as to work a number of marshalling points, or one or more cross-overs by a single pointsman. There is room for a good deal to be done in this direction at the larger stations where it would economise expenditure in pointsmen.

64. **Station equipment** does not include either sprags or chains for securing vehicles on sidings. These should be supplied, and their use prescribed at all stations, but particularly at those situated on gradients or where high winds are prevalent (see General Rules 188 and 191).

65. The *weighing-machines* are supposed to be inspected, tested and adjusted periodically by an inspector employed for the purpose. But there is nothing to show that this is done. I would suggest that each stationmaster keep a book, in which the inspector should note the date of his inspection and the result of his testing of each machine at the station.

66. **Refreshment-rooms.**—These are all worked by contract, the company supplying nothing but the bare room. The result is not satisfactory, and doubtless the comparative smallness of the European traffic renders it difficult for the contractor to make

a reasonable profit. Still there are some stations where there is quite enough refreshment-room business to cover losses elsewhere. I think the company would do well to provide all appliances itself, and to introduce the ticket system which works so well on the Madras Railway. If it could see its way to run the catering also itself, as the Madras Railway does, its reward would follow before long.

67. At the same time I think that it should divide its refreshment rooms into two classes, viz.: those that are prepared to supply really good meals, and those which only profess to provide tea and coffee; and should distinguish the two classes in the time-tables, &c. For example, Koilpatti, Kumbakónam and Chinnatippasamudram are all shown in the published Guide book as refreshment rooms, but if anybody ordered dinner at them he would find good cause for complaint. The dining traffic at such places is *nil*, and the keeping up of a tea and coffee stall and of a few stores selected as useful in an emergency, *e.g.*, a train breaking down, is all that can be expected at them.

68. **Native refreshments.**—This matter is receiving attention, and several small fruit stalls have been started. One at Trichinopoly Fort is particularly good. Doubtless the encouragement received will engender further developments.

69. **Water for passengers.**—The Macnamara filter is usually adopted, and its cleaning and changing is looked after by the Medical staff with care and conspicuous success. Tubs for drinking-water, and special earthen vessels in charge of a caste man are kept at various more important stations. At Máyavaram and other junctions taps with masonry basins, where people can wash their feet, have been set up on the platform and are much appreciated.

70. The following remarks are made regarding the arrangements at individual stations:—

Egmore.—A plan for remodelling this yard is under consideration. It provides for devoting the present platform entirely to up or departure trains, and building a new arrival platform for down trains on the south side, with an overbridge and a new and commodious station building just in front of the existing building which would be dismantled. It would remove the existing engine-shed from the south to the north side. Its principal defect is that, should the line ever be doubled (as is by no means improbable, for the suburban traffic is already heavy), the up and down trains will occupy the wrong positions, taking the right hand instead of the left hand road. I strongly recommend this being avoided if possible. The new locomotive yard also appears larger than necessary, if the new running arrangements are adopted.

Beach Line.—The Madras Railway Company is preparing a scheme for suburban lines for fast passenger traffic on both gauges between Ráyapuram and the Fort, and a separate goods line to the Harbour. It is very desirable that the South Indian Railway should co-operate if the scheme is to be a success.

Beach Station.—Every thing here is of the most temporary character, and there is no platform or provision for the booking or receiving of goods. A scheme is under consideration for acquiring sufficient land from the reclaimed foreshore between the Battery and the Harbour to lay out a small goods yard, and I think this will be found a great convenience to the public.

Chetput.—Steel palisading is required along the approach in order to prevent people committing nuisances. A latrine is required which should preferably be of the Horbury type.

Kodambakum.—This station has no distant signals. The arms of the home signal at the platform have been notched; this should be put right.

Saidapet.—It is proposed to widen the platform which is only $8\frac{1}{2}$ feet wide for half its length and is insufficient for the crowds which use the station. The home signal is not visible from the southern direction.

Chingleput.—The island platform is 20 feet wide with a wooden shed on it with numerous posts, and is thought to be too narrow in times of pilgrim traffic, and it in contemplation to widen it to $31\frac{1}{2}$ feet at the expense of the sidings of the Arkonam is branch. I doubt if this is really essential; in Ceylon 20 feet would be considered a noble platform, fit for the metropolis, and I do not think that more accidents occur there than here, or that the crowds are less numerous or more intelligent.

This station has a home signal at the north points which, though worked by wire connection, is not counterweighted. It gave an ambiguous signal owing to a white light showing between the red and green glasses.

Kolatur North.—A new lay-bye siding, 1000 feet long in the clear, has been put in since the last inspection to enable trains to be passed occasionally. There is another dead end 216 feet long leading to the goods platform, and both face in the same direction, viz., to trains coming from Madras. The new dead end could easily have been joined up to the old one, and the turn out to the latter relaid in the opposite direction so as to give a loop with a short dead end to the goods platform. The only reason for not doing this appears to be that the loop would only be about 1200 feet in clear length instead of 1600 feet, the minimum allowed by the standard dimensions. This shows the necessity for reasonable latitude in the application of the standard dimensions; for obviously a 1200 feet loop is better than a 1000 feet dead end, and I recommend that application be made to alter it without delay.

Padalam.—Goods lay-bye is too short and should be lengthened up to the level crossing, and the usual mark fixed at the fouling point, and the stationmaster forbidden to receive a train on the loop, unless the wagons in the lay-bye are clear of it, which they were not when the inspection train was so received.

Acharapákam.—The goods-shed is only 5′ 4″ from the edge of the goods platform. There is no standard dimension applying to this case, but I would recommend that a minimum of 6′ 0″ be adopted in future.

Perambair.—Station building is kutcha and there is no platform, the traffic being trifling as yet.

Villupuram.—The new engine-shed is practically complete, but not yet in use. The third-class waiting shed is commodious, but not yet paved. A site for a school-house was inspected and approved. The Traffic department seems to be short of quarters.

An interlocking arrangement has been fixed at the south end since the date of the last inspection. It is not quite satisfactory. (See paragraph 71.)

The north junction has not been thought to require interlocking as yet, as the points are well under the control of the stationmaster and protected by distant signals, which, by the way, should be considered as absolute stop signals until home signals are provided at the junction points. The distant signal for the Madras line, which is now between the lines, should be moved to the east side, so as to render absolutely unmistakable to which road it refers.

Valavanur—Has an unnecessary pair of facing points in the main line, which might easily be made to take off the siding.

Pondicherry.—The platform ends in a carriage dock, it should be ramped. The compound, particularly in the south side, is in a very insanitary state, and there is an offensive pool near the staff quarters which should be either drained or filled up.

Sérndanur.—A trial station with a kutcha building. Feeder road is required.

Panruti.—Every part of the station building is tarred; the waiting-room, at least, should be scraped, plastered, and colour-washed. A part of the goods-shed has been enclosed with matting which is out of repair, unsightly, and dangerous.

Cuddálore New Town.—Ticket-window particularly inconvenient, barricade too high and no ledge; should be put right without waiting for other stations.

Cuddalore Old Town.—Platform ends in a carriage dock; it should be ramped. The locomotive yard entrance is on the wharf line, and is supposed to be protected by a semaphore signal, which is simply an indicator of the way the points are set. It would be better to move the semaphore towards the level crossing, and work it like a distant signal, and to put a disc signal and trap to control the locomotive yard.

Mount Capper quarry-siding.—There are three distinct signals about 1275 feet from the points in the up, down, and quarry directions. They are all worked from the points, but that up the quarry-siding is invisible on account of the curve and trees. A disc signal, working with the main line points, indicates the way these are set. A cabin has been built for the telegraph signaller to give line clear when the points are put in. The arrangement is defective, for if a ballast train from the

quarry is checked at the distant signal and draws within it, there is no fixed signal against it to prevent its coming out too far and fouling the main line. It may, however, be used if special instructions are promulgated to guard against this defect; but the better plan would be to move the quarry-line signal in, to within a short distance of the fouling point, and use it as an absolute stop or home signal. If there is any fear of a driver running past this signal, a derailing switch working with it could be put in so as to ditch him if he did so.

Kille—Has only a kutcha station building, but an estimate is being made for a pucca one.

Máyavaram.—Station building is inconveniently situated and will probably have to be removed before long.

Kumbakónam—Third-class waiting-shed should be enlarged. Half windows wanted in ladies' waiting-room. The special arrangements necessary for the coming festival, next February, are not yet decided upon; this should be taken up sharp.

Tanjore.—This is a very cramped yard, and it is proposed to remodel it entirely. The plan shown me makes a clean sweep of everything except the engine-shed. This will be very costly, and I doubt if so drastic a measure is absolutely essential, but certainly very extensive alteration is urgently required, and no more time should be lost in deciding plans and starting work.

Budalur.—The run from here to Tiruverambur is the longest on the line (13¾ miles, occupying from 29 to 59 minutes for various trains). There used to be a station at 238-9, but it was closed as it did not pay. This might be reconsidered.

Tiruverambur.—Winter's patent "electric block and automatic ticket-issuing instruments" had been installed here and at Trichinopoly, a day or two before the inspection, and seemed to work well.

Trichinopoly.—The entrance to the locomotive yard is defective; it opens directly on to the main line, and though a signal is provided there is no trap; consequently a collision occurred some months ago between a train from Madras and an engine. Also the fuel-stacking ground is on the opposite side of the main line, and engines often stand on the main line when fuelling. This is most objectionable. The Chief Engineer was asked to prepare a plan for re-arranging the east end of the yard, so as to put the fuel-stacking ground between the locomotive yard and the main line (which can easily be diverted for the purpose) and to trap the connecting points. The opportunity also to be taken to put in a shunting line at both ends of the yard, and to design the whole so as to provide for interlocking being introduced at an early date. The alteration to the Erode branch suggested in paragraph 10 of the inspection report for 31st December 1895, to be incorporated in the new plan.

Rettamalai quarry-siding.—This has two distant signals on the main line in the up and down deviation, respectively, and a disc signal at the points connected therewith, also a cabin for telegraph signaller. There is no signal on the quarry line, the disc being considered sufficient which I do not think it is. A small home signal should be fixed a short distance beyond the fouling point, and worked by a wire from the points. The diversion put in while the causeway was being built, takes off at the same place and is protected by the same signals, and though the causeway is completed (and was opened for traffic in June 1896) the diversion is still being used for the removal of spoil to Trichinopoly yard; when this is finished the diversion points should be removed.

Kolatur South quarry-siding.—The signals here are the same as at Rettamalai, but the quarry line goes into a back shunt, and consequently a special signal for it is not necessary. The points are out at present, but the distant signal arms are at caution; they should have been dropped to the vertical position or removed altogether when the points are out, as has been done at other similar places (*e.g.*, Mount Capper).

Manaparai.—The waiting-room for first and second class passengers referred to in the last inspection report does not seem to be wanted. The number of these classes of passengers is very small, and there is a dâk bungalow just outside the compound.

Vaiyampati.—The station staff have hitherto lived in shanties said to belong to the fuel contractor. Tents have been sent for their accommodation, and quarters should be built as there is no village in the neighbourhood.

Ayyalur.—The points of the slip siding, referred to in paragraph 31 of inspection report for 30th June 1895, were incorrectly adjusted and did not set themselves automatically for the trap, as they should do. The slip siding takes off the loop, and is not a complete security against a wagon escaping down the incline, in the absence of a strict rule forbidding any vehicles to be cut off or hand-shunted on the main line in the station. This rule should be promulgated at once for this and all other stations where slip sidings have been laid off the loop.

Dindigul.—The bath room suggested last half year for the gentlemen's waiting room has not been provided. The verandah is below the level of the platform, which drains towards it and must surely flood it in heavy rain.

Ammayanáyakkanúr.—Has a slip sidingwith disc signal, trailable locking bar, and weighted points off the loop, like Ayyalur, but works all right. Hand-shunting on main line should be forbidden.

Madura.—More staff quarters will be required if the new scheme of engine runs is adopted. The engine accommodation will also have to be enlarged, but this can be done by abolishing the workshop. More land will probably be required. A neat little school has been started. The question of the junction with the proposed Madura-Pámban Railway must be considered. The plans place the junction about M. 343 (about $1\frac{1}{2}$ miles from the existing station and on the other side of the river Vaigai) facing to trains coming from Madras, and also suggest an alternative junction facing towards Madura station and just on the other side of the bridge. Both would be extremely inconvenient from a locomotive point of view, and it is quite possible that it may eventually be found better and cheaper to take the new line out of the south end of the existing station (even if it be still considered essential to go to Sivaganga) and to make another bridge across the Vaigai, rather than abandon the present station.

Virudupati.—Is a refreshment station, but has no ladies' waiting room, and the gentlemen's waiting room has no bath room, and only a wash-stand behind a screen. There is, however, a very good rest-house for railway officers which is very seldom used, and should be made available for the public.

Koilpati.—Has a thatched hut for refreshments (tea, &c.), which is old and fusty; it would be well to convert a portion of the waiting hall into a refreshment room, and to add an open shed for third-class passengers.

Kumarapuram.—The taluk board refuse to metal a short piece of road across the level crossing between the two approaches to the station. The railway might as well do it, as it is but a trifle.

Kadambur.—The ballast siding was inspected on 4th June (see remarks in my No. 1774 of 9th June 1896). It has the same defect as the Mount Capper siding and requires similar special instructions.

Maniyachi Junction.—There are two waiting rooms, but neither have a bath room. One should be added, as passengers have to wait here fairly frequently. A slip siding is about to be put in off the loop at the south end to guard against vehicles being blown out of the yard. Hand-shunting on the main line should be prohibited.

Tuticorin.—The ground disc at the three-throw facing points at the entrance to the yard still shows the same signal when set for one of the sidings as it does for the main line (see last inspection report). Surely this matter is not beyond the ingenuity of the officers in charge; if so, it would be better to remove the point indicator altogether, as it is merely misleading in its present state.

The loco-yard has three separate entrances off the salt siding which is part of the traffic yard; none of them are trapped or protected. The drainage of the bath room belonging to the waiting rooms is bad, and the gentlemen's bath room had neither tub nor commode on the date of inspection (said to have gone to be painted). If the Ceylon traffic is to be encouraged, the waiting arrangements should be specially good at this station.

A siding for the Port Trust is being put in—old 40 lb. F.F. rails and new pingadu sleepers. It takes off the second line and crosses the platform siding by a

diamond crossing. It was tested with an engine as far as the crossing of the main road, and when completed along the wharf may be used subject to the usual report. A stop block should be fixed between the diamond crossing and the gate in the boundary wall, and this and the points should be kept locked and the keys in the custody of the stationmaster.

Tinnevelly.—The ground disc at the three-throw facing points has the same defect as that at Tuticorin. The floor of the engine-shed wants repair. A carriage turntable and siding is being put in for the Arcot Sugar Works.

Negapatam.—The signals at the entrances to the loco-yard have been notched, although they are necessarily absolute stop signals; this should be altered at once. The staff quarters are crowded and more are required. The necessity for a school and for a railway institute is under consideration. Nothing has yet been done to give better accommodation for the public as suggested in last inspection report.

Sikkil.—The request for additional accommodation referred to in the last inspection report has been considered and might, I think, be negatived, especially as the proposed extension to Nagore will probably relieve this station of a good deal of traffic. Anyhow the good shed cannot be converted into a station building, as it is within standard dimensions. The passenger platform might be lengthened, but a waiting shed is hardly necessary, especially as there is excellent shade under the trees.

Adiyakkamangalam.—This is a new trial station, without a loop and only a gate lodge for station. The inhabitants are clamorous for more accommodation, which may perhaps be justified as the traffic is considerable. Water is required, also a feeder road.

Tiruvallúr.—The junction at the east end has a distant signal for each branch and an auxiliary home signal at the fouling point on the Máyavaram line only; all are worked by levers at the junction points, but these are about to be shifted to the platform, where there is the usual four-armed home signal. Although the auxiliary signal at the fouling point is described as a "stop signal" in the traffic circular on the subject (G. 690 of 26th May 1896), its arm is notched, which is, of course, absurd and should be altered at once.

At the junction at the west end there are only the usual two distant signals worked from the facing points, the home signal being as above stated on the platform.

It is proposed to obtain an interlocking gear from Dutton and Co. for the east junction, something similar to, but I hope more complete than, that at Villupuram; and I think the home signals of all four lines should be shifted to the points. It is a pity a junction is necessary at both ends of this yard; it could have been avoided by keeping the Máyavaram line on the north side of the Negapatam line through the station, and doing all shunting at the west end. As it is the junction at the west end could be taken out, but that the goods traffic of the Mutupet line could not then be got into the goods yard, as shunting it at the east end is inconvenient.

Engines have often to stop here at night, though there is no shed. Surely this might be avoided, especially as there are sheds at Máyavaram and Mutupet as well as at Negapatam and Tanjore.

Koradáchéri.—A strangely inconvenient station yard, with the loop clear of the platform.

Nidámangalam.—Another extraordinary station yard, which might well be remodelled and platform lengthened.

Trichinopoly Fort.—A shunting line for goods marshalling is required, and can easily be put in.

Pulanyur.—Has only kutcha buildings.

Karur.—The floors of the waiting-room have been paved as suggested, but no bath room has been provided for the gentlemen's waiting room, and the ladies' has neither tub nor drainage.

Pugalur.—Is about to be remodelled.

Kodumudi.—Home signal is hidden by trees from the west distant signal.

Erode junction.—There are few conveniences for passengers here, but there are plenty on the Madras Railway side.

Tandarai.—A falling 1 in 160 grade begins at the south points, and a truck escaped down it about a month ago. A slip siding off the loop should be provided, and the goods dead end might be faced the other way or converted into a loop.

Tiruvannámalai.—This has a tiny refreshment room with very little in it. There is no waiting room.

Polur.—The station well is an open *baoli*, with steps leading down to it convenient for washing, and consequently is an excellent arrangement for spreading the cholera which recently appeared in this neighbourhood. This demands prompt remedy.

Kalambur.—A waiting room for first and second class passengers has recently been added.

Vellore.—Neither gentlemen nor ladies' waiting rooms were provided with a bath. The water columns here appear to have been originally erected between the tracks, but have been moved outside, apparently because the tracks are only 15 feet 2 inches centre to centre. This seems a pity; it would have been better to have slewed the tracks.

Ramapuram.—A falling 1 in 100 grade begins about 100 yards outside south points, and extends a long way towards Katpadi. If the goods lay-bye be faced the other way, and the station be well equipped with sprags and locking chains, the necessity for a slip siding might be avoided.

Pákala junction.—The water-supply is pumped from a well at a distance; there is a tall stand pipe which is apparently unnecessary, for its top is closed in being below the hydraulic gradient and the pumping is, to all intents and purposes, direct.

The new quarters of the bomb-proof type recently built here do not commend themselves to the staff for whom they were intended, and the latter object to live in them. This is unreasonable, for the quarters are by no means bad, although (see paragraph 48) they might have been better without extra cost. Probably a few inexpensive additions in the way of verandahs are required, and it is better that such should be added by the Company rather than that occupants should be allowed to add them for themselves (see paragraph 47).

Mangalampetah.—Has a long 1 in 100 grade above and below it. If a slip siding is ever put in here, whether off main line or loop, it should certainly be protected by a catch siding above the station as there is no break in the upper grade, on which a driver could regain control of his train (if he once lost it) as he might be able to do at Kurabalakota and elsewhere.

Chinna Tippasamudram.—Has a waiting room; also a wattle hut which is called a refreshment room, but is so badly equipped with crockery, stores, &c., that it is doubtful whether the "butler" (query, matey?) in charge could supply anything to eat, and he is evidently seldom asked to do so.

Kurabalakota.—The slip siding which originally took off the main line and consequently partly wrecked a train which was out of control from the incline above on 16th December 1895, has been relaid off the siding, and is provided with weighted points and a tall disc indicator. The latter is, however, very carelessly erected, and prevents the weighted points working properly; it is also erected between the tracks, and consequently might be taken to refer to the main line; this should be altered. The instructions issued by the Traffic Department for the use of this slip siding are defective and should be revised. The result of the experiments on this incline will be separately reported upon.

Kadiri.—A falling 1 in 150 grade begins half way between the south facing points and the distant signal, and soon after changes to 1 in 100. A third-class carriage ran away on 17th March 1896, while being hand-shunted on to the main line as the loop was blocked. There was a high wind blowing and no sprags handy. It was fortunately stopped at mile 340$\frac{1}{2}$, before colliding with an approaching train. I suggest converting the present goods lay-bye into a loop and laying a dead end in extension of the present loop so as to form a slip or shunting siding. This will probably suffice if the station be properly equipped with sprags and locking chains and

instructions for their use, and if hand-shunting on the main line be absolutely forbidden. There is a triangle at this station which is no longer required, and should be taken out and the material utilised elsewhere.

Kalasamudram.—A falling 1 in 100 grade begins just outside the points, but the traffic at the station is trifling and the necessity for the slip siding might be avoided by making the goods lay-bye face the other way, and serve as a trap, and by stringent regulations against hand-shunting, and for the use of sprags and locking chains.

Dharmavaram.—All arrangements here belong to the Southern Mahratta Railway.

Nellore.—The station will require remodelling and raising to adapt it for the use of the Bezwada-Madras Railway. The sooner a beginning is made to this, and the other works between here and Gudur, the better.

Vencatachellam.—The platform is on the loop, but the goods lay-bye is off the main line, which causes an unnecessary set of facing points and should be altered when conversion to broad gauge is being done.

Gudur.—This will probably be the junction between the broad and narrow gauge. The plan prepared shows only room for two tracks between the transhipping platform and the broad gauge passenger platform, and would necessitate further remodelling when the East Coast Railway has to be doubled, as it will doubtless be some day. This contingency should be provided for.

Vencatagiri.—Has the same defect as Vencatachellam.

Yerpad.—Has the same defect as Vencatachellam.

Rénigunta.—The Madras Railway latrine here is a much better drained specimen than any I saw on the South Indian Railway, although it had not been specially cleaned up for the inspection.

Tirupatti, East.—Has no loop or telegraph station.

Tirupatti, West.—A falling (1 in 100) grade begins about 100 yards outside the north facing points, and extends (as 1 in 200) almost continuously into Rénigunta. A slip siding formerly took off the main line, but the points have recently been removed without (in my opinion) sufficient consideration. The yard is a peculiar one, the platform is on the loop, and there are no less than four sets of facing points on the main line, all facing the same way (to up trains), viz., one to Perur quarry, and two to the goods sidings, besides the usual facing points to the platform loop. I suggest that the three turnouts to quarry and goods yard should be gathered into one shunting line, clear of the main line, and connected with it about the middle of the yard by a cross over facing against the grade and weighted for the shunting line which would thus form a safety siding. There is a turntable here on a dead end off the platform loop which cannot be required, and might be utilised elsewhere.

Chandragiri.—The falling grade begins at the north facing points, and the goods lay-bye faces towards it. A slip siding should be put in off the loop, and sprags and chains supplied.

71. **Interlocking gear at Villupuram.**—This is by Saxby and Farmer, and consists of a six-lever frame fixed close to the station building. Four of the levers work the signals of the south junction, viz., two home signals fixed at the fouling point, and two distant signals at the usual distance along the main and Pondicherry lines, respectively. The other two levers work the arms of the home signal at the platform which refer to trains entering at the north junction from Madras or Pákala, respectively. The levers are interlocked, so that only one home signal can be put down at a time, and that neither distant signal can be pulled off unless its home signal has been first put down. The points are worked by the pointsman at the junction, but controlled by the stationmaster by a detector which prevents a home signal being lowered unless the points are correctly set, and locks them when the home signal is down.

72. A facing point lock and treadle bar were ordered, but have not yet been fixed. A duplex point-indicator on a post is provided to show the way the points are set, but the post is not quite high enough to enable the man who works the signals to see whether the points are set right for the road for which it is desired to set the signals.

73. This point indicator shows two lights both ways, also a rocking arm which resembles a semaphore, and so far as the driver of an incoming train is concerned is, I consider, useless and misleading; *useless*, because the home signals at the fouling point are all that is necessary; *misleading*, because a driver entering from one of the branches has to pass a horizontal arm on the left side of the post. It is also misleading, but not wholly useless, to drivers of outgoing trains. The spectacle has a green glass in the centre and a purple one on each side, these are not sufficiently distinctive. I recommend that one of the lamps be removed and the other obscured so as to show no light to incoming trains; the purple glasses should be removed and white ones substituted, and the two arms removed and a single arm substituted in an upright position over the central spectacle. The signal should then be an efficient indicator to the stationmaster of the way the points are set, and that is all it is wanted for, though it may (in the absence of starting signals) be useful also to drivers of departing trains.

74. The distant signal on the Pondicherry branch is not visible from the lever which works it. A number of trees will have to be cut down to enable it to be seen clearly, or else it might be moved about 50 or 60 yards nearer the station; one or other should be done.

75. The gear does not comply with condition 2 (*a*) of circular No. IX Railway of 18th March 1893 (for the facing points of the yard are not detected), nor with condition I of Colonel Boughey's Committee (for the home signals have only one arm each), so no higher speed than 10 miles an hour can be permitted for entering trains. Nor can a higher speed be permitted for departing trains as the gear is defective as follows, viz., that as the points are free when all signals are at danger, there is nothing to prevent the pointsman setting the junction points the wrong way for a departing train and perhaps causing a collision if an entering train is checked by signal on one branch till the departing train has gone out on the other. This can be partially avoided by making the distant signals absolute stop signals, and issuing special instructions in the working time book, but the proper way to do it is to provide interlocked starting signals at the points, and unless this is done, the points must be treated as unlocked, or be locked with a padlock in the usual manner.

76. **Workshops.**—The Negapatam shops appear to be excellently laid out and managed. The foundry is small, and if enlarged a good deal could be done to use up the enormous stock of cast iron scrap by making pot sleepers, &c.

77. There are auxiliary workshops at Egmore and Madura, which must be a heavy expense, and might well be abolished. It is understood that this will shortly be effected.

78. **Stores.**—A good deal could be done in the way of disposing of surplus rubbish, and of getting lamps and other things made in the local market. I would suggest that the Agent should ascertain what has been done in this direction of late on the North-Western Railway at Lahore.

79. **Rolling-stock.**—The new O class engines are not considered so great a success as had been anticipated. They are said to steam badly, to consume an excessive amount of fuel, and not to pull enough for their work. Perhaps this may be only the prejudice which drivers often display to a new type. Anyhow, it is proposed to reduce the indent recently sent home to five, instead of twelve.

80. At present the vacuum brake is not used south of Madura, because there are said not to be enough O class engines available to work it. I would recommend that a few of the old four-wheeled coupled type, which are used south of Madura, should be fitted with vacuum gear as soon as possible. The expenditure will not be wasted even after the rest of the O class are received.

81. I think it is a great pity so little room is given under the seats of the first and second class carriages. A notice is posted up that nothing may be taken into the carriages unless it will go under the seat, but the seats are so low that hardly anything will go under them. It is a great convenience to passengers (particularly ladies) on long journeys to be able to take a small cabin trunk in with them, and these are rarely less than 12 inches deep (the P. & O. regulation is 3′ 0″ × 1′ 9″ × 1′ 3″), yet no carriage that I measured gave more than $11\frac{3}{4}$ inches. The cabin trunk need not be exempted from weighment even if brought into the carriage.

82. A statement showing the coaching and goods stock under repair during the two quarters of this half-year is attached as appendix E.

83. **Breakdown trains**—do not seem to be maintained anywhere on a regular system. An odd lot of jacks, bars and other tools is kept in a covered wagon, and taken away for use at the engine shed between whiles. The wagon is not really devoted to its purpose, but belongs to the traffic, and is supposed to be under repair. If an accident crane happens to be available, it probably (as at Pákala) has no dummy, so could not be sent out unless a low-sided truck could be cadged from somewhere. Most of the best travelling cranes have been lent to the Engineering Department, and are not available at all.

84. **Brake-van equipment**— does not seem to have been prescribed by rule. An odd lot of flags without sticks, six fog signals, a lamp and a rule-book were all that could be produced on one occasion. Sprags, safety chains and scotches are never supplied at all.

85. **Medical and Sanitation.**—There are dispensaries at the principal stations, *e.g.*, Egmore, Villupuram, Cuddalore, Trichinopoly, Negapatam, Madura, Pákala, &c. They appear neat and well kept, and largely used. The rules under which medical assistance is claimable are posted up in most of them. None of these however have any accommodation for in-patients, so all such have to be sent to whatever civil hospital there may be available.

86. The sanitation of the station premises is looked after by the apothecary in charge. This does not appear invariably to be satisfactory, and perhaps a sanitary committee including the principal subordinate of each department represented at the station (as adopted with considerable success on the North-Western Railway) might be tried if any serious complaints arise.

87. A new time-table was brought into force on 15th July, which is thought to offer considerable advantages. It was noticed that the trains did not appear so crowded as was formerly the case.

88. The Agent is anxious to encourage through-traffic between India and Ceylon *viâ* Tuticorin, but has received little assistance from the British India Steam Navigation Company, which evidently considers that coolies and goats pay better than first-class passengers. The landing and embarking arrangements at Tuticorin are particularly defective, though at the prices charged the business must be extremely profitable to the steam-boat Company, which only maintains a ricketty launch for the purpose. An attempt has been made to give the coolies a chance of avoiding the clutches of the native touts who fleece them at the ports, by arranging to book them through to any railway station in Ceylon, but it has not been successful so far, the influence of the touts being apparently too strong—perhaps the civil authorities might assist in this matter.

89. **Feeder Roads.**—This question is a most important one, particularly on the Pákala-Dharmavaram section which passes through a country capable of considerable development. For almost the whole length of this section (142 miles), the railway is in close proximity to the trunk road, but with one or two exceptions there are no cross roads to connect the interior of the country with either the trunk road or the railway. The old famine-roads constructed many years ago are said to have fallen into decay, and to be now almost impassable for wheeled traffic, although it is understood that with comparatively small expenditure they could be kept in good order. But the up-keep of the main road is said to absorb all the funds the district boards can spare. A traffic officer has been deputed to explore the country and see what can be done towards inviting traffic to the railway and he seems sanguine of good results if only feeder roads can be provided.

90. The Agent has furnished a list of feeder roads required, an abstract of which is attached as appendix H. A full copy of the list has been communicated to the Local and Municipal Department for necessary action.

(Signed) C. W. HODSON,
Senior Govt. Inspector of Railways.

Ootacamund,
11th August 1896.

Ootacamund 2339
Lr 1896 dt
Pr 1756 dt
15-9-96.

Note by the Consulting Engineer for Railways.

Girder strengthening.—The plan suggested by Mr. Hodson in paragraph 12 should be referred to Sir George Bruce for his opinion. It is no use, however, restricting speed.

My own opinion is that, having completed the strengthening of the small girders, a systematic renewal of the larger spans should be undertaken, spreading the expenditure over the next ten or more years and taking the girders in order of their theoretical and actual condition.

I do not believe in putting off renewals of girders any more than the permanent-way, nor do I believe the larger spans can be economically patched up.

2. **Signals**—*Paragraph* 56.—The gradual introduction of double armed signals at the points worked from the platform and the distant signal worked from the points as on the North-Western, Great-Indian Peninsula and other lines, is recommended.

Paragraph 61.—Ground disc signals should certainly not be drivers' signals.

3. No mention is made in this report of the very desirable re-arrangement of locomotive running stations. I pressed this on the management some years ago and hope it is in a fair way of being accomplished on the lines laid down by the present Agent and Acting Locomotive Superintendent.

Ootacamund,
2nd September 1896.

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

Order—No. 785 R., dated 15th September 1896.

Communicated to the Agent, South Indian Railway, for information and necessary action.

2. A copy of these Proceedings will be forwarded for the information of the Government of India.

[Here enter No. 786 R., dated 15th September 1896.]

(True Extract.)

Offg. ~~Joint~~ under Secy. to Government,
Railway Branch.

To the Agent, South Indian Railway.
„ Local and Municipal Department.

Exd. T. K. Narayana Aiyangar.

APPENDIX A.

STATEMENT showing the renewals of rails on the South Indian Railway including Pondicherry and Máyavaram-Mutupet Railways for the half-year ended the 30th June 1896.

Railway.	Rails displaced.																							
	Iron.									Steel.														
	68 lb.			40·3 lb.						35·5 lb.				60 lb.					41 lb.					
	21′	18′	Cut L. ft.	24′	21′	18′	Cut L. ft.	30′	27′	24′	21′	18′	Cut L. ft.	19′	16½′	14′	Cut L. ft.	30′	27′	24′	21′	18′	Cut L. ft.
1	2	3	4	5	6	7	8	13	14	15	16	17	18	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Main Line.																											
South Indian	229	8	143	3,963	2,158	180	7,392	1		7	5	1								698	1,381	14		
Pondicherry	..	..	..	59	3	1	..																	
Máyavaram-Mutupet	..	..	..	220	68	..	..																	
Total ..	229	8	143	4,242	2,229	182	7,392	1		7	5	1								698	1,381	14		
Sidings.																								
South Indian	41	4	..	235	158	42	..													6	6			
Pondicherry	..	..	..	..	..	..	..																	
Máyavaram-Mutupet ..	..	..	..	..	..	..	..																	
Total ..	41	4	..	235	158	42	..													6	6			
Grand Total ..	270	12	143	4,477	2,387	224	7,392	1		7	5	1								704	1,387	14		

Railway.	Rails replaced.																							
	Iron.									Steel.														
	68 lb.			40·3 lb.						35·5 lb.				60 lb.					41 lb.					
	21′	18′	Cut L. ft.	24′	21′	18′	Cut L. ft.	30′	27′	24′	21′	18′	Cut L. ft.	19′	16½′	14′	Cut L. ft.	30′	27′	24′	21′	18′	Cut L. ft.
1	2	3	4	5	6	7	8	13	14	15	16	17	18	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Main Line.																											
South Indian	229	8	143	217	90	19												5,565	106	36	5	1	1,101	283	536		
Pondicherry	..	..	..	59	3	1																					
Máyavaram-Mutupet ..	..	..	..	220	68	..																					
Total ..	229	8	143	496	161	21												5,565	106	36	5	1	1,101	283	536		
Sidings.																											
South Indian	41	4	..	128	112	22																					
Pondicherry	..	..	..	..	..	..																					
Máyavaram-Mutupet ..	..	..	..	..	..	..																					
Total ..	41	4	..	128	112	22																					
Grand Total ..	270	12	143	624	273	43																					

Railway.	Iron.									Steel.														
	68 lb.			40·3 lb.						35·5 lb.				60 lb.					41 lb.					
	21′	18′	Cut L. ft.	24′	21′	18′	Cut L. ft.	30′	27′	24′	21′	18′	Cut L. ft.	19′	16½′	14′	Cut L. ft.	30′	27′	24′	21′	18′	Cut L. ft.
1	2	3	4	5	6	7	8	13	14	15	16	17	18	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Main Line.																											
South Indian	229	8	143	3,963	2,158	180	7,392	1		7	5	1								698	1,381	14		
Pondicherry	..	..	..	59	3	1	..																	
Máyavaram-Mutupet ..	..	..	..	220	68	..	..																	
Total ..	229	8	143	4,242	2,229	182	7,392	1		7	5	1								698	1,381	14		
Sidings.																								
South Indian	41	4	..	235	158	42	..													6	6			
Pondicherry	..	..	..	..	..	..	..																	
Máyavaram-Mutupet ..	..	..	..	..	..	..	..																	
Total ..	41	4	..	235	158	42	..													6	6			
Grand Total ..	270	12	143	4,477	2,387	224	7,392	1		7	5	1								704	1,387	14		

Railway.	Rails replaced.																							
	Iron.									Steel.														
	68 lb.			40·3 lb.						35·5 lb.				60 lb.					41 lb.					
	21′	18′	Cut L. ft.	24′	21′	18′	Cut L. ft.	30′	27′	24′	21′	18′	Cut L. ft.	19′	16½′	14′	Cut L. ft.	30′	27′	24′	21′	18′	Cut L. ft.
1	2	3	4	5	6	7	8	13	14	15	16	17	18	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Main Line.																											
South Indian	229	8	143	217	90	19												5,565	106	36	5	1	1,101	283	536		
Pondicherry	..	..	..	59	3	1																					
Máyavaram-Mutupet ..	..	..	..	220	68	..																					
Total ..	229	8	143	496	161	21												5,565	106	36	5	1	1,101	283	536		
Sidings.																											
South Indian	41	4	..	128	112	22																					
Pondicherry	..	..	..	..	..	..																					
Máyavaram-Mutupet ..	..	..	..	..	..	..																					
Total ..	41	4	..	128	112	22																					
Grand Total ..	270	12	143	624	273	43																					

APPENDIX B.

STATEMENT showing the renewals of sleepers on the South Indian Railway including Pondicherry and Máyavaram-Mutupet Railways for the half-year ended the 30th June 1896.

Railway.	Sleepers displaced.										Sleepers replaced.									
	Creosoted, 9'.	Creosoted, 6'.	Pingadu.	Teak of sizes.	Pot, 68 lb.	Pot, 60 lb.	Pot, 40 lb.	Transverse steel sleepers.	D and O sleepers.		Creosoted, 9'.	Creosoted, 6'.	Pingadu.	Teak of sizes.	Pot, 68 lb.	Pot, 60 lb.	Pot, 40 lb.	Transverse steel sleepers.	D and O sleepers.	
	Nos.	Nos.	Nos.	Nos.	Pairs.	Pairs.	Pairs.	Nos.	Pairs.		Nos.	Nos.	Nos.	Nos.	Pairs.	Pairs.	Pairs.	Nos.	Pairs.	
										Main Line.										
South Indian	..	1,080	4,622	119	475	31,128½	..	28	115½		..	322	6,893	75	8½	..	..	..	..	
Pondicherry	..	313	411	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	
Máyavaram-Mutupet ..	..	..	12	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	
Total ..	..	1,393	5,045	119	475	31,128½	..	28	115½		..	322	6,893	75	8½	..	..	..	..	
										Sidings.										
South Indian	4	4,571	2,650	65	3½	..	..	..	..		..	..	..	..	..	..	..	..	..	
Pondicherry	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	
Máyavaram-Mutupet ..	..	..	..	..	..	..	..	..	..		..	..	..	..	..	..	..	..	..	
Total ..	4	4,571	2,650	65	3½	..	..	..	..		..	..	..	..	..	..	..	..	..	
Grand Total ..	4	23,399	14,425	2,355	184¼	149½	4,009	40	115½		..	1,715	11,938	194	478½	31,128½	..	28	115½	

APPENDIX C.

SOUTH INDIAN RAILWAY COMPANY (LIMITED).

Engineering Department.

STATEMENT showing the mileages of the different kinds of Permanent-way materials on 30th June 1896.

Details.	68 lb. rails on cast iron pots.	50 lb. rails on cast iron pots.	40 and 41 lb. rails.				35 lb. rails on wooden sleeper.	Total.
			Wooden sleeper road.	Iron pot sleeper road.	Transverse steel sleeper road.	D and O sleeper road.		
Main Line.								
Madras to Tuticorin	·14	431·57	(a) 11·36	2·66	..	..	..	445·73
Branches.								
Arkonam	..	18·13	20·89	·16	..	..	..	39·18
Pondicherry (Villupuram) to Ginjee River)	..	·50	15·40	·36	..	..	..	16·26
Pondicherry (Ginjee River to Pondicherry)	..	0·34	7·46	..	..	..	..	7·80
Negapatam	37·27	10·96	..	..	..	..	..	48·23
Erode	86·95	·23	..	..	..	..	..	87·18
Tinnevelly	..	..	18·10	..	..	..	..	18·10
Villupuram-Dharmavaram section	..	..	5·61	..	273·62	..	..	279·23
Pákala-Nellore section ..	..	..	3·68	..	58·97	45·03	..	107·68
Máyavaram-Mutupet section ..	..	..	(c) 53·99	..	..	..	..	53·99
Total main line on main line and branches ..	(b)124·36	(c)461·73	136·49	3·18	332·59	45·03	..	1,103·38
Sidings.								
Main Line Madras to Tuticorin.	7·62	7·43	45·80	8·04	4·22	..	..	73·11
Branches.								
Arkonam	..	·16	1·62	..	..	..	1·19	2·97
Pondicherry (Villupuram to Ginjee River)	..	..	·73	..	..	..	..	·73
Pondicherry (Ginjee River to Pondicherry)	..	..	1·76	0·06	..	..	..	1·82
Negapatam	8·40	·82	3·90	..	..	..	..	13·12
Erode	7·63	..	..	..	..	..	..	7·63
Tinnevelly	..	..	2·18	..	..	..	..	2·18
Villupuram-Dharmavaram section	..	..	4·26	..	16·11	..	..	20·37
Pákala-Nellore section ..	3·92	..	7·57	..	·85	1·13	..	13·47
Máyavaram-Mutupet section ..	..	..	(e) 5·03	..	0·37	..	..	5·40
Total sidings on main line and branches ..	(d) 27·57	8·41	72·85	8·10	21·55	1·13	1·19	140·80
Grand Total, main line and sidings ..	151·93	470·14	209·34	11·28	354·14	46·16	1·19	1,244·18

(a) This length is laid on creosoted sleepers strengthened with three Pingadu sleepers to each rail length.
(b) This includes 9·66 miles laid on mixed pot and wooden sleepers.
(c) This includes ·76 mile of 56 lb. bridge rails, viz., ·55 mile on main line and ·21 mile on Pondicherry branch.
(d) Of this 20·17 miles are laid on wooden sleepers.
(e) These are old 40 feet iron rails, on new Pingadu sleepers.

APPENDIX D.

SOUTH INDIAN RAILWAY COMPANY (LD.).

Engineer Department.

MEMORANDUM showing lengths in main line yet remaining to be relaid with 50 lb. rails for half-year ending 30th June 1896.

From mile	To mile	Total.	Remarks.
0	218·32	·44	Over Coleroon bridge.
218·32	218·71	·39	In Tanjore station.
253·34	256·00	2·66	41¼ lb. steel rails on cast iron pots.
414·00	415·65	1 65	
416·80	425 35	8·55	
443·65	443·84	·19	
443·84	Buffer end at Tuticorin.	·15	
Total miles still to be relaid ..	..	14·03	
,, already relaid	..	431·57	
From South Indian Railway Limit, Madras Beach station	To 700 feet north.	445·60 ·13	
Total miles of main line ..	..	445·73	

APPENDIX E.

Statement showing the Coaching and Goods Stock received for renewals and repairs and turned out for the quarter ending 31st March 1896.

Particulars.	Passenger vehicles.	Covered goods wagons.	High-sided wagons.	Other vehicles.	Total.
Total stock on hand on 1st January 1896	119	57	34	46	256
,, received from 1st January to 31st March 1896	148	199	77	96	520
Total ..	267	256	111	142	776
Deduct stock turned out from 1st January to 31st March 1896	117	160	59	62	398
Total stock on hand ..	150	96	52	80	* 378

* Undergoing repairs 236
Awaiting ,, ... 142

For the quarter ending 30th June 1896.

Particulars.	Passenger vehicles.	Covered goods wagons.	High-sided wagons.	Other vehicles.	Total.
Total stock on hand on 1st April 1896	150	96	52	80	378
,, received from 1st April to 30th June 1896 ..	124	161	89	67	441
Total ..	274	257	141	147	819
Deduct stock turned out from 1st April to 30th June 1896	169	163	81	73	486
Total stock on hand ..	105	94	60	74	† 333

† Undergoing repairs 213
Awaiting ,, ... 120

APPENDIX F.

LIST of bridges at present arranged to be cross sleepered and those done up to July 1896.

Mileage. Miles.	Mileage. Telegraph Posts.	Name by which bridge is known.	Opening. Number of span.	Opening. Span.	Remarks.
2	19	Cooum River	5	40′	..
6	12	Adayar	6	65′	..
42	12—16	Pálár	18	120′	..
84	5	Thondayar	4	100′	..
85	13—16	Gingee River	22	30′	..
92	2—3	Vikravandi	6	30′	..
..	..	Do.	1	120′	..
97	0—½	Do.	3	30′	..
103	9	Do.	3	40′	..
105	..	Pennar	17	100′	..
124	..	Gaddilam	15	100′	..
127	7	Ooppanar	1	150′	..
134	16	Do.	3	30′	..
136	9	Paravanar	2	150′	..
140	17	East Coast Canal	1	30′	..
145	8	New Vellar	4	150′	..
146	7	Old Vellar	1	100′	..
151	6	Porto Novo Canal	1	70′	..
151	16	Do.	1	30′	..
152	13	Ooppanar	2	100′	..
154	3	Old Coleroon	2	100′	..
155	7—8	New Coleroon	14	150′	..
159	6—7	Do.	1	30′	..
163	14—15	Ooppanar	4	30′	..
185	17	Veerasholanar	4	40′	..
194	11	Arasalar	4	40′	..
201	1—2	Tirumalarajanar	3	30′	..
201	6—7	Kodamurutti	6	30′	..
211	9	Vettar	4	50′	..
211	10	Mirattar	1	30′	..
214	4—5	Vennar	6	50′	..
214	6	Do.	1	30′	..
214	10	Do.	1	30′	..
215	4—5	Vadavar	4	30′	Done.
251	6½	Corayar	10	30′	do.
287	9	Do.	1	70′	do.
299	11	Do.	2	30′	do.
302	6	Do.	6	30′	do.
344	5—8	Vaigai	15	70′	do.
356	15—16	Do.	7	30′	..
361	14½	Do.	6	30′	..
365	7	Do.	2	30′	..
373	10	Do.	9	30′	Done.
374	10½	Do.	1	70′	do.
383	6	Gunnicherry	7	70′	..
387	7	Vencatachellapuram	5	50′	..
389	7	Vaippar or Satur	12	70′	..
389	16	Chittar	1	70′	..
396	16	Do.	5	30′	Done.
430	2½	Kurthapallinuthan	3	50′	..
431	8	Soyriamangalam	5	50′	..
442	13	Do.	1	30′	..
		Maniyachi-Tinnevelly Branch.			
			10	70′	..
T. 433	6	Chittar	2	30′	Done.
T. 442	3½	Do.			

APPENDIX G.

Statement of Whipple Murphy girders that are weak for "O" Class Engine under Government of India and Board of Trade Standard Rules.

Government of India Rules—"O" Class Engine.

Span.	150 feet.						120 feet.						100 feet.						70 feet.			65 feet.		
Type.	Pin joints.			Rivetted joints.			Pin joints.			Rivetted joints.			Pin joints.			Rivetted joints.			Rivetted joints.			Rivetted joints.		
Member. Numbers.	Area required.	Area available.	—	Area required.	Area available.	—	Area required.	Area available.	—	Area required.	Area available.	—	Area required.	Area available.	—	Area required.	Area available.	—	Area required.	Area available.	—	Area required.	Area available.	—
1 2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Top boom. A	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Top boom. B	23·40	22·22	1·18	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Top boom. C	26·74	25·42	1·32	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Top boom. D	27·86	25·42	2·44	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Top boom. E	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Top boom. F	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bottom boom. a	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bottom boom. b	10·03	8·44	1·59	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bottom boom. c	17·83	15·19	2·64	..	..	..	8·13	6·75	1·38	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bottom boom. d	23·40	22·79	·61	..	..	..	14·46	13·50	·96	..	..	..	6·69	5·90	·79	..	..	..	..	..	..	..	..	..
Bottom boom. e	26·74	22·79	3·95	..	..	..	..	..	..	..	..	..	11·89	10 96	·93	..	..	..	..	..	..	..	..	..
Bracings (struts). I	..	..	..	..	..	..	21·69	20·25	1·44	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bracings (struts). II	..	..	..	..	..	..	..	..	..	..	..	..	17·84	16·02	1·82	..	..	..	..	..	..	..	..	..
Bracings (struts). III	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bracings (struts). IV	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4·84	3·99	·85
Bracings (struts). V	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3·85	3·36	·49
Bracings (struts). VI	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2·94	2·73	·21
Bracings (ties). 1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2·12	2·11	·01
Bracings (ties). 2	13·64	10·62	3·02	..	..	..	11·12	9·00	2·12	..	..	..	9·20	7·00	2·20	..	..	..	6·21	5·31	.90	6·84	5·62	1·22
Bracings (ties). 3	10·35	8·44	1·91	..	..	..	8·45	7·50	·95	..	..	..	7·01	6·50	·51	..	..	..	4·74	4·38	·36	5·44	4·69	·75
Bracings (ties). 4	7·33	6·50	·83	..	..	..	6·01	5·25	·76	..	..	..	..	..	..	..	..	..	3·40	3·05	·35	4·16	3·75	·41
Bracings (ties). 5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3·00	2·42	·58
Bracings (ties). 6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1·96	1·79	·17
Cross girders. Top ..	12·38	9·65	2·73	..	..	..	10·96	7·69	3·27	..	..	..	9·51	7·03	2·48	4·42	3·66	·76	8·81	6·65	2·16	..	..	..
Cross girders. Bottom.	12·38	9·65	2·73	..	..	..	10·96	7·69	3·27	..	..	..	9·51	7·03	2·48	4·42	3·66	·76	8·81	6·65	2·16	..	..	..
Rail bearers. Top ..	6·55	6·20	·35	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Rail bearers. Bottom.	6·55	5 98	·57	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

NOTE.—This statement was furnished by the Chief Engineer, South Indian Railway, on 4th August 1896.

APPENDIX G—*cont.*

Statement of Whipple Murphy girders that are weak for "O" Class Engine under Government of India and Board of Trade Standard Rules—*cont.*

Board of Trade Rules—"O" Class Engine.

Span.	150 feet.						120 feet.						100 feet.						70 feet.			65 feet.		
Type.	Pin joints.			Rivetted joints.			Pin joints.			Rivetted joints.			Pin joints.			Rivetted joints.			Rivetted joints.			Rivetted joints.		
Member. Numbers.	Area required.	Area available.	—	Area required.	Area available.	—	Area required.	Area available.	—	Area required.	Area available.	—	Area required.	Area available.	—	Area required.	Area available.	—	Area required.	Area available.	—	Area required.	Area available.	—
27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Top boom. A	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Top boom. B	27·93	24·03	3·90	..	..	..	22·42	21·21	1·21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Top boom. C	31·92	27 40	4·52	..	..	..	25·62	24·96	·66	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Top boom. D	33·25	27·40	5·85	..	..	..	26·69	24·96	1·73	..	..	..	21·24	21·21	·03	..	..	..	..	..	..	..	..	..
Top boom. E	..	..	..	..	..	..	..	..	..	..	..	..	22·12	21·21	·91	..	..	..	..	..	..	..	..	..
Top boom. F	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bottom boom. a	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bottom boom. b	9·58	8·44	1·14	..	..	..	7·69	6·75	·94	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bottom boom. c	17·02	15·19	1·83	..	..	..	13·66	13·50	·16	..	..	..	6·37	5·90	·47	..	..	..	..	..	..	..	..	..
Bottom boom. d	..	..	..	..	..	..	..	..	..	..	..	..	11·33	10·96	·37	..	..	..	..	..	..	..	..	..
Bottom boom. e	25·54	22·79	2·75	..	..	..	20·49	20·25	·24	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bracings (struts). I	..	..	..	..	..	..	..	..	..	..	..	..	16·99	16·02	·97	..	..	..	..	..	..	..	..	..
Bracings (struts). II	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bracings (struts). III	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bracings (struts). IV	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bracings (struts). V	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bracings (struts). VI	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bracings (ties). 1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bracings (ties). 2	10·72	10·62	·10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bracings (ties). 3	..	..	..	..	..	..	..	..	..	..	..	..	7·14	7·00	·14	..	..	..	..	..	..	..	..	..
Bracings (ties). 4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bracings (ties). 5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bracings (ties). 6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cross girders. Top ..	..	..	..	..	..	..	10·12	9 47	·65	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cross girders. Bottom.	..	..	..	..	..	..	8·10	7·69	·41	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Rail bearers. Top ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Rail bearers. Bottom.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

NOTE.—This statement was furnished by the Chief Engineer, South Indian Railway, on 4th August 1896.

APPENDIX H.

South Indian Railway.

Statement of Feeder Roads required to Stations.

Stations.	Order of urgency.	Name of village to which the road is required.	Length of the road required.
			MILES.
South Arcot District.			
Alapakam	8	Kambliaradu	2
Serndanur	18	Thalavanur *vid* Malata river	1
	19	Arasamangalam	1
Mugaiyur	4	Trunk road north of the station	5
	5	Do. south of the do.	3
Kalambur	3	Southansal trunk road	3
North Arcot District.			
Mangalampeta	15	Mangalampeta village	1½
		Kottapet	1½
Cuddapah District.			
Pulicherla	20	Rampicherla	5
Do.	21	Kallupan (Kallur)	4
Piler	22	Tsadum	7
Kalikeri	2	Mahal	9
Do.	12	Kundur	7
Vayalpad	1	Somanarapally to Tirululam	6
Kurabalakota	16	Kurabalakota village	½
Tummanamgutta	9	Ghutta	5
Battulapuram	..	Kottakota	7
Mulacalacheruvu	10	Mudukadripally	5
Mudigubba	11	Pamadurti	..
Tanjore District.			
Saliyamangalam	14	Orathanadoo Chattram	10
Tirunattiyattangudi	13	Adivadangam	2
Coimbatore District.			
Chavadipalaiyam	7	Madukurichi	2
Tinnevelly District.			
Koilpati	17	Elirampannai	7
Tulukapati	6	Local fund road leading to Sivakási	2

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Order of Government	A	A	A	A	A	A	A	
Letter of Government.								
Statement with ditto.								
Papers not filed up, being meant for despatch in original.								

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