

THE STORY OF A  
"RAILED ROAD,"

*Being a description of the*

*Farla Kimedi Light Railway.*

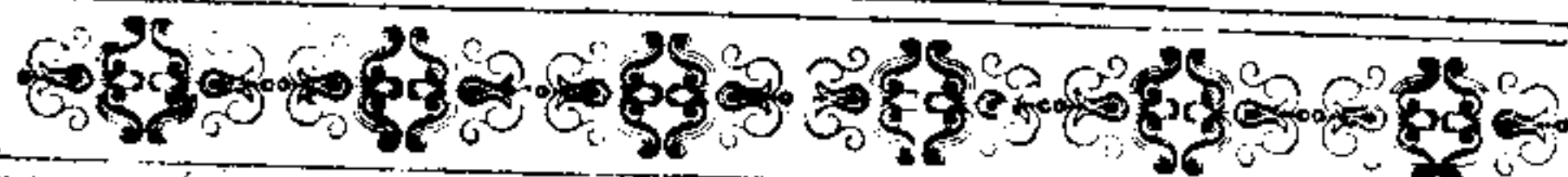
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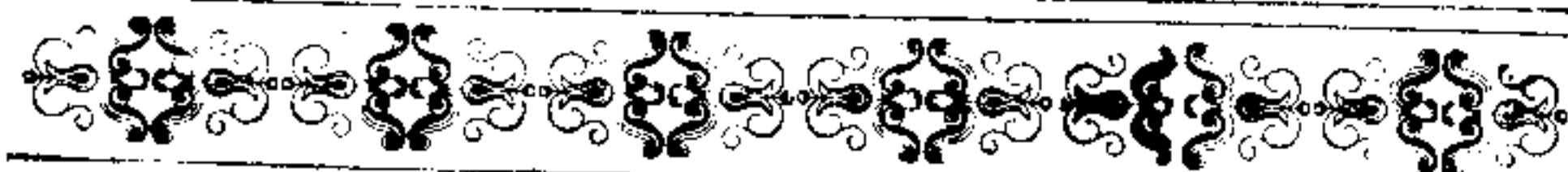
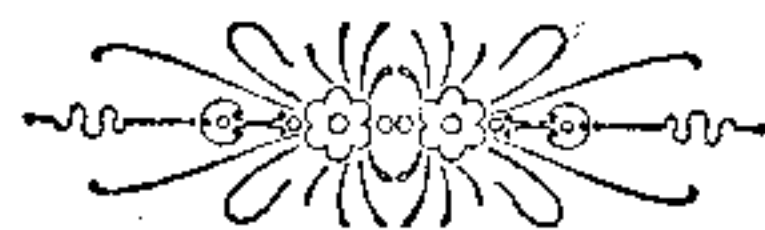
J. R. SANDFORD, C. E.,  
ENGINEER OF THE WORK.

*Printed for Private Circulation.*

MADRAS:  
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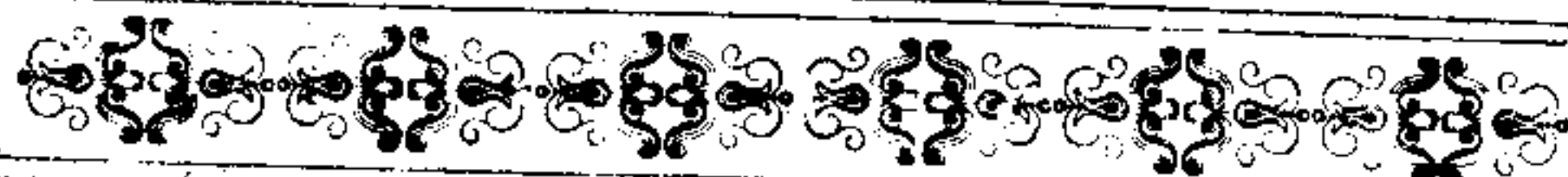
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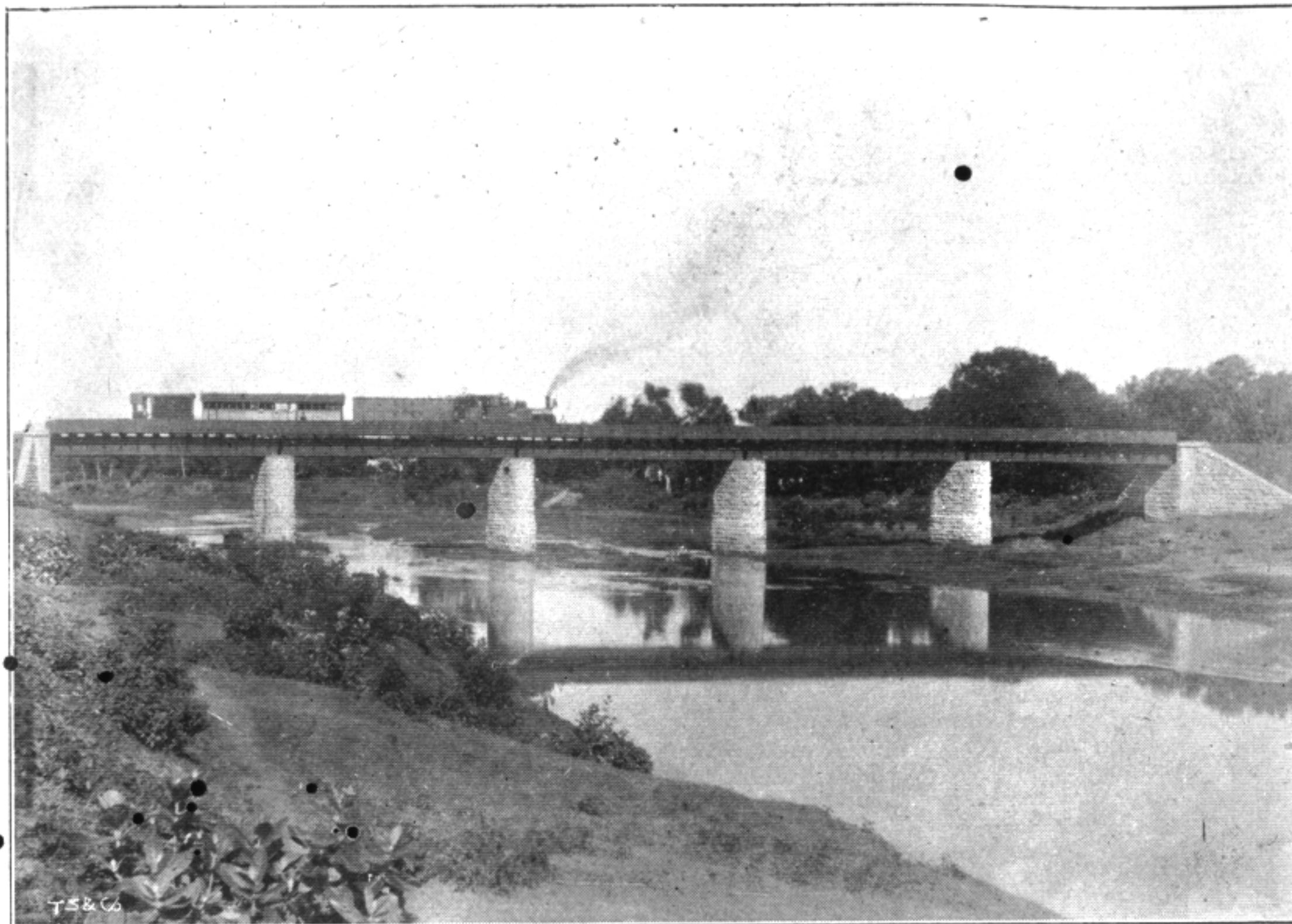
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Parla Kimedi Light Railway, 2 ft. 6 in. gauge.



MAHENDRA TANNIA BRIDGE.

*Five 50-foot Spans on Skew.*

Reproduced from the **INDIAN & EASTERN ENGINEER.**

## NOTE.

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The following description of the Parla Kimedi Light Railway was contributed to the *Madras Mail* and appeared in its issues of June 23rd, 28th and 30th, 1900. It is now reprinted in pamphlet form with the kind permission of the Manager of that paper.

The view of the Mahendra Tannia Bridge, the only major work on the line, is given as a frontispiece through the kindness of the representative in India of the *Indian and Eastern Engineer*, in which it was first published. This view is put forward not as a record of difficult or unusual construction, but merely as an example of a comparatively heavy work occurring on a *light* Railway.

J. R. SANDFORD,

*Engineer, P. K. L. R.*

PARLA KIMEDI,  
August 27th, 1900. }

# NOTES

## ON THE

### PARLA KIMEDI LIGHT RAILWAY.

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SEVERAL appreciative notices of our little railway having appeared from time to time in the *Madras Mail*, it has occurred to me that, now that it is practically complete and ready for traffic, some notes on the work, written by one whose duty it has been to carry it out, would be acceptable to the general reader and especially to Engineers who have to deal with the important question of improving communications in outlying backward Districts.

Parla Kimedi is an ancient Zemindari lying in the western corner of the southern portion of the Ganjam District, and it is bounded on the West by the District of Vizagapatam and on the North by the Jaipur State and the Eastern Ghauts, here called the Maliyas, over a large extent of which the Rajah has certain rights. The Estate proper is about 612 square miles in area, much of it consisting of low rocky hills, but the intervening valleys are remarkably rich, and being well watered from tanks, every valley having its two or three tanks and every hollow in the plain being bunded and turned into a pond, the consequence is the country is extremely productive and the exports of grain and other produce are very large, much to the advantage of the cultivators, who as a rule are well off and contented. In some places these tanks are very large, forming, when full, wide stretches of water which might be taken for lakes, and which, with the surrounding wooded hills reflected in them, look very picturesque. The two peaks, Mahendraghiri (5,000 feet) and Devaghiri (4,500 feet)—the giants of the Eastern Ghauts—stand out well in nearly every



In times not very remote, this part of the country was very much cut off from the rest of the world, and the only means of communication were narrow paths through the thick forest, along which the traveller was labouriously carried in a palki, never knowing at what turn of the track a tiger would be encountered. Consequently the people were inclined to lawlessness, and, on more than one occasion, they broke out and defied the British Government, which at that time was in these parts very weak. This, and the incapacity of the Rajahs in those days to control their people and keep the more turbulent hill tribes in check, induced the Government to place the Estate in the hands of the Court of Wards, who did not relinquish their trust for over sixty years. Under the rule of the Court of Wards jungle was cleared away, tanks were constructed in every direction, and roads made, until the Estate became the rich and populous and prosperous country it is at the present time. Tigers are now entirely unknown and the Rajah takes care to keep the leopards well in hand, having shot about 80 of them, and the only animals one is likely to encounter in a night's journey along one of the roads are bears, but they are harmless if left alone. The rule of the Court of Wards not only meant improved communications and the construction of tanks in every direction, but a large balance in the coffers of the Estate, and it was desired by the present Rajah in 1892, soon after he was placed in charge of the Estate, to utilise a portion of these accumulations in providing a branch line from a convenient station on the East Coast Railway, the construction of which was then just commenced, and the writer was called in by the Rajah's Agent, Mr. W. Taylor, to make a survey, starting from the Salt Factory at Naupada to a point on the East Coast Railway suitable for a railway station and so on through the important town of Tekkali to Parla Kimedi and on to Gunipur, a very important trading centre on one of the main tracks to the Central Provinces, a few miles inside the border of the Jaipur State, a total distance of over 60 miles. The survey was very satisfactory and showed that a light railway could be cheaply constructed notwithstanding the very hilly nature of the ground. It was hoped that a start with the work would at once be made, but, owing to some technicality, the Court of Wards could not give up the money, and so the Rajah's scheme had to be shelved for the time.

In 1897, however, funds became available from another source, sufficient to allow a portion of the original scheme to be carried out, and the writer was placed in charge of the work. This time it was decided, for some recondite reason, not to take any trouble to secure the salt traffic from Naupada Salt Factory, but to make the terminus at Naupada Station, on the East Coast Railway. Final staking out of the railway was accordingly put in hand without delay and the zero point was fixed on the cross centre line of Naupada Station. The line was carried along the edge of the existing road from the railway to Tekkali, but the District Board objected to this, and finally, after a long delay, it was laid clear of the limits of the road, and, at one place, to avoid a tank, well away from it. The general idea was to make use of existing roads as far as possible and this was done beyond Tekkali, where, for a distance of about eight miles, an abandoned District Board road was made use of, and for a further six miles a private Estate road was given up to the railway; but all along a sufficient breadth of road is left for local traffic, 15 feet being the minimum width, with 10 feet over bridges and culverts. Staking out was continued into Parla Kimedi, and as it was necessary, in some places, to alter the line to save heavy work, and the last four miles, including the crossing of the Mahendra Tannia river, had to be laid out anew, the work was somewhat slow. In certain places along the line where there was no chance of any alteration being likely to be proposed, earthwork was started in order to have the benefit of the coming monsoon, and plans and estimates for the whole work were in due course sent in. In the meanwhile a correspondence had been going on with Government as to the terms on which permission would be granted to the Rajah to construct his railway, their first proposals having been very arbitrary, and such that the Rajah could not accept them. However, the matter was finally adjusted on a more equitable basis, and in February, 1899, sanction for the construction of the railway under the Tramway Act was published in the *Fort St. George Gazette*, and from that time only dates the actual and recognised starting of the work. By June all the masonry was completed, including the Mahendra Tannia Bridge of five 50 feet spans on skew, and had the ironwork reached us as early as it was expected, we might have got the girders up



before last rains, but we, like many others, had our calculations in this matter put out owing to press of work in England and so our girders did not reach us till August, and we had to postpone further work on the bridge till after the rains.

About July we started platelaying, working from Naupada, but the bank for the first three miles being quite new, as we could only put the work in hand at the last moment before the rains, was very soft and our engine buried itself many times in the mud and so work could only go on fitfully when the weather was favourable. Thus we worked on till in November we laid the rails down to the Mahendra Tannia river, which we crossed by a diversion, and on the 30th December the last rail was laid into Parla Kimedi and the very first train steamed into the station carrying the Collector, the Rajah, the few Europeans of the place and several hundreds of the people, besides whom a great number of the people were at the station to see the train come in, and there was great enthusiasm. Having the diversion in the river close up to the bridge the ironwork was easily deposited there, and the work of erecting the girders was put in hand without delay, but, owing to some unforeseen difficulties, trains did not run across the bridge till the end of March. The actual time taken, therefore, in the construction of the railway from the date of the receipt of the Government sanction was about thirteen months, and even that time might have been considerably shorter had we received our bridge work earlier, and could we have started our ballast and material train at the proper time, when we were prepared for it.

The country between Naupada and Tekkali is very open and uninteresting, the only relieving feature about it being the fine panorama of the Eastern Ghats, terminating at one end with the bold peak of Mahendraghiri with its three humps, and including a peep, in certain places, of Devaghiri. The rise from Naupada to Tekkali is over 80 feet. Tekkali is a large town of considerable importance as regards trade, and it is the headquarters of a Tahsildar and Police Inspector, with a dispensary and hospital and several schools. It is also a station of the Canadian Baptist Mission. The Railway station is placed close to the town, and it is likely to do a good traffic both in goods and passengers. Leaving Tekkali Station the railway joins the abandoned District Board

road and keeps along its edge for about eight miles. The open country continues for about four miles with some considerable rises and falls, the line gradually approaching the hills. After passing the small flag station, Polavaram, with the public road as platform, the village of that name is reached and here the railway takes a sharp bend to the right, into the hills, and continues in rough country for the next twelve miles. There is a sharp ascent to the crest of the bund of the Nundasagaram tank, a fine sheet of water, generally covered with duck and wild fowl in the cold season, and the line keeps close to the water for some distance. It again ascends and so goes on gradually rising, and passing through some very picturesque country, till it reaches a long piece of heavy gradient along a high bank and through a deep cutting which brings it to Temburu Station. This place is of no importance from a traffic point of view, but it is necessary as a crossing station, and, having a good water-supply, engines will take water there.

At Temburu there is a small rest-house belonging to the Estate, but the great feature of the place is the Asrla tank, a splendid sheet of water about a mile across when full, surrounded by bold rocky hills with much vegetation on them which, when reflected in the water, have a very fine effect. Leaving Temburu the same physical features continue, the line still rising and with glimpses of the Asrla tank, at a much lower level, here and there. An old banian tree of rather remarkable growth is passed a mile from Temburu and about a mile again, further on, the highest point reached by the railway, about 240 feet above Naupada, is passed. At  $18\frac{1}{4}$  miles from Naupada the small flag station, Pedda Logidi, occurs, and at 21 miles the station for Patapatnam is reached, and here the line finally leaves the road and strikes off across country. Patapatnam (old town) is, as its name implies, the old residence of the Rajahs of Parla Kimedi. It is a picturesque and rather straggling agricultural town about a mile from the railway station but quite close to the line in the valley below. It is noticeable for the particularly fine groups of mango and other trees, which surround it, and for the great extent of its vegetable and fruit gardens. From Patapatnam Station the railway falls with a sharp gradient down to the river Mahendra.

feet girder spans on skew, and falling again from the bridge, is continued at about the ground level for a mile up to the high ground leading into Parla Kimedi town. This portion of the line is across the very rich valley which surrounds Parla Kimedi, and it is made low on purpose to allow extreme floods in the river, which sometimes spread from side to side of the valley, to pass over it without obstruction—there has not been such a flood for the past 15 years—rather than to make a long embankment, keeping the rails above flood level, and constructing a long bridge of sufficient capacity to carry away the flood water.

Sitasagaram Flag Station has been placed in a convenient position to serve the requirements of passengers from the southern part of the town, and it is expected it will be very much used. From Sitasagaram Station the railway rises by a steep gradient to the top of the Sitasagaram Tank bund, and, skirting the edge of the tank with a reverse curve, Parla Kimedi Station, the terminus, is reached at  $24\frac{1}{2}$  miles from Naupada. The station is in a very pretty spot, with the large tank covered with water lilies, which are one sheet of pink blossom in their season, in front, rocky hills in all directions all round, and Devaghiri, here only a few miles off, seen through a gap in the trees, many of which, of very fine growth, are dotted about in clumps in the station yard.

Parla Kimedi is rather a straggling town, in plan much like the letter L, scattered round the foot of the well wooded hill which is the distinctive feature of the place. The horizontal portion of the L faces south, and at the corner where it and the vertical portion join is situated the Palace, a most picturesque group of buildings designed and constructed by Mr. Chisholm some fifteen odd years ago. The back wall of the Palace compound faces the Sitasagaram Tank, with the railway between, and a particularly fine view of the Palace, with the hill in the back ground, is obtained from the bund of the tank. To the north of the Palace is the Uriya quarter, where also the few traders of the place reside. Leading up eastwards from the main entrance to the Palace is what ought to be a very fine street, lined with cocoanut trees on both sides, but unfortunately the principal residents are charcoal burners and fishermen, who, however useful and prosperous they may be,

tations for such a locality. At the junction of Palace Street with the Varnassi Road, and immediately at the foot of the hill, and facing the Palace, is situated the Rajah's College and in front of it the High School, also maintained by the Rajah. The College is on the highest ground, probably, in the town, and the view from its front verandah of all the surrounding country is particularly noticeable. The College has been provided with a public clock by the kindness of the Rajah, and it should be mentioned that lately an installation of Mansfield's gas has been made in the Palace, and the effect of the lights, about 350 in number, in the great crystal chandeliers in the Durbar Hall, a very beautiful room in itself, is very fine. This work is particularly noticeable owing to the difficulties overcome in adapting chandeliers not intended for gas to the purpose, it having been necessary to drill through thick masses of glass in many places—a most difficult and delicate operation—but Mr. Walter Mansfield, who was in personal charge of the work, was not one to give up even the most risky and apparently hopeless job in despair. The gas is laid along "Palace Street," and beyond as far as the gateway to the Agent's house, but, so far, the lamps have not been lighted for the benefit of the public. At present the new lamps look rather unmeaning, having in every case a companion in the shape of a Municipal lamp, of the usual somewhat undignified pattern.

Going past the College and at less than a mile from the Palace, are the Police Lines and the Municipal Hospital and Dispensary; and beyond these again come the house of Mr. Taylor, the Rajah's Agent, the bungalow set apart for the use of the Assistant Superintendent of Police, and the Engineer's house, all in fine large compounds of acres in extent with great trees grouped and dotted about them. Further on, less than a mile from the Engineer's house, is the Ramasagaram, another large sheet of water with a splendid amphitheatre of hills around it, and the view of Devaghiri and Mahendraghiri, with a broad stretch of water, also lily-covered, in the foreground, is worth going a long way to see. It was forgotten to mention in the proper place that near the Palace is situated the Rajah's Choultry, a very fine building, which was designed and constructed by Mr. Chisholm when the Palace was in progress. Here the more respectable native

travellers are comfortably housed, and, if necessary, fed, at the Rajah's expense, and the humbler class of travellers, mostly passing along in mobs, to and from Puri, are also well looked after, and some strange sights are seen in front of the Palace, where these people usually put up, when some particularly holy devotees go through their ascetic rites, seated in the midst of a lot of fires or in some other very uncomfortable position. Pilgrims from all parts of India are to be seen here from time to time.

The Parla Kimedi Light Railway is of a total length of  $24\frac{2}{3}$  miles, and of this about 11 miles is on a gradient of 1 in 100, the longest continuous piece being 50 chains, or nearly a mile long and there are two other lengths of 36 chains each. The greatest height of embankment is 10 feet with 16 feet in two short lengths near the Mahendra Tannia Bridge, and the greatest depth of cutting is 10 feet for a few chains at Temburu. A usual height of bank or depth of cutting is about 6 feet, but for long distances, here and there, the railway is almost on the same level as the road. There are fifty-six curves, the ordinary radius being 1,910 feet, and in the sharpest curves, of which there are five, 1,146 feet. Bridges and culverts number about one hundred and sixty, the largest span being one of twenty feet, but the majority of them are small drains for irrigation channels. Foundations were, as a rule, very bad, so that what appears an insignificant work above has cost out of all proportion for what is below ground. The majority of the waterways are openings with Dorman, Long and Co.'s rolled steel beams. Arches were not possible in most cases owing to the want of height in the banks. It was found practicable to make use of only three road bridges which proved to be strong enough to carry the railway, and they had to be so much lengthened and altered that the cost of an entirely new bridge for the railway would have been no greater. The majority of the smaller road culverts were found to be so badly built, with mere surface foundations, that it was impossible to make use of them.

The Permanent way consists of 30lb. flat-footed steel rails spiked to cross sleepers and strengthened at the joints with extra deep fish plates weighing 6 lbs. each. Sleepers are of Pynkadu from Rangoon, which were delivered at Vizagapatam, and Sal from the Gumsur forests, purchased locally. Sleepers



are laid nine to the 24 feet rail. Ballast is laterite gravel, of which there is abundance at several places along the line, but it is rather clayey, and therefore it has been mixed, as far as possible, with a proportion of river sand.

At Naupada a small corrugated iron structure has been put up as a waiting shed with a small office and parcel and lamp rooms. There is also a running engine shed with an ash pit for one engine, and a well and tank for engines. The station yard is simply laid out, and a tranship platform for the interchange of goods with the East Coast Railway is provided. At Tekkali the station is built of brick, plastered, with Mangalore tiles, and consists of a small booking office, a parcel room, and a lamp room, with a verandah all round. There is a dead end siding for goods. Polavaram Station is merely a small brick and mud structure, standing beside the road, roofed with country tiles. Temburu Station building is similar to Tekkali, but there is a through siding to allow trains to cross. There is a small well and tank for supplying engines with water, and the public road is the platform. Pedda Logidi and Sitasagaram Stations are similar to Polavaram, and Patapatnam the same as Tekkali, and it also has a short dead end siding for goods traffic. Parla Kimedi, as the terminus, has more pretentious station buildings than any of the others, as, besides a large open shed for third class passengers, it is provided with a small waiting room and ladies' room, etc. The station yard is simply laid out and has a goods shed and carriage shed with an engine shed and large tank and well for locomotive purposes. At both Naupada and Parla Kimedi, proper platforms, one foot high above rail level, are provided, as the line there, being partly in a shallow cutting, they were not much trouble to construct, but ordinarily raised platforms are not necessary for narrow gauge railways, the ground, made up to rail level and gravelled, being quite sufficient to allow passengers to alight from the train, or get into it, quite comfortably.

Our locomotives, which are of the side tank type, were made by the Brush Engineering Company, of Loughborough, and they are very powerful. They have six wheels 33 inches in diameter; coupled, the centre pair, the driving wheels, being without flanges, and under the footplate a bogie with four wheels 24 inches in diameter. Cylinders are 12 inches in diameter with 18 inches stroke. Coal capacity 18 cwt., and tank



capacity 600 gallons. Maximum steam pressure 140 lbs., and weight of engine 22 tons, which, taking the bogie as one pair of wheels, is very equally distributed, being about  $5\frac{1}{2}$  tons per axle. The engines have worked very satisfactorily. They run with safety over a very rough road, and they take with ease the sharpest curve. They have not been properly tested, but they are calculated to take a load of about 200 tons up 1 in 100 at a fair speed.

The rolling-stock on the Parla Kimedi Light Railway is very good, in fact it is about as good as can be made. The coaching stock was designed by the late Mr. A. Morton, Loco. Superintendent, East Coast Railway, and it was built in the Workshops at Waltham. It consists of but three types—a "Special class" saloon, a "composite" carriage with upper and lower class with a Post Office compartment, and a "lower" class carriage. It is proposed to provide accommodation in the trains for only two classes, "upper" and "lower," which are the same as second and third on the broad gauge. The special carriage was designed to be a State carriage for the Rajah, and to be used only on special occasions for guests of the Rajah. It is a very handsome carriage on bogies, 34 feet long and 6 feet broad inside. The accommodation given is a large general saloon with a lavatory, and communicating through a passage with a servants' compartment, and there is a small ladies' saloon with a lavatory. The seats are long enough for sleeping on—and there are upper bunks. Accommodation—seats for twelve and sleeping room for eight, with a servants' compartment. The composite is also a bogie carriage, 32 feet long, with seats for 24 lower class passengers and 10 upper class. This portion of the carriage is neatly finished and a lavatory is attached. The lower class carriage is 32 feet long on bogies, and has comfortable seating accommodation for 56 passengers, on cross benches, in seven compartments.

Wagon stock, which, with only one exception, was made by the Oldbury Company in England, consists of four types. Covered goods, of iron, on bogies, 25 feet long, 6 feet broad, and 6 feet 6 inches high, with a corrugated iron roof. Low-sided wagons, 25 feet long, on bogies, 6 feet broad, and 1 foot 6 inches high. Four-wheeled wagons, 14 feet long, 6 feet broad and 1 foot 6 inches high. Ballast wagons, on 4 wheels, with flexible base, 18 feet

long, 6 feet broad, and 1 foot 6 inches high. These were made out of old metre gauge material in the Waltair Workshops from a design by Mr. Morton. The gross load allowed for these wagons is 16 tons for the bogie ones, and 8 tons on the others, but they have been very strongly constructed and could carry much more. Only one carriage of each sort is supplied, with three brake vans, also two covered goods, eight low-sided bogie wagons, two four-wheel low-sided, and six ballast wagons. Not nearly enough, allowing for all contingencies, to do a satisfactory, not to say a profitable, traffic.

The estimated cost of the railway was Rs. 5,92,259, or Rs. 24,057 per mile, including the Mahendra Tannia Bridge with its approaches, but it is likely this will be exceeded, as, owing to delays, establishment will cost more than was expected, and much extra work, not contemplated in the estimate, has had to be done. Still, putting the cost at 7 lakhs, the railway is not a dear work, and, taking all things into consideration, it is one of the cheapest lines of its kind in India. There were no serious difficulties in construction, but it soon became evident that the local workman is not to be depended upon—he is incompetent, he is lazy, and he is very independent. Carpenters and masons are particularly bad. Labour for earthwork and ballast is plentiful, but the earthwork is badly done, as, though paid by pit measurement, the people will insist on heaping the earth in great clods as loosely as possible and the consequence is that, though very neatly finished off, the banks melt to nothing at all with the first rain. "Cutchee" masons were engaged, under contractors, to do the masonry, and they did it very well. One item, in which the local artisans are very deficient, is blasting rock. They have the most primitive ways of working, and a very small job takes them months to complete.

The question of the possibility of the Parla Kimedi Light Railway being a financial success may now be considered. The main object of its construction was to give the Rajah and his people easy access to the East Coast Railway, and a dividend is not looked for. At the same time it would certainly be an advantage to make even a "Rajah's Railway" pay, and it would be a discouragement to similar lines if this one failed.

not know the circumstances of the case. Parla Kimedi is not a trading town in itself, but being the residence of the Rajah with many well-to-do people, there will always be a considerable traffic in miscellaneous goods with a large proportion of passengers. The bulk of the traffic of this part of the country is from the valley of the Vamsadhara, with Battili and Gunipur as the principal centres, but as most of it is for Calingapatam, Bimlipatam and Vizianagram, and there is a good road all the way down the right bank of the river to Chicacole Road Station, on the East Coast Railway, thus entirely avoiding Parla Kimedi, it is only natural that it should make its route down that way and leave Parla Kimedi miles away to the eastward. This traffic is very heavy and only a short time ago, when the busy season was past, a string of three hundred carts were counted (carrying say 150 tons) leaving Battili for Chicacole; this, of course, not considering many other carts during the day. All this traffic is lost to us, and will be until the line is extended to Gunipur or to Godairi—twenty miles beyond—that is 50 miles from Parla Kimedi. With this extension, the railway would have about as much traffic as it could ordinarily deal with. A further extension is also advisable eastwards from Parla Kimedi, skirting the hills and passing through Mandasar, to some point on the East Coast Railway about Barwa. As the matter stands then, the railway can only depend upon the actual traffic of the town and the surplus produce from a radius of say ten miles north, east and west. Passengers, it is likely, will soon be about 200 a day each way and they at 4 annas a head would give Rs. 100 a day or Rs. 36,500 per year, which would probably pay working expenses of the railway, and a profit at the rate of 5 per cent. on the capital expended would require the transport of 29,200 tons of goods at  $\frac{1}{3}$  pie per maund per mile, or Re. 1-4-0 per ton, for the 24 miles. This is supposing all the traffic came from and to Parla Kimedi; but Tekkali is an important trading centre, and a fair quantity of goods may be expected also from Patapatnam. It is a great pity the idea of starting the railway from Naupada Salt Factory was abandoned, as by means of a system of cradles, broad gauge wagons might have been taken there to load and unload and thus a very steady source of income, which could have been easily worked, has been entirely thrown away, and cannot now

structed from Naupada Station to the Salt Factory, and it will not be removed. The timber traffic from Gunipur and the valley of the Vamsadhara would be very valuable, but we can get no advantage from it without the northern extension. A Syndicate has been formed in London to carry out the proposed extensions in the Parla Kimedi Estate, and to take up other schemes of the same kind elsewhere, but it is unfortunate that terms cannot be agreed upon between the Rajah and them.

A few words may not be out of place on the selection of the gauge for the Parla Kimedi Light Railway, and on the advantages of this gauge generally. The question in this case was the provision of a *railway*, not a mere tramway, with reasonably comfortable accommodation and to cost as little as possible. The broad gauge had many advocates, and examples of cheap construction were quoted, but they were all very exceptional in their circumstances and the saving in cost depended much upon the possibility of buying second hand materials. But it is evident that second hand materials are not always available, and though good enough for short branches and sidings, etc., they are not adapted for smooth running for long distances. Another fallacy in the assumed cheapness of such lines is that cost of rolling stock is usually not included, a very important item, and one which if not paid at once out of capital is an increased charge out of revenue. The parent line has to provide it in any case, and, naturally, if it does not get paid for it in one way, it takes care that it does in another. Although there were strong advocates for a 2 ft. gauge tramway it was found on investigation that not one which had so far been constructed was a success; they were expensive in the first cost, the accommodation provided was of the omnibus type, and they were thus not railways. Further, owing to the narrowness of the gauge, train loads were small, and for a thickly populated country with good traffic prospects, this was not what was wanted. One of the 2 ft. gauge tramways which was held up as an example for all to follow was the Howrah-Amta Railway; but this, though through an absolutely flat country with few waterways, and with an abundance of cheap labour, cost Rs. 37,508 per mile, and its utmost capacity is a train of 18 small carriages holding 300 passengers altogether. I need not refer to one or two other lines of the same gauge which were constructed by Government and were more than equally costly.

On the other hand, we had the examples as 2 ft. 6 in. gauge lines of the Morvi Railway, the Gaikwar's Railway, the Kooch-Bihar Railway and the Tezpur Railway, the cost of which varied between Rs. 20,671 per mile for the Tezpur Railway, and Rs. 28,869 for the Kooch-Bihar Railway, and all of which are recognised as commercial successes. The Morvi Railway pays so much as 8 per cent. on its capital expenditure. These examples are only taken from India, but in other parts of the world the 2 ft. 6 in. gauge railway has established itself, perhaps the most successful line being the Antofagasta-Bolivia Railway, in South America, which is 574 miles long and it has gradients as steep as 1 in 32. It rises to an elevation of 13,000 feet above sea-level and for many miles runs through an absolutely rainless tract with no water.

To return, however, to the Parla Kimedi Light Railway. We have what is in every respect a *railway*, with comfortable carriages and strong wagons of large capacity—rolling stock which would be no discredit to any railway—powerful engines capable of drawing a load of 200 tons up a steep gradient at a fair speed, and though including some heavy works—for a light railway—the railway stands well up in the list of economically constructed lines. As to its capacity for traffic, it would be easy to run a passenger train of 12 bogie coaches, holding 600 passengers, the whole distance of  $24\frac{1}{2}$  miles in two hours, against the Howrah-Amta 13 (small) carriages with 300 passengers taking four hours to do 28.62 miles. In case of trouble in the Maliyas the Parla Kimedi Railway would thus be able to run in the whole of the regiment at Berhampur from Naupada to Parla Kimedi in two hours, or say five hours from Berhampur, and a following goods train would bring in all their tents and baggage. Taking the ordinary traffic to be expected at its best, the railway, provided it is sufficiently supplied with rolling stock, could run, say, two mixed trains and four goods trains each way per day, taking 650 tons and 400 passengers each way. That is for daylight working only, but by running two or three trains extra during the night, the capacity would be about 1,000 tons of goods a day each way. Thus, this little railway, which it has been shown can be worked to a good profit with 200 passengers each way per day and an average of 80 tons of goods both ways, can, with a sufficient



staff, expand in case of a famine or other serious emergency so as to take 1,000 tons of goods per day one way with 800 passengers both ways, and its construction has cost about one-fourth of the ordinary estimate for a broad gauge line, with rolling stock. Mr. Spring's valuable pamphlet on the subject of "railed roads" has brought the question of providing better means of communication for backward District prominently before the public, and it is hoped these rough notes hastily thrown together, being a record of what has actually been done in providing a "railed road," may be of advantage to District Boards, and others interested in the matter, in considering questions of the sort which may be brought before them. I will close my remarks with a few suggestions which may further help in deciding for or against the introduction of "railed roads" in any particular locality.

Our experience here has made it plain to us there is not much advantage in making use of existing roads, that is to say, if they are of the ordinary "maistry" construction, which have been made neither to line nor level, and, with very few exceptions, the bridges and culverts are of the poorest quality of masonry, and not calculated to carry an engine weighing 22 tons. Such roads bend round impossible corners, and where the ground is a little rough the height of the railway bank or depth of cutting quite obliterates the road, so that at such places it is best to keep well away from it. On this railway there are several such diversions. The only advantage in keeping to the road is the saving of land, and there may be some saving in earthwork, but that is a small matter where earthwork is so cheap. Against these advantages must be put the trouble and cost of adapting road culverts, such as are strong enough to the railway, and the unfavourable gradients with unnecessary curves in some places, where a direct line across country would be a great improvement on the road alignment.

The probability of accidents from passing cattle and carts along the road is found to be non-existent. As a rule, the cattle hardly wince when the train is passing, and should they shy, they shy off the road and away from the train; but it is found they shy no more for a passing train than they do for a passing bicycle or even a European walking by. Very few cases of cattle being run over on the line have occurred,



certainly not more than might be expected on any unfenced railway.

The question of working a narrow gauge branch line is one which requires careful consideration. As regards management there are several examples to prove that "separate" working is the best. But then the management establishment for a short 25 miles line is no smaller than would be wanted for a length of 100 miles, and an efficient manager cannot be got on small pay; and everything depends upon the manager. A workshop is necessary for ordinary repairs, and two or three good reliable men to keep the engines and carriages in order, but such a workshop and repairs establishment would be sufficient for a much longer line. With traffic worked by the parent line a small branch line can expect no more than the attention due from the officers of the parent line to an item of their own work, and therefore many small traffic questions which might very seriously affect the prosperity of a small line, but be a negligible quantity on a big line would be neglected or slurred over for want of local knowledge or time to go into them; in fact, there is no opening for traffic on such a line so small as not to be worthy of consideration. It seems, therefore, that a short length of line on a different gauge from the parent line has so much against it in the question of management by the parent line that it would be a very good branch indeed that would "pay" under such circumstances. But make the line about 100 miles long and it would be worth while to keep up an efficient separate establishment, and a "railed road" then in almost any position is bound to be a financial success. The Morvi Railway is a case in point. It is 94 miles long, and though it passes through a poor country nearly all the way, with a very small population, it has paid a good dividend from the first, and now earns 8 per cent. The Tezpur Railway is an example of a short railway worked by itself successfully, but rates for both goods and passengers are very high, and it is in other respects an exceptional case.

It will be understood, I trust, that the figures I have quoted of ordinary and maximum capacity for traffic on the Parla Kimedi Light Railway, and my deductions from them, apply only to this railway or to one with equally heavy gradients running through a rough country. With easier gradients, say none worse than 1 in 150, the train loads would be 30 per cent. heavier for the same class of engine, or a lighter engine might be employed to take the same loads, but under Government Standard Dimensions Rules, tank

engines weighing up to 30 tons—8 tons heavier than ours, could be used on 30lb. rails, with of course a corresponding increase of load. The utmost capacity of this line, therefore, which I have put at 1,000 tons a day in one direction, with 800 passengers both ways, might with a line running through a better country be almost doubled.

As regards the question of broad or narrow gauge, the comparison may be made in this way:—Taking the cost of a broad gauge line between Naupada and Parla Kimedi at Rs. 80,000 per mile, with new material and fully equipped with rolling stock, the total would have been Rs. 19,60,000. The extensions to Godairi and Barwa, on the E. C. Railway, say, 85 miles at the same rate, would be Rs. 68,00,000—total for the  $109\frac{1}{2}$  miles, Rs. 87,60,000. To pay a dividend of 5 per cent. on that would, allowing 60 per cent. of receipts for working expenses, require traffic earnings to the extent of Rs. 9,63,600 per annum or Rs. 170 per mile per week. In other words, the earnings of a trunk line, and it is very questionable if a broad gauge railway could be constructed through such a rough country for Rs. 80,000 per mile.

Against this we can put a narrow gauge (2'6") railway such as has been made, at even Rs. 30,000 per mile. The cost of the whole system would be only Rs. 32,85,000 for the  $109\frac{1}{2}$  miles and to allow this to pay 5 per cent. with the same proportion of working expenses as before would require total traffic earnings of Rs. 3,61,350 per annum, or Rs. 66 per mile per week—a much more reasonable figure. The only conclusion, therefore, to be come to is that for the very questionable advantage of having a broad gauge branch into Parla Kimedi it would have been necessary to spend Rs. 19,60,000, and it is doubtful if there is traffic enough to pay even working expenses on that, and there would have been no possibility of extending it in any direction as a local line. Whereas under present circumstances a railway quite sufficient for all requirements has been provided for less than 7 lakhs, and for a total expenditure of only 33 lakhs extensions are possible which will largely improve the estate indirectly and be a source of profit to those who undertake them.