DOUBLE-BOGIE CAR BUILT BY THE BRUSH ELECTRICAL ENGINEERING CO.

by 3ft. 6in. deep respectively. Only one size of iron frame and cover is used, however, the upper brickwork of the large manholes being racked in to the required extent. The cover is recessed and filled with asphalt to a depth of 2in. The ducts are laid with a slight fall so as to drain into the manholes, and, where the accumulation of water would be likely to be considerable, a connection is made between the manhole and the nearest sewer.

Four boosters, each consisting of a shunt-wound motor direct coupled to a series-wound generator, manufactured by the General Electric Company, of Schenectady, U.S.A., are provided in the power station. It was calculated that there would be required on the negative side one booster to give 20 volts at 400 amperes, and two giving approximately 110 volts at 330 amperes, and on the positive side one booster to give 105 volts at 250 amperes. It was desirable to make the last three machines interchangeable, and this was accomplished by selecting generators of capacity of 125 volts at 330 amperes, which would give at a lower load 105 volts at 250 amperes. Shunts across the fields of two of the machines reduce the pressure at 330 amperes to 110 volts. The specified maximum variation at any load from the straight line characteristics required for the generators is 8 per cent. of the voltage at that load. The power station is in two bays, each roughly 53ft. wide and 104ft. long, and is of the usual construction—brick walls over a steel framework. The roof is of corrugated iron, laid over 1¼in. boards.

The plant at present comprises :—

Four Babcock and Wilcox boilers, each of 2,100 sq. ft. heating surface, provided with Babcock and Wilcox chain-grate stokers.

One Green's economiser of 360 tubes.

Three engines, made by Cole, Marchent and Morley, Limited, of the horizontal cross-compound Corliss type, each capable of 475 i.h.p. normal and 700 i.h.p. maximum output, running at 100 r.p.m., with steam pressure at the stop valve of 150 lbs. per square inch. The specified maximum steam consumption at full rated load, working condensing, is 14½lbs. per i.h.p. hour, and the minimum mechanical efficiency at the same load 90 per cent. The permanent speed variation from the mean speed does not exceed 2½ per cent., or the temporary variation 4 per cent., when the load is altered under working conditions.

Three 300-k.w., 8-pole, direct-connected, continuous-current, compound-wound railway generators constructed by the General Electric Company, and capable of 50 per cent. overload. The specified efficiency at full load is not less than 93½ per cent. These generators are without shaft or bearings, the armature being pressed on to the engine shaft.

One 600-k.w. set constructed by the British Electrical Engineering Company ; the engine, made by the same Company, being capable of 1000 i.h.p.

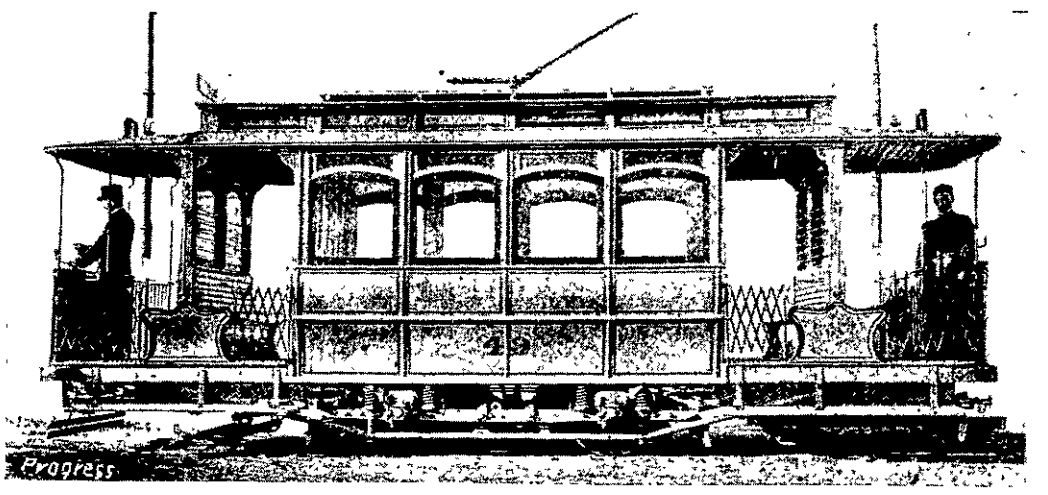
One 25-k.w. auxiliary unit, manufactured by the General Electric Company.

Four boosters already mentioned.

Switchboard, consisting of three generator panels, one load panel, one Board of Trade panel, four booster panels, six feeder panels, one lighting panel, and spare panel, made by the General Electric Company. The panels are of blue Vermont marble, held in a riveted steel frame. The board is of the flat pattern, with back connections.

One 20-ton overhead travelling crane, operated by hand from the ground, constructed by Higginbottom and Mannock. Piping, feed pumps, injectors, filters, hot well, tank, etc. etc. The feed pumps and economiser scrapers are electrically driven.

The rolling stock consists of : 55 passenger and one freight cars, all constructed by the Brush Electrical Company, Limited, with the exception of one built



SINGLE-TRUCK COMBINATION CAR BUILT BY MESSRS. COUSINS AND ATKIN, AUCKLAND.

by Messrs. Cousins and Atkin, Auckland. The single-deck bogie cars are of the combination type with closed centre and open ends, and are designed to accommodate 48 passengers ; the double-deck cars have reversed staircases and four motor equipments, and will seat 80 ; and the four-wheeled cars are divided into two compartments (one intended for smoking) with seats for 32. The bogie trucks are all equal-wheel, with wheel base of 4ft. In the double-deck cars each truck carries two motors, and in the single-deck bogie cars one motor, provision being made in the latter case for a second motor being added at any time. The wheel base of the single truck is 6ft. 6in., and it is, of course, fitted with two motors. The radius of the sharpest curve is 40ft. to the inner rail.

The wheels are of 30in. diameter. In view of the high speed at which the cars run at times, it may be suggested that 33in. wheels would have been more suitable, but, on going carefully into the question, it was found that the use of 33in. wheels would entail the platform step being inconveniently high, and this idea was accordingly abandoned.

Each car is fitted with a hand brake, a track brake, and an electrical emergency brake. The track brake is of the Spencer pattern, two slippers being fitted on each truck, and is so designed that a pressure of 4000 lbs. can be readily applied to each slipper without undue exertion on the part of the operator. The grades are very severe on some of the routes, the steepest about 200 yards in length, averaging 1–8.8, and there are longer grades of 1–11. Efficient brakes and ample motor power are, therefore, both necessary.

One standard size of motor, rated at 40 b.h.p., has been adopted. The maximum tractive effort specified was 1700lbs. at the wheel tread, and the maximum car speed 18 miles an hour, the gear ratio being 14.68.

Each car is fitted with two life-guards of the "trigger" type. The trigger is a hinged frame under the front end of the platform, which, struck by anybody, releases the catch by which the guard is normally held up clear of the track, and allows it to drop down to receive the body and carry it along until the car can be stopped.

The Company owns two car depots, conveniently situated, which have been reconstructed and electrically equipped to accommodate 44 and 30 cars respectively.

The principal building is in two bays, 354ft. and 328ft. long respectively, and each 39ft. wide, containing the car-shed, paint shop and erecting shop, There are six lines of track in the car shed, all with pits under their whole length A third and smaller bay contains the machines, wood-machine, and blacksmith's shops, winding-room, stores, etc. A cross-pit connects the machine shop with the car-shed. Light rails are laid along the floor of all the pits ; with turntables at the junctions with the cross-pit : and, with the aid of wheeled hydraulic jacks parts requiring repair can thus be transported from under the cars to the shops with the greatest facility. The tools, etc., in the repair shops include a 30-cwt. overhead travelling crane, 15in. and 8in. lathes, one heavy and one light drilling machine, a 150-ton hydraulic wheel press and an Allday's patent "Climax" hearth and blower. The lathes and drilling machines are electrically driven For lifting the cars bodily a car-lifting appliance of 15 tons capacity is provided, consisting of two pairs of screw jacks on wheels and two girders.

In concluding this article mention should be made of the fact that the 1904 profits handed to the Auckland City Council by the Tramways Company amounted to £2,300, in addition to £1,200 paid in street rents and rates.

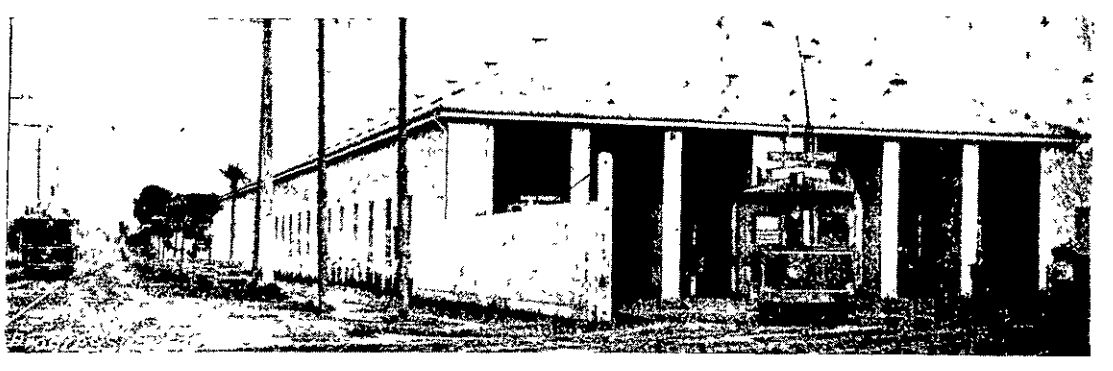
The results of the first and second years' workings are as follows :—

1903.

Total car mileage run	1,318,469
Number of passengers carried	13,535,611
Total receipts	£82,929
Dividend	4½%

1904.

Total car mileage run	1,702,173
Number of passengers carried	18,045,703
Total receipts	£112,429 9 7
Dividend	6%



THE CAR SHEDS AT PONSONBY.

The drainage, water supply, and street improvement works, which are to be carried out in the borough of Lower Hutt, Wellington, at a cost of £52,000, was on the 10th ult. formally commenced.