

Public Works (1898) Department

RAILWAY BRANCH.

G.O., No. 206-7-2

DATED 4th Feb. 1898.

70 copies
150/5 30

[Despatch Abstract.]

Report of Inspection of the East Coast Railway
including the Puri Branch

The Senior Govt. Inspector's — for the half-year ending the 31st Decr 1897, Communicated to the Manager of the Railway for information and necessary action; and Copy of the Pro: forwarded to the Govt. of India.

Forwarding Copy of the Pro: embodying the Senior Govt. Inspector's — for the half-year ending the 31st Decr 1897

Forwarding copy of the Proceedings embodying the Senior Government Inspector's — for the half-year ending the 31st December 1897.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Railway.

Read the following paper:—

EAST COAST RAILWAY.

STANDARD GAUGE 5' 6".

Mileage open for traffic 546 miles (including Puri branch 25 miles).

INSPECTION Report for the half-year ending 31st December 1897.

The inspection was made on January the 3rd to the 6th, inclusive, in company with the Manager and the heads of the Engineering, Traffic and Locomotive Departments, and over their respective lengths by the District officers and their assistants.

2. *The Road.*—Except on the Puri branch, the road has got a very good top on it nearly everywhere. On the main line, ballast is still deficient in places, and it will not be possible to get the entire road into a uniformly good condition just yet. But on the whole the road is a good one, fit for any ordinary speed. Large quantities, ten or twelve lakhs of cubic feet I think, of ballast have been spread since last inspection, and larger quantities have been collected. Now that banks have pretty well consolidated, it would be well to have a regular survey made of the ballast in the road and a schedule of how much remains, mile by mile, to bring it up to standard. For many miles there is little or no bottom ballast, and, though the road looks well enough in the dry season, it must be expensive to maintain during the rains until properly ballasted. As regards the Puri branch, I think it very doubtful whether the profits on working it during last rains, with the heavy engines, in its unballasted condition while the high banks were quite new, have not been many times over swallowed up in subsequent maintenance; even still there are 10 men per mile on it, and yet it is rough. For some miles south of Ellore the road has rather a poor top on it. For about 20 miles south of the Gódávári the road is sand-ballasted; this makes a most excellent road, but is very dusty; it might, with great advantage, be covered up with a thin layer of broken stone as is done on the Madras Railway. On this length, by the way, a curious thing was brought to my notice. The sand is the sharp quartz sand of the Gódávári, and it is found that on curves of less than 2,000 feet radius the rubbing of the foot of the rail, with the help of the sand, has cut most of the dog spikes nearly through just below the head. I have never heard of this having been found to occur elsewhere, and it might, perhaps, never occur with micaceous, wind-blown sand; but it is certainly a source of very considerable danger under such conditions as are prevalent where it was shown to me, and it will necessitate the exercise of care on the part of the platelayers. It is just five years since the spikes referred to were driven. The mischief is said not to occur in curves of larger radius.

3. *Stations.*—At Khurda road a new lamp-room has been added since last inspection, and also a new bath-room to the 2nd-class waiting-room, and a hydrant in the 3rd-class waiting-shed. Puri temporary station is just as it was six months ago, but they hope to get into the permanent station 3 miles further on by the end

of March next. At Chatrapur a waiting-room for Europeans is certainly necessary, as Chatrapur is the civil station of the district. Berhampore wants a goods-platform; it has a goods-shed and gets lots of traffic. Kottavalasa wants a dead end siding. The home signal arms at Simháchalam require stops; they now fall vertically. At Waltair, since last inspection, a corrugated iron passenger waiting-shed has been put up; half of it is, at present, being used as a goods-shed. At Durgada, where there is a stone and ballast siding, there has been put up since last inspection a signal interlocked with the siding points. At Gódávári North, the goods-shed has been built which was recommended at last inspection. The question of the relocation of Kovvur station in connection with the re-alignment necessitated by the Gódávári bridge requires looking into. Meanwhile, certain temporary proposals of the Manager for pulling the lines about at Kovvur are approved.

At Bezwada there is a question of the best position for certain new staff quarters. From an intimate personal knowledge of the locality, I am inclined to advise that they be built on the side of the hill instead of on the black cotton plain; because the few degrees of extra heat on the hill can be compensated for by thicker walls and flat thick roofs, whereas it will always be unhealthy down on the black cotton low land.

4. *Watering arrangements.*—It has properly been decided to lay a large bore water-pipe from the pump in the Kistna bridge north abutment to the Bezwada locomotive tank. For the supply of good water to the locomotive shed at Sitanagram—a very important matter—I incline to recommend as follows. As the bridge footway contractor uses only one of the overhead footways, place iron water tanks inside the battlements on both upstream abutment towers. Connect these across the bridge by a small pipe, say a two-inch pipe, laid on the upstream overhead footway. This will act merely as a balance pipe to bring the water to a level in both tanks. Then pump into the tank at the Bezwada end, and draw off from that at the Sitanagram end. I think it will be found that the contents of the Sitanagram tank will be large enough, as compared with the demands of the Sitanagram locomotive station, to allow it to fill at its leisure from the tank at the Bezwada end of the bridge through the small pipe. That, of course, can be easily calculated. The advantages would be the full utilization of the steam pump at the excellent abutment source of water-supply, and the possibility of shutting up the separate engine pumping arrangement for the supply of the locomotive tanks at Sitanagram. At Khurda road the water-supply in the well is very short, but a new source of supply has been found and arrangements are being made. At Kalupara Ghât the water turns out to be very good, so it is being made into a watering station. At Rambha the watering arrangements somewhat urgently require looking into. At Chatrapur the water-supply is unsatisfactory, but in a cutting, about a mile to the south, there is plenty of good water which can apparently be run down to Chatrapur by gravity, and for this the small piping which is to be removed from Bezwada might be utilized. The locomotive well at Waltair has been much improved since last inspection. The artesian well at Cocanada is to be re-opened. Water is rather short at Palasa, as also at Parlákimedi road. The engines watering heretofore at the latter place will have to fill at Kota Bommali.

5. *Telegraph.*—At numerous places all along the line, and especially at mile 38-39, I noticed that where the wire crosses the line, the poles are planted within about 10 feet of the centre of track. This is contrary to orders.

6. *Steel sleepers.*—I was told that corrosion amongst the steel sleepers is but little noticeable. But in spite of the great care which was exercised during the construction days to avoid laying them in salt soil, I noticed some places near mile 161-62 where there were steel sleepers and yet salt encrustation was visible in the borrow pits. I should like the sleepers at this place to be taken out and specially examined.

7. *Dead end sidings.*—Under the orders which were current at the time of construction, orders applicable rather to lines on the North-West frontier than to the East Coast, all through sidings were made 2,000 feet long. There was not enough material for dead ends at most of the roadside stations, and consequently much inconvenience has to be put up with at those stations when goods traffic offers. Again, in

many small stations where dead ends have been provided, there is scarcely a waggon per month of goods traffic. It would, I think, be wise to cut down many of the through sidings from 2,000 feet to 1,400 feet and to eliminate some of the unused dead ends, using the material so set free to give dead ends where they are obviously needed.

8. *Junction for the Vizagapatam Branch.*—There is a question of laying out a direct through line here, a third side to the triangle, and of working the line from there through Waltair to the Port as a branch line. The idea is a good one and might now be elaborated. It would save, I think, some two hours on the through Calcutta-Madras journey. As the engine station, Waltair, would be on the branch, the fresh engine would take out the branch train and the tired engine would return with it.

9. *Floods.*—Between Durgada and Samalkot, and chiefly between Pithápuram and Samalkot, further flood damages are threatened. The subject is being carefully gone into by Mr. J. Eaglesome, and I have no doubt that it will be properly treated. It seemed to me that it is rather a question of raising the bank and thoroughly pitching existing waterways than of giving extra spans; but naturally the question is one for more than superficial consideration. Money is very properly being now spent on flooring.

10. *Samalkot Station.*—I was told of some proposals for giving more accommodation for passengers here, by turning the present third-class waiting hall into a refreshment room and waiting room for higher class passengers, and building an outside waiting shed. But I think it would be wise to wait and see the effect of the completion of the Gódávári bridge and of the connection through with Madras, and meanwhile to erect a small temporary shed on the platform without interfering with the present hall.

11. *Cocanada Branch Culverts.*—Some of these show signs of being thrust forward by the swelling black cotton soil behind them. They might, with advantage, be inverted, and perhaps flat-arched.

12. *Proposed Parlákimedi Branch Railway.*—I met Mr. Sandford, the Engineer of Parlákimedi estate, to whom the preparation of this project has been entrusted. It will be 25 miles of a 2' 6" gauge line. It is proposed that it should first connect the salt factory of Naupada with a salt platform alongside the railway station, and should then cross the East Coast Railway on the level, and run to Parlákimedi. I understand that the funds are to be provided by the Zamindar and are now actually available. If this line is made, the East Coast Railway arrangements at Naupada station will require some modification. The new line ought to be a very valuable feeder to the trunk line, and very useful also to the Salt Department. I am disposed, since I went over part of the Bengal District Road Tramway Company's lines a few weeks ago with Sir Acquin Martin, to advise that this and all similar narrow gauge branch lines be made on the 2' 0" gauge instead of 2' 6". The 2' gauge is good enough for anything up to 50 or 60 miles long in a country of ordinary density of population and of produce, if provided with rolling stock of proper design. I hear that it is possible that the Oriental Salt Company may do all the handling of the salt on the east side of the East Coast Railway, in which case the Parlákimedi Railway would start from the west side.

13. *The Manganese Trade.*—I was told that this now averages 12 to 15 waggons per day. Unfortunately the lead is short, only about 50 or 60 miles.

14. *Vizagapatam.*—It is a pity that a little money is not available to gradually tidy things up a bit at this port. Half a lakh would do a vast deal of permanent work that must be done sooner or later, chiefly the levelling up of the yard and the filling up of great holes and the making of the foreshore fit for the manganese trade. A floating pontoon landing place like the smaller floating Calcutta jetties is very badly wanted just at the goods-shed, and a road is wanted from the business part of the town to the same goods-shed. The track through Ross Hill cutting has been pulled up at last as was inevitable sooner or later, and the only proper logical sequence of this now is to hand over the cutting to the municipality to carry a road through it to

the port station and goods-shed. The line will have to be carried round eventually, balloon-wise, through the thinly-housed part of the town, into the south end of the present Vizagapatam station. It might be as well to do this as soon as money is available and so make a good job of it once for all. I know the conditions well, and can say that the carrying out of none of these suggestions need in any way prejudice, or be prejudiced by, whatever is to be done in the future about either the convergence of railways on Vizagapatam port, or the harbour scheme.

15. *The Salt Trade.*—I was told that some months ago there was a great export of salt from Naupada towards Orissa, but that this has now stopped, because it was merely the temporary result of the selling of salt either damaged or likely to be damaged. But from Humma 6 or 7 waggon loads are said to go daily towards Cuttack. This salt is booked, not to the terminus at Barang for the most part, but to Khurda or Bhubaneswar, whence it is carted to Cuttack. The object apparently is to evade the terminal placed on salt booked for Barang which preferred not to use the out-agency. But the Manager has now abolished the terminal, and it seems probable that booking to Barang will be resumed. It is a special condition of Humma factory that a lot of local carts make a livelihood by working between the pans and the railway. About 100 to 200 cart loads are said to come daily to the station from the factory, and a cart reckons to make two trips per day. There is a good road. Under such favourable carting conditions as these it is doubtful whether a short branch railway would pay or is necessary. At Naupada either the Parlákimedi Railway or the Oriental Salt Company will perform the function of carts. The conditions at Karassa factory are altogether different. Here there is no class of local cartmen, and it is necessary, for the lifting of the salt at all, that the cartmen from the hinterland, who themselves are small traders and not merely hirelings, should bring their carts right down to the pans. Naturally in such circumstances they do not get in touch with the railway. But if the railway were to go right down to the pans and to place the salt (in bond) at the trading centres of Tuni and Vizianagram, not only would it get freight on so much haulage, but the cartmen would presumably readily lend themselves to an arrangement which would result in the saving to them of a week on their journey. However the very recent appearance on the scene of the Oriental Salt Company, as represented by Mr. MacNab, seems likely to so completely change all the conditions of the trade that it is quite impossible now to say whether it would be wise for the railway to take a siding down to Karassa or not.

16. *Locomotives.*—Two important classes of defects in the heavy compound locomotive engines in use on the line were brought to my notice. First the breakage of cylinder port bridges, and second the cracking of fire-box tube plates. The breakage of cylinder port bridges has occurred in 8 or 10 cases, and to both high and low pressure cylinders. I do not know whether failures of this nature are or are not common. If not caused by loose nuts getting caught in the port, they may apparently be ascribed to unequal shrinkage at the place where the large mass of hot metal in the cylinder joins the thin mass at the port bridge. This might easily result in initial flaws in the casting, and eventually, after much vibration, and perhaps an occasional knock under the valve face, the bridge would go. The damage is being patched up as it occurs, and the port faces are being covered with steel plates screwed down to them.

The second and more important class of failures that came to my notice in the same compound engines was a cracking of the copper fire-box tube plates, the crack running through the bridges between the holes, and sometimes through several bridges in succession. These cracks are found to occur for the most part in the outer two or three rows of holes at the sides, top or bottom of the plate and not towards the middle. I prefer to deal with this very important matter in a separate report. The Civil Engineering College, Madras, would, I am sure, be glad to undertake the testing of parts of the failed plates and to compare them with commercially pure copper, and with similar plates of Madras Railway engines which have not failed in this particular way, in the 100 ton testing machine of the College. I recommend that this testing be done. I was shown indentations inside the plates of the main frames of these engines where the foundation ring rivet heads of the fire-box foul the frames, thus communicating undue vibration to the fire-box and enhancing the state of rigidity from which it, presumably, suffers.

17. *Rolling-stock*.—I was told that arrangements are being made for completing the rolling-stock which is debitable to the Capital Account of the line during the current financial year. It is proposed, and from what I could learn wisely, to give up the use on the East Coast Railway of intermediate carriages, and to turn them into 3rd-class female carriages.

18. *Stores*.—I was very much struck with the comparatively large quantity of stores in charge of the Locomotive Department and the small quantity in charge of the Stores Department. Such stocks as metals, timber, and in fact everything normally in use, except perhaps sufficient of each for a few weeks' consumption, ought, in my opinion, as a matter of principle, to be kept in charge of the Stores Department. As an instance of the evils resulting from the dual system, I was shown a large quantity of teak timber, mostly "country squares," perhaps a lakh or a lakh and a half's worth, which was lying unused in charge of the Locomotive Department, while enquiries for teak are going on all round from the Storekeeper. This latter officer having no official knowledge of the Locomotive Department teak, and the Locomotive Superintendent knowing nothing of the enquiries for teak, it has resulted that this large and valuable stock is lying about, and has, I hear, been lying about for two or three years, and is certainly deteriorating in value. This is quite wrong. I advise that it be transferred to the Stores Department, and that arrangements be made for its sale or utilization. I was told that the stores in charge of the Locomotive Department were about double the value of those kept by the Stores Department. Arrangements for remedying this state of things are now in train, and quite time too. Needless to point out the money might all this time have been very much better employed elsewhere, down at the harbour face for example. There did not seem to be any abnormal accumulation of stores either with the Stores Department or in the Locomotive Stores. But special efforts might, I think, be made to get rid of a few things that are almost certainly wanted elsewhere in India if only men could hear of them. Some of these things though quite good have been locked up for years in store. Amongst other things I saw about 40 twelve feet iron well curbs, priced at Rs. 7-4-0 per cwt.; 6 forty feet Bell's dredgers, surely wanted on some of the East Indian or Bengal-Nagpur extensions; 50 distant signal winches which might easily have been used on the Bezwada-Madras Railway and may perhaps still be used on the Bengal-Nagpur Railway; 20 or 30 Bell's or Bull's dredgers of small sizes; 2 Glover and Hobson's rock drills; 18 metre gauge end tip waggons; and 13 tons of lead coloured paint priced at Rs. 12 per cwt. I am sure that the Manager is open to reasonable offers for all these things.

19. *Hospital*.—One of the drivers' quarters at Waltair is being used for a hospital and dispensary. It seems to me to be very cramped, and it is located in a place where I know that four or five feet of water sometimes stand in the rains, which might be awkward for disabled patients. This is the only place where sick Europeans can be accommodated. Whatever may be the future of the East Coast Railway, I think that a proper hospital ought to be built at Waltair.

20. *Godavari Ferry*.—In my last report I found fault with the mode of attaching the rails on the shore to those on the wagon ferry pontoons. This is now being satisfactorily remedied. The approach road to the ferry on the south or Kovvur side is being slewed round to a point which will make the cold season passage of the river a business of only a few minutes, saving perhaps an hour or two on the through journey.

21. *Godavari Bridge*.—Of the 56 well foundations on which the bridge is to stand, the curbs of 19 have been pitched and 17 of these have had their masonry started. About 300 lineal feet of very excellent masonry has been built and perhaps 150 feet of well sunk below ultimate level of well top. It seems likely that 33 spans may be on dry land in the cold weather and that the wells of 30 of these and many of their piers may be completed this season. But judging by present arrangements it seems unlikely that anything will be done this season on the 23 foundations in more or less deep water. It might have been expected that everything would have been done to start the deep water piers first, as it is here that delay will occur and difficulty may occur; but I understand that there is some question of saving money by waiting to bring round the pontoons now being used at the Indus bridge. I fail to see where the economy comes in, for new pontoons for the Godavari can probably be built locally for

less money than the freight alone of the Kotri pontoons will cost, not to mention the cost and inconvenience of each additional year of maintaining the ferry. I gathered in conversation with Mr. Walton, and I think it right to refer to it here, that he either is, or fancies he is, hampered about the obtaining of supplies and of plant on a scale commensurate with the magnitude of his work. I understood that he could not get a few sticks of long timber, stuff that can only be obtained in the form of pitch pine, through English ports from Pensacola and Oregon. From one to two lakhs worth of such timber was used on each of the following bridges, Benares, Sher Shah, Sukker and Kistna, and much of it passed on at a reduced value from one to the other. The result of the entire absence of any of it at Godavari would perhaps account for the insufficiency of the well-sinking arrangements, small light dredgers worked one at a time by 3-ton hoists from little rail gantries, instead of 40 feet Bell dredgers which the same hoists could easily work, and plenty of which are lying around only waiting to be picked up on the East Coast and I think on the Assam-Bengal Railways. The galleys for big dredgers of course require big and long sticks.

I wish to record here that I entirely disapprove of the design of the deep water wells. They are likely in my opinion to bring disaster. I also disapprove of the small spans adopted over the deep water. The spans in my own final design were 250 feet, and the piers and their caissons for the deep water part of the river were specially designed with an enlarged base, for stability in the very deep and rapid current where but scanty support is to be expected from the few feet of bottom in which the base can be embedded. My caissons too were designed with special provision for pneumatic sinking; a very necessary provision where, as is the case in the deep water wells, probably boulders and certainly rock, and perhaps not level rock either, have to be encountered. There is no real reason, æsthetic or other, why all the spans should be of one size. No such necessity is recognized in American engineering, or in modern English engineering for that matter: and the conditions of the Godavari are such, especially in the case of a bridge designed as is the present one to cross the entire breadth of it instead of to cross between training works, that it is good engineering to have small spans, 150 feet as designed, for the southern 30 or 40 spans, and then possibly a few 200 feet ones, and the rest 250 feet. It is even a question whether it would not be wiser to make the northern two or three shore spans 300 feet, in order to minimise the risk of their foundations, and to get the wells out into better ground as early as possible. The piers of these larger and deep water spans ought to splay out at the base as in my final design, and ought to be provided with pneumatic attachments for use if found necessary.

It is not yet too late to attend to these very important matters, and I commend them to the consideration of the Director of State Railways Construction.

22. *Kistna Junction Arrangements*.—The arrangements for the junction of the broad and metre gauges at and around Tadépalli, south of Bezwada, do not appear to me to have been sufficiently thoroughly threshed out. Arrangements seem to have been drifted into which will only have to be all undone again and which, until undone, will only give rise to trouble and friction. Nearly every one concerned, first I, who made the first design, and subsequently Colonel Selby, the Consulting Engineer, Bombay, and two successive Agents of the Southern Mahratta Railway, Colonel Lindsay and Major Burn Murdoch, and the Nizam's Railway officers, all agreed that there is ample room at Bezwada for all possible future development, and this I can prove by plans now in my possession. But now it has been decided that the tranship arrangements shall be located at Tadépalli, instead of at Bezwada; and the Chief Engineer of the Bezwada-Madras Railway has already gone so far with his tranship siding construction that it seems futile to re-open the question and the arrangement must be a permanent one.

The detailed arrangement of the stations, however, is surely susceptible of improvement, for within a radius of half a mile there are the following stations around the junction of the gauges. First, nearest Bezwada, is the Sitanagaram station necessitated by the Sitanagaram locomotive sheds. Next, just beyond the canal bridge, is the actual junction of the gauges, called temporary Kistna Canal Junction, or K.C.C. Just beyond this on the standard gauge line is Kistna Canal Junction, K.C.J. with its tranship lines for both gauges; and about opposite it on the Southern Mahratta Railway is Tadépalli station. Tadépalli station is about as temporary a structure as could be erected for four or five years' traffic, and was purposely

designed so that it might be cheaply lifted up and stuck down again. The right thing to have done would have been to have ignored Tadépalli altogether and to have designed the new Kistna Canal Junction so that it might perform the functions of the broad gauge, of the metre gauge, of transshipment, and of the junction of the gauges. This can easily be done even now though not anything like as well as might have been done at an earlier stage.

But even better than this will be to cross the canal with a separate bridge for the metre gauge, and only allow the gauges to actually meet at Sitanagaram, the station which it is impossible to abolish because of the Locomotive sheds. Then the broad and metre gauges would only meet at the tranship yard between Tadépalli and Kistna Canal Junction, and their main lines would only interfere with each other at Sitanagaram immediately before crossing the Kistna bridge. Thus the congestion zone would be reduced to half its present length. Even now the congestion is severe enough at certain hours, and it will be worse when the standard gauge is connected up towards the south.

23. *Goods Traffic south of Bezwada.*—Arrangements were come to in my presence between the officials of the East Coast Railway open line and those of its unopened extension towards Madras, whereby the former are to man the stations south of Bezwada as far for the present as Bapatla, and to arrange for the booking of goods in and out, and the latter are to attach the goods vehicles to their construction trains and work them at their own convenience. I do not know why the southern extension of the East Coast Railway, called temporarily as a matter of convenience the Bezwada-Madras Railway during construction, should be at the expense and trouble of putting letters and numbers on their rolling-stock which in a few months will only have to be painted out. The proper lettering and numbering of the vehicles might easily have been arranged with the East Coast Railway Locomotive Department.

MADRAS,
13th January 1898.

FRANCIS J. E. SPRING,
Senior Government Inspector of Railways.

ORDER—No. 206 R., dated 4th February 1898.

Communicated to the Manager, East Coast 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. 207 R., dated 4th February 1898.]

(True Extract.)

FRANCIS J. E. SPRING,
Joint Secretary.

To the Manager, East Coast Railway.
" Engineer-in-Chief, Gódvári Bridge.
" Consulting Engineer for Railways.
" Revenue Department.
" Marine Department.

ENDORSEMENT—No. 207 R., dated 4th February 1898.

Forwarded.

(By order.)

FRANCIS J. E. SPRING,
Joint Secretary.

Public Works Department
Railway Branch
Madras 26 January 1898

- (1) His Excy. the Governor
(2) Hon. Sir Henry Bliss K.C.S.E.
(3) Hon. Mr. J. Grose C.S.E.

Inspection Report of
the East Coast Railway, for
the half year ended 31st Dec-
ember 1897.

seen 25.1.98

There are several errors
in pages 12 & 14 - see my
pencil notes.

BH
31/1/98

col.

FJS
26/1/98

seen
2/2/98

seen 26.1.98

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Railway.

Read the following paper :--

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2. *The Road.*—Except on the Puri branch, the road has got a very good top on it nearly everywhere. On the main line, ballast is still deficient in places, and it will not be possible to get the entire road into a uniformly good condition just yet. On the whole, however, the road is a good one, fit for any speed. Large quantities, ten or twelve lakhs of cubic feet I think, of ballast have been spread since last inspection, and larger quantities have been collected. Now that banks have pretty well consolidated, it would be well to have a regular survey made of the ballast in the road and a schedule of how much remains, mile by mile, to bring it up to standard. For many miles there is little or no bottom ballast, and, though the road looks well enough in the dry season, it must be expensive to maintain during the rains until properly ballasted. As regards the Puri branch, I think it very doubtful whether the profits on working it during last rains, with the heavy engines, in its unballasted condition while the high banks were quite new, have not been many times over swallowed up in subsequent maintenance; even still there are 10 men per mile on it, and yet it is rough. For some miles south of Ellore the road has rather a poor top on it. For about 20 miles south of the Gódvári the road is sand-ballasted; this makes a most excellent road, but is very dusty; it might, with great advantage, be covered up with a thin layer of broken stone as is done on the Madras Railway. On this length, by the way, a curious thing was brought to my notice. The sand is the sharp quartz sand of the Gódvári, and it is found that on curves of less than 2,000 feet radius the rubbing of the foot of the rail, with the help of the sand, has cut most of the dog spikes nearly through just below the head. I have never heard of this having been found to occur elsewhere, and it might, perhaps, never occur with micaceous, wind-blown sand; but it is certainly a source of very considerable danger under such conditions as are prevalent where it was shown to me, and it will necessitate the exercise of care on the part of the platelayers. It is just five years since the spikes referred to were driven. The mischief is said not to occur in curves of larger radius.

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of March next. At Chatrapur a waiting-room for Europeans is certainly necessary, as Chatrapur is the civil station of the district. Berhampore wants a goods-platform; it has a goods-shed and gets lots of traffic. Kottavalasa wants a dead end siding. The home signal arms at Simhachalam require stops; they now fall vertically. At Waltair, since last inspection, a corrugated iron passenger waiting-shed has been put up; half of it is, at present, being used as a goods-shed. At Durgada, where there is a stone and ballast siding, there has been put up since last inspection a signal interlocked with the siding points. At Gódavari North, the goods-shed has been built which was recommended at last inspection. The question of the relocation of Kovvur station in connection with the re-alignment necessitated by the Gódavari bridge requires looking into. Meanwhile, certain temporary proposals of the Manager for pulling the lines about at Kovvur are approved.

At Bezwada there is a question of the best position for certain new staff-quarters. From an intimate personal knowledge of the locality, I am inclined to advise that they be built on the side of the hill instead of on the black cotton plain; because the few degrees of extra heat on the hill can be compensated for by thicker walls and flat thick roofs, whereas it will always be unhealthy down on the black cotton low land.

4. *Watering arrangements.*—It has properly been decided to lay a large bore water-pipe from the pump in the Kistna bridge north abutment to the Bezwada locomotive tank. For the supply of good water to the locomotive shed at Sitanagram—a very important matter—I incline to recommend as follows. As the bridge footway contractor uses only one of the overhead footways, place iron water tanks inside the battlements on both upstream abutment towers. Connect these across the bridge by a small pipe, say a two-inch pipe, laid on the upstream overhead footway. This will act merely as a balance pipe to bring the water to a level in both tanks. Then pump into the tank at the Bezwada end, and draw off from that at the Sitanagram end. I think it will be found that the contents of the Sitanagram tank will be large enough, as compared with the demands of the Sitanagram locomotive station, to allow it to fill at its leisure from the tank at the Bezwada end of the bridge through the small pipe. That, of course, can be easily calculated. The advantages would be the full utilization of the steam pump at the excellent abutment source of water-supply, and the possibility of shutting up the separate engine pumping arrangement for the supply of the locomotive tanks at Sitanagram. At Khurda road the water-supply in the well is very short, but a new source of supply has been found and arrangements are being made. At Kalupara Ghât the water turns out to be very good, so it is being made into a watering station. At Rambha the watering arrangements somewhat urgently require looking into. At Chatrapur the water-supply is unsatisfactory, but in a cutting, about a mile to the south, there is plenty of good water which can apparently be run down to Chatrapur by gravity, and for this the small piping which is to be removed from Bezwada might be utilized. The locomotive well at Waltair has been much improved since last inspection. The artesian well at Cocanada is to be re-opened. Water is rather short at Palasa, as also at Parlákimedi road. The engines watering heretofore at the latter place will have to fill at Kota Bommali.

5. *Telegraph.*—At numerous places all along the line, and especially at mile 38-39, I noticed that where the wire crosses the line, the poles are planted within about 10 feet of the centre of track. This is contrary to orders.

6. *Steel sleepers.*—I was told that corrosion amongst the steel sleepers is but little noticeable. But in spite of the great care which was exercised during the construction days to avoid laying them in salt soil, I noticed some places near mile 161-62 where there were steel sleepers and yet salt encrustation was visible in the borrow pits. I should like the sleepers at this place to be taken out and specially examined.

7. *Dead end sidings.*—Under the orders which were current at the time of construction, orders applicable rather to lines on the North-West frontier than to the East Coast, all through sidings were made 2,000 feet long. There was not enough material for dead ends at most of the roadside stations, and consequently much inconvenience has to be put up with at those stations when goods traffic offers. Again, in

many small stations where dead ends have been provided, there is scarcely a waggon per month of goods traffic. It would, I think, be wise to cut down many of the through sidings from 2,000 feet to 1,400 feet and to eliminate some of the unused dead ends, using the material so set free to give dead ends where they are obviously needed.

8. *Junction for the Vizagapatam Branch.*—There is a question of laying out a direct through line here, a third side to the triangle, and of working the line from there through Waltair to the Port as a branch line. The idea is a good one and might now be elaborated. It would save, I think, some two hours on the through Calcutta-Madras journey. As the engine station, Waltair, would be on the branch, the fresh engine would take out the branch train and the tired engine would return with it.

9. *Floods.*—Between Durgada and Samalkot, and chiefly between Pithápura and Samalkot, further flood damages are threatened. The subject is being carefully gone into by Mr. J. Eaglesome, and I have no doubt that it will be properly treated. It seemed to me that it is rather a question of raising the bank and thoroughly pitching existing waterways than of giving extra spans; but naturally the question is one for more than superficial consideration. Money is very properly being now spent on flooring.

10. *Samalkot Station.*—I was told of some proposals for giving more accommodation for passengers here, by turning the present third-class waiting hall into a refreshment room and waiting room for higher class passengers, and building an outside waiting shed. But I think it would be wise to wait and see the effect of the completion of the Gódvári bridge and of the connection through with Madras, and meanwhile to erect a small temporary shed on the platform without interfering with the present hall.

11. *Cocanada Branch Culverts.*—Some of these show signs of being thrust forward by the swelling black cotton soil behind them. They might, with advantage, be inverted, and perhaps flat-arched.

12. *Proposed Parlákimedi Branch Railway.*—I met Mr. Sandford, the Engineer of Parlákimedi ~~State~~, to whom the preparation of this project has been entrusted. It will be 25 miles of a 2' 6" gauge line. It is proposed that it should first connect the salt factory of Naupada with a salt platform alongside the railway station, and should then cross the East Coast Railway on the level, and run to Parlákimedi. I understand that the funds are to be provided by the ~~Native State~~ and are now actually available. If this line is made, the East Coast Railway arrangements at Naupada station will require some modification. The new line ought to be a very valuable feeder to the trunk line, and very useful also to the Salt Department. I am disposed, since I went over part of the Bengal District Road Tramway Company's lines a few days ago with Sir Acquin Martin, to advise that this and all similar narrow gauge branch lines be made on the 2' 0" gauge instead of 2' 6". The 2' gauge is good enough for anything up to 50 or 60 miles long in a country of ordinary density of population and of produce, if provided with rolling stock of proper design. I hear that it is possible that the Oriental Salt Company may do all the handling of the salt on the east side of the East Coast Railway, in which case the Parlákimedi Railway would start from the west side.

13. *The Manganese Trade.*—I was told that this now averages 12 to 15 waggons per day. Unfortunately the lead is short, only about 50 or 60 miles.

14. *Vizagapatam.*—It is a pity that a little money is not available to gradually tidy things up a bit at this port. Half a lakh would do a vast deal of permanent work that must be done sooner or later, chiefly the levelling up of the yard and the filling up of great holes and the making of the foreshore fit for the manganese trade. A floating pontoon landing place like the smaller floating Calcutta jetties is very badly wanted just at the goods shed, and a road is wanted from the business part of the town to the same goods shed. The track through Ross Hill cutting has been pulled up at last as was inevitable sooner or later, and the only proper logical sequence of this now is to hand over the cutting to the municipality to carry a road through it to the port station and goods shed. The line will have to be carried round eventually, the balloon-wise, through the thinly-housed part of the town, into the south end of the present Vizianagram station. It might be as well to do this as soon as money is available and so make a good job of it once for all. I know the conditions well, and

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can say that the carrying out of none of these suggestions need in any way prejudice, or be prejudiced by, whatever is to be done in the future about either the convergence of railways on Vizianagram port, or the harbour scheme.

Vizianagram

15. *The Salt Trade.*—I was told that some months ago there was a great export of salt from Naupada towards Orissa, but that this has now stopped, because it was merely the temporary result of the selling of salt either damaged or likely to be damaged. But from Humma 6 or 7 waggon loads are said to go daily towards Cuttack. This salt is booked, not to the terminus at Barang for the most part, but to Khurda or Bhubaneswar, whence it is carted to Cuttack. The object apparently is to evade the terminal placed on salt booked for Barang which preferred not to use the out-agency. But the Manager has now abolished the terminal, and it seems probable that booking to Barang will be resumed. It is a special condition of Humma factory that a lot of local carts make a livelihood by working between the pans and the railway. About 100 to 200 cart loads are said to come daily to the station from the factory, and a cart reckons to make two trips per day. There is a good road. Under such favourable carting conditions as these it is doubtful whether a short branch railway would pay or is necessary. At Naupada either the Parlákimedi Railway or the Oriental Salt Company will perform the function of carts. The conditions at Karassa factory are altogether different. Here there is no class of local cartmen, and it is necessary, for the lifting of the salt at all, that the cartmen from the hinterland, who themselves are small traders and not merely hirelings, should bring their carts right down to the pans. Naturally in such circumstances they do not get in touch with the railway. But if the railway were to go right down to the pans and to place the salt (in bond) at the trading centres of Tuni and Vizianagram, not only would it get freight on so much haulage, but the cartmen would presumably readily lend themselves to an arrangement which would result in the saving to them of a week on their journey. However the very recent appearance on the scene of the Oriental Salt Company, as represented by Mr. MacNab, seems likely to so completely change all the conditions of the trade that it is quite impossible now to say whether it would be wise for the railway to take a siding down to Karassa or not.

16. *Locomotives.*—Two important classes of defects in the heavy compound locomotive engines in use on the line were brought to my notice. First the breakage of cylinder port bridges, and second the cracking of fire-box tube plates. The breakage of cylinder port bridges has occurred in 8 or 10 cases, and to both high and low pressure cylinders. I do not know whether failures of this nature are or are not common. If not caused by loose nuts getting caught in the port, they may apparently be ascribed to unequal shrinkage at the place where the large mass of hot metal in the cylinder joins the thin mass at the port bridge. This might easily result in initial flaws in the casting, and eventually, after much vibration, and perhaps an occasional knock under the valve face, the bridge would go. The damage is being patched up as it occurs, and the port faces are being covered with steel plates screwed down to them.

The second and more important class of failures that came to my notice in the same compound engines was a cracking of the copper fire-box tube plates, the crack running through the bridges between the holes, and sometimes through several bridges in succession. These cracks are found to occur for the most part in the outer two or three rows of holes at the sides, top or bottom of the plate and not towards the middle. I prefer to deal with this very important matter in a separate report. The Civil Engineer/College, Madras, would, I am sure, be glad to undertake the testing of parts of the failed plates and to compare them with commercially pure copper/and with similar plates/ of Madras Railway engines which have not failed in this particular way, in the 100 ton testing machine of the College. I recommend that this testing be done. I was shown indentations inside the plates of the main frames of these engines where the foundation ring rivet heads of the fire-box foul the frames, thus communicating undue vibration to the tube/plates/ and enhancing the state of rigidity from which they suffer.

fire-box

17. *Rolling-stock.*—I was told that arrangements are being made for completing the rolling-stock which is debitable to the Capital Account of the line during the current financial year. It is proposed, and from what I could learn wisely, to give up the use on the East Coast Railway of intermediate carriages, and to turn them into 3rd-class female carriages.

18. *Stores.*—I was very much struck with the comparatively large quantity of stores in charge of the Locomotive Department and the small quantity in charge of the Stores Department. Such stocks as metals, timber, and in fact everything normally

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in use, except perhaps sufficient of each for a few weeks' consumption, ought, in my opinion, as a matter of principle, to be kept in charge of the Stores Department. As an instance of the evils resulting from the dual system, I was shown a large quantity of teak timber, mostly "country squares," perhaps a lakh or a lakh and a half's worth, which was lying unused in charge of the Locomotive Department, while enquiries for teak are going on all round from the Storekeeper. This latter officer having no official knowledge of the Locomotive Department teak, and the Locomotive Superintendent knowing nothing of the enquiries for teak, it has resulted that this large and valuable stock is lying about, and has, I hear, been lying about for two or three years, and is certainly deteriorating in value. This is quite wrong. I advise that it be transferred to the Stores Department, and that arrangements be made for its sale or utilization. I was told that the stores in charge of the Locomotive Department were about double the value of those kept by the Stores Department. Arrangements for remedying this state of things are now in train, and quite time too. Needless to point out the money might all this time have been very much better employed elsewhere, down at the harbour face for example. There did not seem to be any abnormal accumulation of stores either with the Stores Department or in the Locomotive Stores. But special efforts might, I think, be made to get rid of a few things that are almost certainly wanted elsewhere in India if only men could hear of them. Some of these things though quite good have been locked up for years in store. Amongst other things I saw about 40 twelve feet iron well curbs, priced at Rs. 7-4-0 per cwt.; 6 forty feet Bell's dredgers, surely wanted on some of the East Indian or Bengal-Nagpur extensions; 50 distant signal winches which might easily have been used on the Bezvada-Madras Railway and may perhaps still be used on the Bengal-Nagpur Railway; 20 or 30 Bell's or Bull's dredgers of small sizes; 2 Glover and Hobson's rock drills; 18 metre gauge end tip waggons; and 13 tons of lead coloured paint priced at Rs. 12 per cwt. I am sure that the Manager is open to reasonable offers for all these things.

19. *Hospital*.—One of the drivers' quarters at Waltair is being used for a hospital and dispensary. It seems to me to be very cramped, and it is located in a place where I know that four or five feet of water sometimes stand in the rains, which might be awkward for disabled patients. This is the only place where sick Europeans can be accommodated. Whatever may be the future of the East Coast Railway, I think that a proper hospital ought to be built at Waltair.

20. *Godavari Ferry*.—In my last report I found fault with the mode of attaching the rails on the shore with those on the waggon ferry pontoons. This is now being satisfactorily remedied. The approach road to the ferry on the south or Kovvur side is being slewed round to a point which will make the cold season passage of the river a business of only a few minutes, saving perhaps an hour or two on the through journey.

21. *Godavari Bridge*.—Of the 56 well foundations on which the bridge is to stand, the curbs of 19 have been pitched and 17 of these have had their masonry started. About 300 lineal feet of very excellent masonry has been built and perhaps 150 feet of well sunk below ultimate level of well top. It seems likely that 33 spans may be on dry land in the cold weather and that the wells of 30 of these and many of their piers may be completed this season. But judging by present arrangements it seems unlikely that anything will be done this season on the 23 foundations in more or less deep water. It might have been expected that everything would have been done to start the deep water piers first, as it is here that delay will occur and difficulty may occur; but I understand that there is some question of saving money by waiting to bring round the pontoons now being used at the Kotri bridge. I fail to see where the economy comes in, for new pontoons for the Godavari can probably be built locally for less money than the freight alone of the Kotri pontoons will cost, not to mention the cost and inconvenience of each additional year of maintaining the ferry. I gathered in conversation with Mr. Walton, and I think it right to refer to it here, that he either is, or fancies he is, hampered about the obtaining of supplies and of plant on a scale commensurate with the magnitude of his work. I understood that he could not get a few sticks of long timber, stuff that can only be obtained in the form of pitch pine, through English ports from Pensacola and Oregon. From one to two lakhs worth of such timber was used on each of the following bridges, Benares, Sher Shah, Sukker

and Kistna, and much of it passed on at a reduced value from one to the other. The result of the entire absence of any of it at Górávari would perhaps account for the insufficiency of the well-sinking arrangements, small light dredgers worked one at a time by 3-ton hoists from little rail gantries, instead of 40 feet Bell dredgers which the same hoists could easily work, and plenty of which are lying around only waiting to be picked up on the East Coast and I think on the Assam Bengal Railways. The galleys for big dredgers of course require big and long sticks.

I wish to record here that I entirely disapprove of the design of the deep water wells. They are likely in my opinion to bring disaster. I also disapprove of the small spans adopted over the deep water. The spans in my own final design were 250 feet, and the piers and their caissons for the deep water part of the river were specially designed with an enlarged base, for stability in the very deep and rapid current where but scanty support is to be expected from the few feet of bottom in which the base can be embedded. My caissons too were designed with special provision for pneumatic sinking; a very necessary provision where, as is the case in the deep water wells, probably boulders and certainly rock, and perhaps not level rock either, have to be encountered. There is no real reason, æsthetic or other, why all the spans should be of one size. No such necessity is recognized in American engineering, or in modern English engineering for that matter: and the conditions of the Górávari are such, especially in the case of a bridge designed as is the present one to cross the entire breadth of it instead of to cross between training works, that it is good engineering to have small spans, 150 feet as designed, for the southern 30 or 40 spans, and then possibly a few 200 feet ones, and the rest 250 feet. It is even a question whether it would not be wiser to make the northern two or three shore spans 300 feet, in order to minimise the risk of their foundations, and to get the wells out into better ground as early as possible. The piers of these larger and deep water spans ought to splay out at the base as in my final design, and ought to be provided with pneumatic attachments for use if found necessary.

It is not yet too late to attend to these very important matters, and I commend them to the consideration of the Director of State Railways Construction.

22. *Kistna Junction Arrangements.*—The arrangements for the junction of the broad and metre gauges at and around Tadépalli, south of Bezwada, do not seem to me to have been sufficiently thoroughly threshed out. Arrangements seem to me to have been drifted into which will only have to be all undone again and which, until undone, will only give rise to trouble and friction. The first mistake was the rejection of Bezwada as the transhipment station. Nearly every one concerned, first I who made the first design, and subsequently Colonel Selby, the Consulting Engineer, Bombay, and two successive Agents of the Southern Mahratta Railway, Colonel Lindsay and Major Burn Murdoch, and the Nizam's Railway officers, all agreed that there is ample room at Bezwada for all possible future development, and this I can prove by plans now in my possession. But somehow or other it has come about since I left the East Coast Railway in 1893, that the tranship arrangements have been located at the wrong place, viz., at Tadépalli, instead of at Bezwada; and the Chief Engineer of the Bezwada-Madras Railway has already gone so far with his tranship siding construction that it seems futile to re-open the question and the mischief must be a permanent one. (The detailed arrangement of the stations, however, is surely susceptible of improvement, for within a radius of half a mile there are the following stations around the junction of the gauges. First, nearest Bezwada, is the Sitanagaram station necessitated by the Sitanagaram locomotive sheds. Next, just beyond the canal bridge, is the actual junction of the gauges, called temporary Kistna Canal Junction, or K.C.C. Just beyond this on the standard gauge line is Kistna Canal Junction, K.C.J. with its tranship lines for both gauges; and about opposite it on the Southern Mahratta Railway is Tadépalli station. Tadépalli station is about as temporary a structure as could be erected for four or five years' traffic, and was purposely designed so that it might be cheaply lifted up and stuck down again. The right thing to have done would have been to have ignored Tadépalli altogether and to have designed the new Kistna Canal Junction so as to perform the functions

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of the broad gauge, of the metre gauge, of transshipment, and of the junction of the gauges. This can easily be done even now though not anything like as well as might have been done at an earlier stage.

But even better than this will be to cross the canal with a separate bridge for the metre gauge, and only allow the gauges to actually meet at Sitanagaram, the station which it is impossible to abolish because of the Locomotive sheds. Then the broad and metre gauges would only meet at the tranship yard between Tadépalli and Kistna Canal Junction, and their main lines would only interfere with each other at Sitanagaram immediately before crossing the Kistna bridge. Thus the congestion zone would be reduced to half its present length. Even now the congestion is severe enough at certain hours, and it will be worse when the standard gauge is connected up towards the south.

23. *Goods Traffic south of Bezwada.*—Arrangements were come to in my presence between the officials of the East Coast Railway open line and those of its unopened extension towards Madras, whereby the former are to man the stations south of Bezwada as far for the present as Bapatla, and to arrange for the booking of goods in and out, and the latter are to attach such goods vehicles to their construction trains and work them at their own convenience. I do not know why the southern extension of the East Coast Railway, called temporarily as a matter of convenience the Bezwada-Madras Railway during construction, should be at the expense and trouble of putting letters and numbers on their rolling-stock which in a few months will only have to be painted out. The proper lettering and numbering of the vehicles might easily have been arranged with the East Coast Railway Locomotive Department.

MADRAS,
13th January 1898.

FRANCIS J. E. SPRING,
Senior Government Inspector of Railways.

ORDER—No. 206 R., dated 4 January 1898.

Communicated to the Manager, East Coast 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. 207 R., dated 4 January 1898.]

(True Extract.)

FRANCIS J. E. SPRING,
Joint Secretary.

To the Manager, East Coast Railway.
" the Engineer-in-Chief, Godáviri Bridge.
" the Consulting Engineer for Railways.
" the Revenue Department.
" the Marine Department.

ENDORSEMENT—No. R., dated January 1898.
Forwarded.
(By order.)

FRANCIS J. E. SPRING,
Joint Secretary.

60 Printed & sent to Secy 14/2/98