

ELECTRIC TRAMWAYS OF NEW ZEALAND.

No. 4. - - - Auckland.

Written for PROGRESS.

THE Auckland Electric Tramways Company, Limited, was formed in March, 1899, to take over the existing horse tramways, with a view to their extension and conversion to electric traction. Under the laws of New Zealand no private promoter can apply direct for tramway powers; so, after protracted negotiations, the Auckland City Council applied for and obtained the City of Auckland Electric Tramways Order (No. 1), subsequently delegating their powers to the Company by a deed dated June 28th, 1900. In due course, the suburban authorities, ten in number, followed suit. The concession is for 32 years, after which time the local authorities may purchase the undertaking as a going concern, and confers upon the Company the exclusive right to construct and work tramways in the district.

The British Electric Traction Company, Limited, were appointed consulting engineers, and in July, 1901, contracts were placed with Messrs. J. G. White & Company, Limited, for the whole of the traction construction, overhead line, feeder system, and power station and plant. Subsequent contracts have been made with the same firms for the cars and the condensing system. The consulting engineers kept the construction and equipping of the car depots in their own hands. The track construction included in the present contract, and completed, consists of twenty route miles laid to standard gauge; and the Company was enabled to instal double track throughout the routes where heavy traffic was to be expected. Furthermore, the clearway between the tracks is everywhere six feet, enabling centre poles to be used to a very large extent.

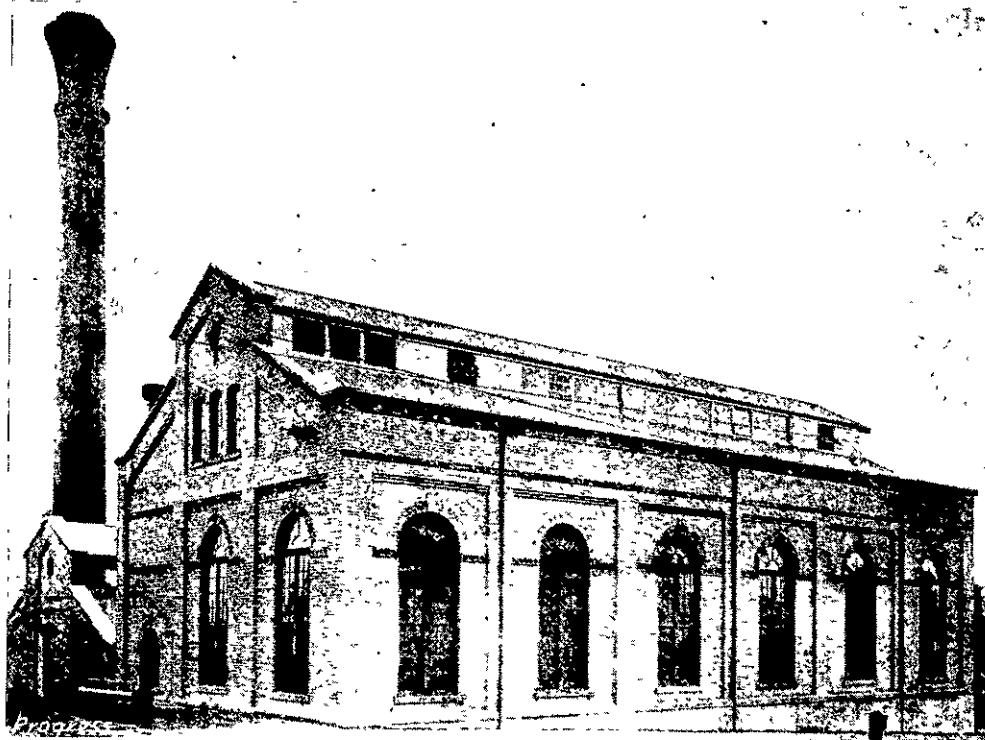
The rails used on the straight weigh 92lb. per yard. For the inner rail of each track, on curves of less than 300ft. radius a section weighing 95lb. per yard is employed. It was ascertained that 37ft. was the greatest length that could be conveniently shipped, and that was accordingly fixed upon as the standard length for rolling. The fishplates are 24in. long, weigh 52lb. per pair, and are fixed with six bolts. The rails and fishplates were manufactured by the Lorain Steel Company, the specified proportions of foreign elements in the rails being as follows :-

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| Carbon | .45 to .55 per cent. |
| Silicon | .04 to .08 per cent. |
| Phosphorus | Not more than .10 per cent |
| Sulphur | Not more than .085 per cent. |
| Manganese | .80 to 1.0 per cent. |

The standard permanent way construction is as follows:—the rails are bedded about 1in. in longitudinal concrete sleepers, 18in wide by 9in. deep,

and are edged on each side with one row of the local bluestone setts, laid serrated, or "hit and miss" fashion. Between the sleepers the road is excavated 9in. deep and filled in with macadam well rammed down.

Another matter, of which mention may be made is the system of draining the track. As the rainfall at Auckland amounts to about 60in.



THE POWER STATION : SHOWING SELF-SUPPORTING STACK.

a year it was felt that the drain boxes which have answered satisfactorily in England would not be adequate under these conditions, especially as the surface is macadam, and not setts. Accordingly, not only the rail groove, but also the whole width of the double or single track is drained. A narrow culvert with concrete bottom and brick walls is run across the full width of the track or tracks, a slot being cut out of the bottom of the groove of each rail to open into it, and is suitably connect-

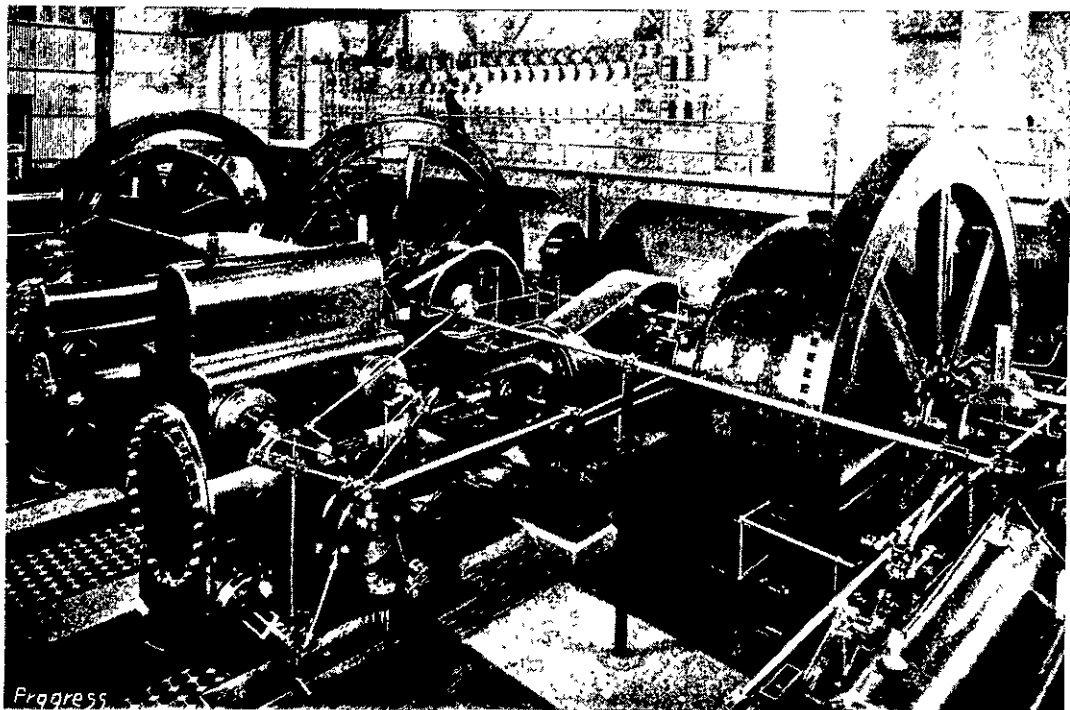
ed with the nearest surface water drain or gully. The covers consist of stout iron grids, and an edging of setts is laid round the framework. One of these arrangements is placed at the bottom of each grade, the average distance apart being about three-quarters of a mile. All points and special work are also drained.

Coming to the overhead equipment, it has already been noted that centre poles predominate. Span-wire construction is used at curves and junctions, and in certain districts where the use of centre poles was objected to, as also on one or two branch lines. Side poles and brackets are employed to a limited extent. In fact, every variety of construction is to be seen, both with iron and wood poles, the latter being permitted in outlying districts. Swivel trolleys are used on the cars, and the overhead work is arranged for maximum outreach of the trolley arm of 4ft. 6in., it not being considered advisable to exceed this amount with the speed of 10 to 18 miles an hour at which the cars run. All centre poles are provided with cast-iron wheel guards to prevent accidents to vehicular traffic, and, as an

additional precaution, are painted white for six feet above ground. In the principal street the poles have ornamental bases. All poles, both iron and wood, are 32ft. long overall. Three grades of iron poles are used, weighing 905lbs., 1295lbs. and 1,435lbs. respectively. The wood poles are of totara, and are square in form, and tapered 11in. side at bottom to 8in. at the top. All wood poles are thoroughly tarred at the bottom seven feet.

The trolley wire is No. S.C. B.S.G., and flexible suspension is used throughout. The hangers are of galvanised malleable iron. The same regulations as to guard wires apply as in England, but, in addition, the Company was required to insulate all telegraph and telephone wires crossing its lines. The work in carrying out this proviso, and in raising the telegraph and telephone wires along the routes where centre poles were not permitted, has been considerable. Outside the central quarter, where cables have been laid underground, the feeders, consisting of 3, 4, and 6 bare copper wires of No. 4/0 B.S.G., are carried overhead on wooden cross arms affixed to the poles. The test and telephone wires are carried overhead on little brackets. The configuration and extent of the lines, and the heavy traffic, have made necessary an elaborate system of feeders. As far as possible, these have been carried overhead, but elsewhere cables insulated with vulcanised bitumen and manufactured by Callender's Cable and Construction Company, Limited, have been drawn into earthenware ducts. The ducts are all single way and octagonal externally, measuring about 4½in. across, and having 3½in. diameter bore. They are supplied in 18m. lengths and have been laid in what is known as the "Camp" system. The ducts are grouped together with a thin film of cement mortar between each, and the whole is surrounded with concrete uniformly 4in. thick, making a very strong and watertight construction.

The manholes are placed on the average 90 yards apart, and are of two sizes, 4ft. by 4ft. internally by 5ft. deep, and 2ft. 5in. by 3ft. 5in. internally



THE POWER HOUSE : SHOWING CORLISS ENGINES AND GENERAL ELECTRIC CO.'S GENERATORS.