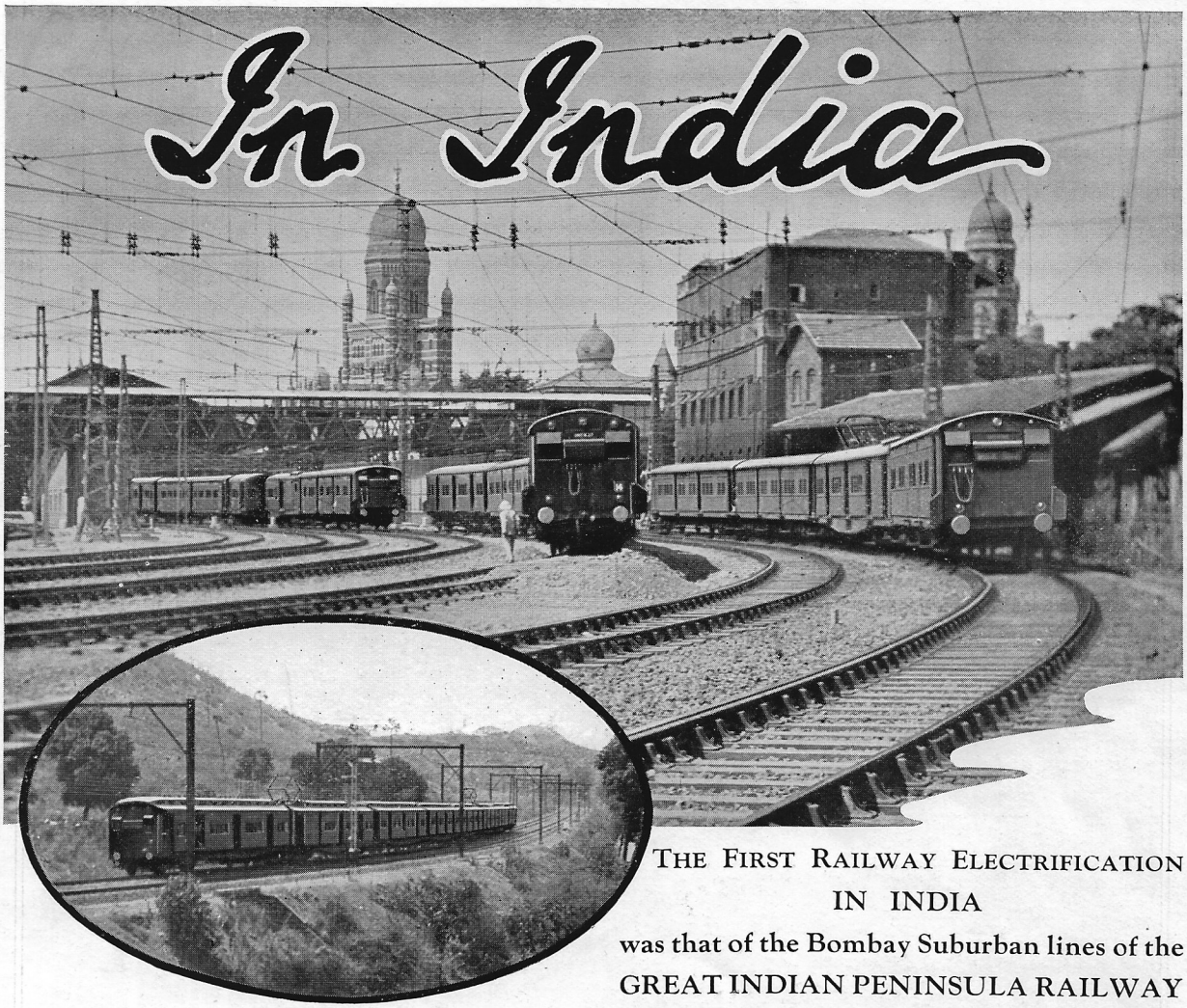
In India



THE FIRST RAILWAY ELECTRIFICATION
IN INDIA
was that of the Bombay Suburban lines of the
GREAT INDIAN PENINSULA RAILWAY

The larger view taken outside Victoria Terminus Bombay shows on the left, an 8-coach Thana train entering on the main line; in the centre, a Kalyan 4-coach unit about to shunt back to a similar unit; and on the right a 4-coach train leaving for Thana on the Harbour Branch line. The inset picture is of an 8-coach train between Thana and Kalyan.

The ENGLISH ELECTRIC Company Limited

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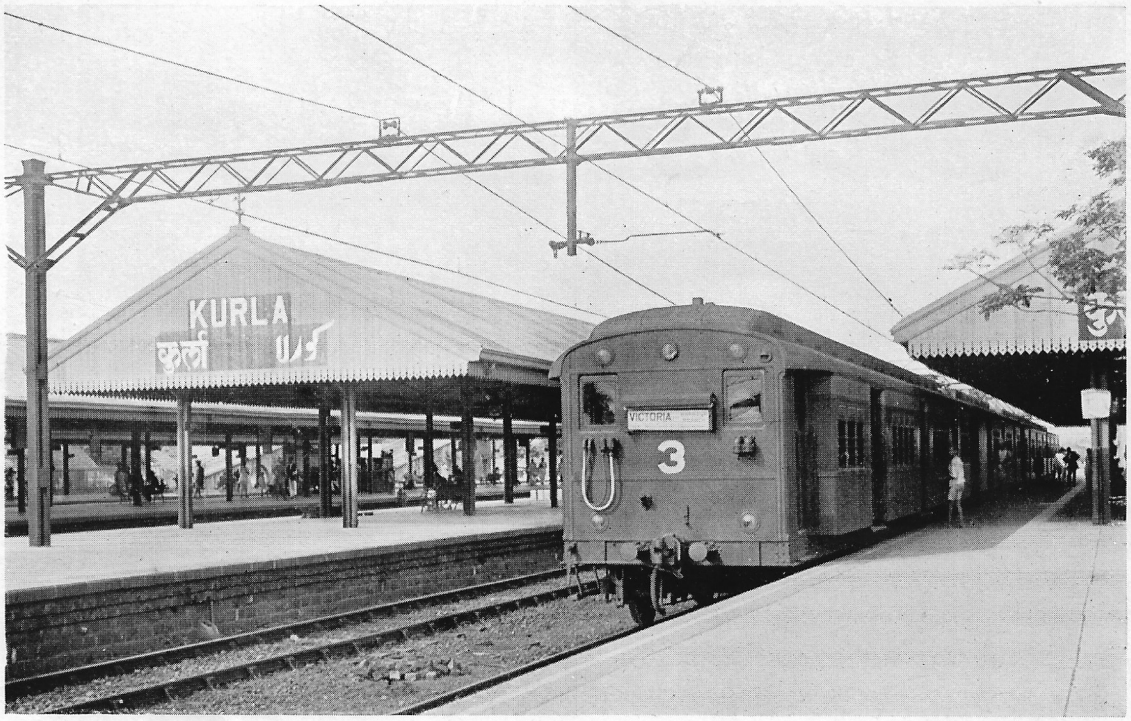


These two views are of interest in showing the routine operation of the first electrified line in India. Suitable design of the motors prevented any interruption to the service by the monsoon floods.

GREAT INDIAN PENINSULA RAILWAY

THE electrification of the Bombay suburban lines of the Great Indian Peninsula Railway is of special interest because of its pioneer character, for the opening of the Harbour Branch on February 3rd, 1925, by His Excellency the Governor of Bombay, marked the inauguration of the first electric railway service in India.

In common with many other large and growing cities, Bombay reached a stage of development where the existing transport facilities were no longer adequate. After preliminary consideration of the problem in 1913, further action was postponed until after the war; a careful review of the situation was then made, and it was decided that while some of the local railway services could continue to meet the requirements with steam operation, the Harbour Branch, at any rate, could only meet its obligations by being converted to electric working.

The Engineers of the Railway reported that the steam service could be increased sufficiently only by large capital outlay on rolling stock, stations and workshops, and that this would not be as economic as electrification. Careful calculations showed that for the route in question the cost of running an improved steam service would be 39·79 annas per train mile, whereas with electric working the corresponding figure would be 29 annas.

It was decided to electrify the Harbour Branch in the first instance, and to proceed with further electrification work as the necessity arose, and in the light of the experience gained. There was so little doubt, however, as to the success of this first electrified section that prior to its inauguration a decision was taken to extend the conversion to Thana, 22 miles from Bombay. This was proceeded with and the electric service via the Harbour branch was started on June 21st, 1925, less than five months after the opening of the first section. In July, 1926, the electrification of the main suburban line from Victoria terminus to Kurla was completed, giving an alternative route to Thana.

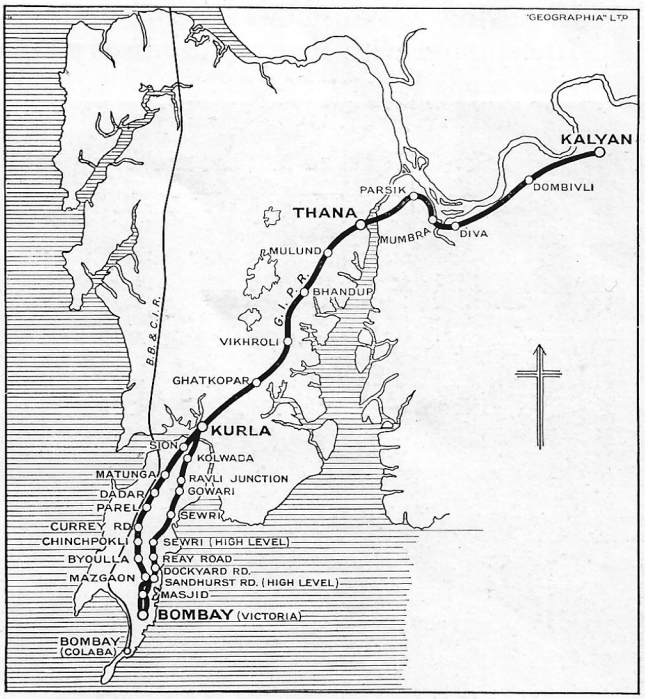


Fig. 1. Map of Bombay Suburban Lines.

The final section of the suburban electrification was completed in October, 1928, when the electric service was carried to Kalyan, 34 miles from the city.

The English Electric Company supplied the whole of the train equipments required, and 53 motor coaches, 102 driving trailer coaches and 51 non-driving trailer coaches are now in service.

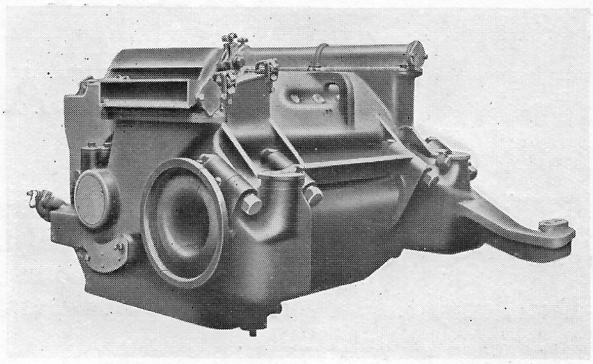


Fig. 2. 275 H.P. Motor with Flood Valves.

Prior to the conversion, the Harbour Branch consisted of a track from Kurla, some 9½ miles from the main terminus in Bombay, up to a dead end at Reay Road, a few miles outside the city. It was considered essential to carry this line right into the city, but owing to certain restrictions in regard to the intervening land, the only way in which the extension could be made was by carrying the track over the goods yard at Wadi Bunder. This bridging involved two considerable gradients, of 1 in 42 on one side of the yard and 1 in 34 on the other side, which practically ruled out economical steam operation, but were quite feasible with electric working. To have carried the Harbour Branch line into the terminus by any other route would have necessitated very large expenditure, and, therefore, this consideration alone furnishes a very good example of one outstanding advantage obtained by electrification, namely, its unique economy for operating on severe gradients.

In common with many other heavy traffic systems in India, the track gauge on the G.I.P. Railway is 5 ft. 6 in., and the rolling stock is large in proportion. The unit train for the suburban services consists of one motor and three trailer coaches. Fig. 6 illustrates a train made up of two such units and having a total weight of 418 tons and a total seating capacity of 874. Other views of trains in service are shown on the cover and in the frontispiece.

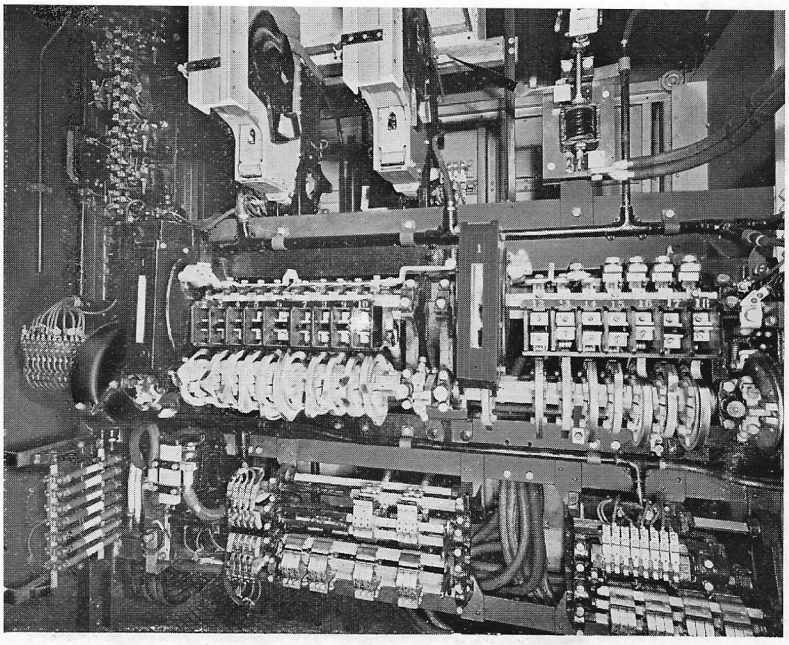


Fig. 3. Control Equipment, showing Camshaft Controller.

Each motor coach is equipped with four 300 h.p. direct-current motors connected permanently in pairs in

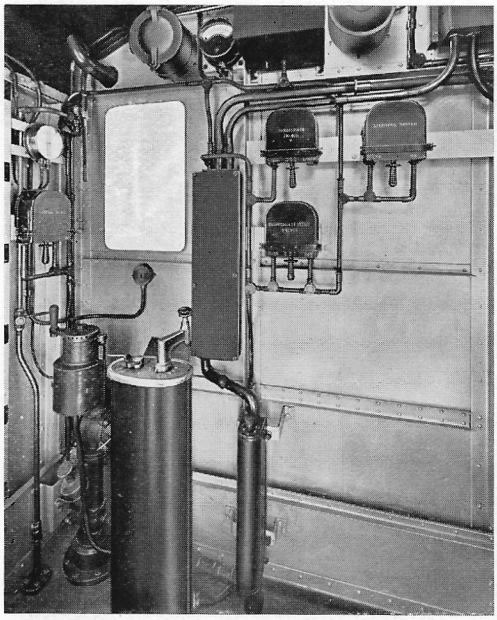


Fig. 4. A Driving Position.

series for working on 1,500 volts. Current is collected from an overhead trolley wire by pantograph collectors of which there are two on each motor coach, one being used at a time. The operation of the motors is controlled by an electrically-operated camshaft control equipment mounted in a compartment at one end of the coach.

An interesting feature of the motors supplied for the first section of the electrification is that although they are, of course, ventilated machines, they had to be designed so that the ventilating openings could be closed in the event of the track becoming badly flooded. At that time the line in question was subject to periodical flooding at several points during the monsoon season, and therefore the motors were fitted with special air valves, as shown in Fig. 2, in order that they might operate satisfactorily even when there was water on the track to a depth of 2 ft.

Before the electrification, traffic was often suspended owing to the water putting out the fires of the steam locomotives, but electric running has at no time been interrupted by flooding. The lower illustration of the frontispiece shows a train running on a flooded section of the track.

The rolling stock equipment supplied for the second section of the conversion to electric working was generally similar to that already described. For the third section also, the equipments were practically identical, but the special air valves on the motor ventilation openings were omitted as steps had been taken to divert the monsoon floods.

The latest figures show that this suburban system has benefited by electrification in the same remarkable manner that has resulted on other electrified suburban lines. In 1926/7, the first year following the conversion, the total number of passengers carried was 16,220,076 and the earnings 13,10,889 rupees. In the following year the number of passengers increased by 68·6 per cent. and the earnings

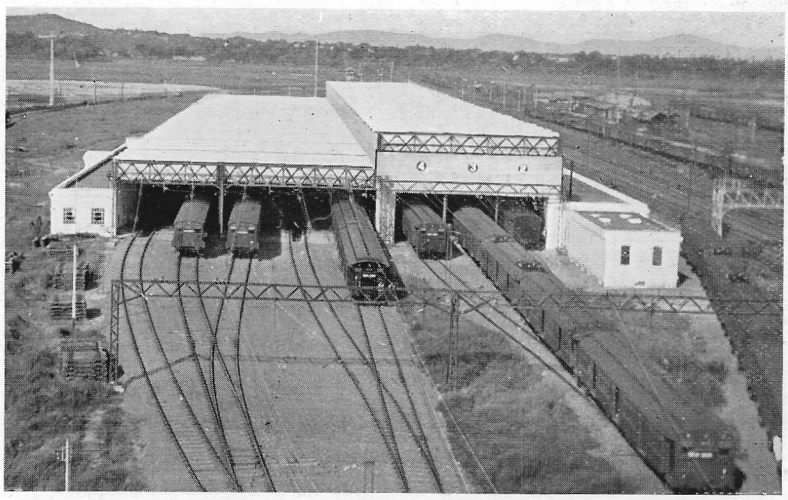


Fig. 5. Car Sheds at Kurla.

by 62·2 per cent., without taking into account the extension to Kalyan, which was not opened until late in 1928.

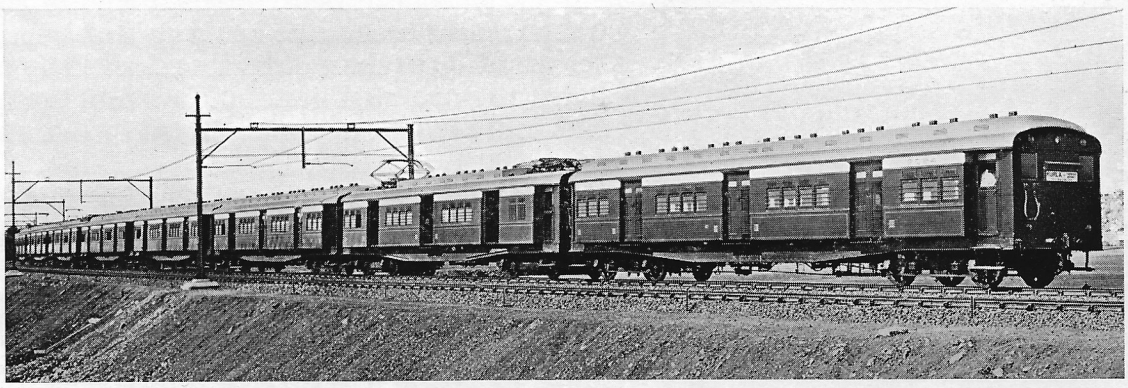


Fig. 6. An 8-coach Train in Service.

A schedule speed of 21 miles per hour is attained on the densest traffic portion from Bombay to Kurla, where the average distance between stops is ·96 mile and the stopping time at each station 30 seconds. The average speed is 26·5 miles per hour.

The Great Indian Peninsula Railway has provided plant of the most modern type for the service of their electric lines, and important sections of this were entrusted to the English Electric Company. For the various substations 15,000 kW. of 1,500-volt rotary converter units have been supplied, each unit consisting of two 1,250 kW. 750-volt machines in series; three such 2,500 kW. units in the Kalyan substation are provided with "English Electric" automatic switching equipments.

At the Kalyan Power Station of the Railway an important outdoor switching equipment has been installed for the control of 110,000-volt step-up transformer and transmission lines, which includes electrically operated outdoor-type oil circuit-breakers for this voltage, control boards, and a considerable amount of auxiliary apparatus.

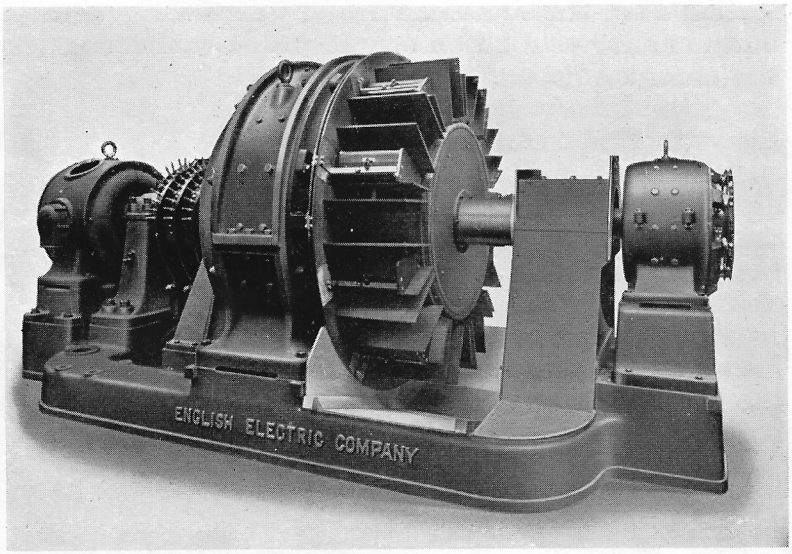


Fig. 7. 1,250 kW., 750-volt Rotary Converter for Automatic Working.

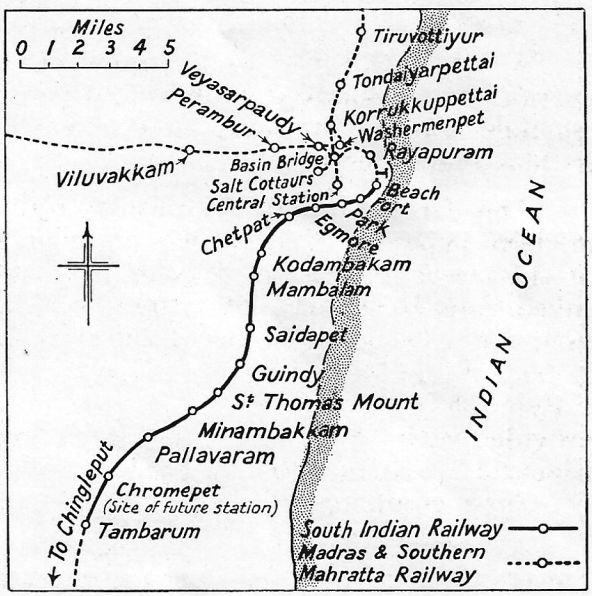
The material supplied under these contracts was to the specification and approval of Messrs. Merz & McLellan, consulting engineers to the Government of India.

SOUTH INDIAN RAILWAY

Madras Suburban Lines

The latest railway to use electricity for its suburban services is the South Indian Railway, which has recently decided to electrify the lines from Madras to Chingleput. The contract for the complete rolling stock has recently been given to the English Electric Company, and electric operation of this line is expected to commence towards the end of 1930. As in the case of so many railway electrification schemes, a direct-current system operating at 1,500 volts has been selected.

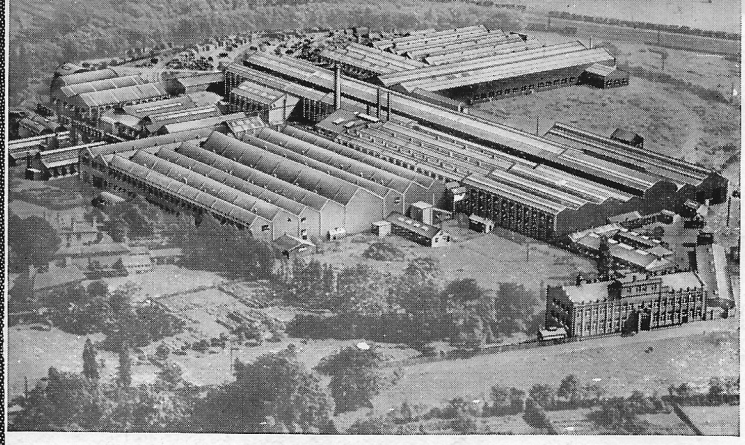
The accompanying sketch map of the line is reproduced by kind permission of "Modern Transport." According to that journal the first stage of the electrification comprises two tracks between Madras (Beach) and Tambarum, a route distance of 18 miles, which together with certain sidings will make a total single track distance of 43 miles. They state that the project is of added interest in that it represents an entirely new electrification and not merely the conversion of steam operated lines; it calls for the provision of new track and the construction of fifteen stations specially designed for suburban passenger traffic.



The rolling stock now in hand consists of 17 composite units, each unit consisting of 3 coaches mounted on articulated bogies. Each unit is being equipped with 4 motors of 120 h.p., which will be mounted on the intermediate bogies, while the control equipment will be fitted in a compartment at one end of the centre coach. Driving positions are provided at both ends of each unit.

A detailed description of this electrification, which, it will be noted, presents several novel features, will be published when the system is put into operation.

THE ENGLISH ELECTRIC COMPANY LIMITED



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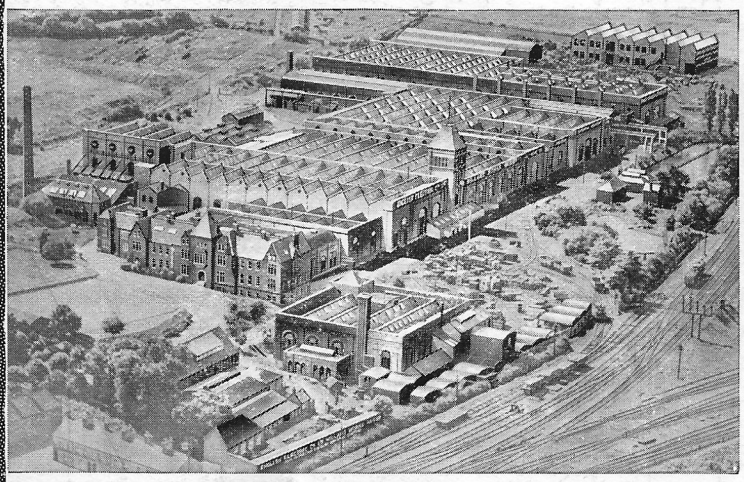

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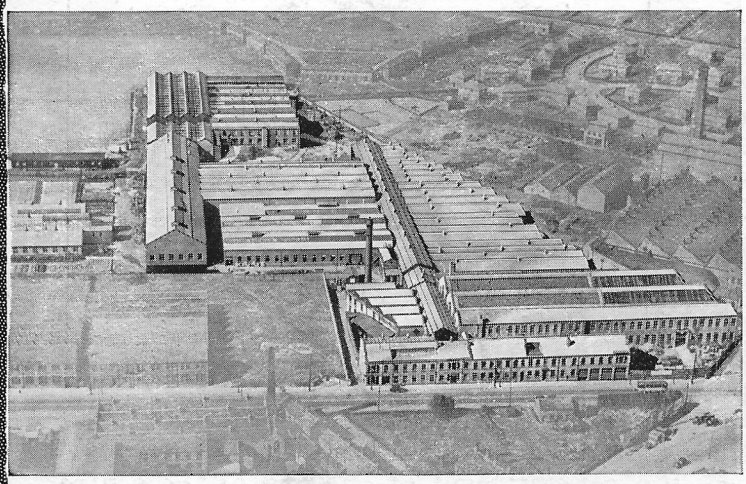

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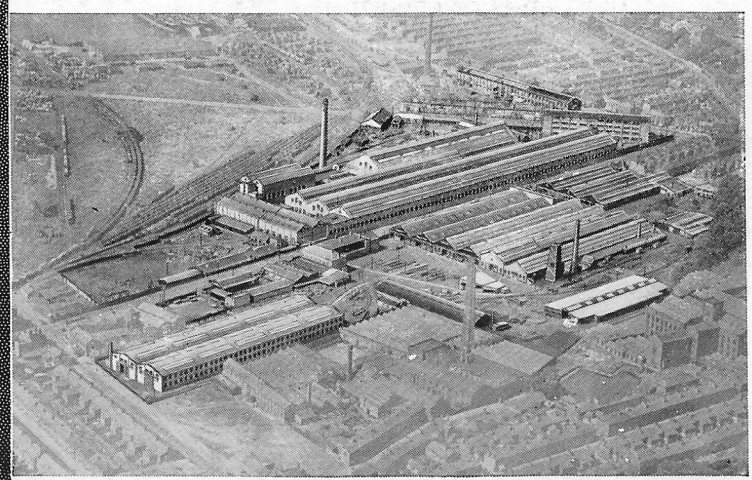

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