

application. Textile work again involves exacting conditions such as smooth starting of spinning frames and wide variation of working speed by fool proof equipment, which are met by this type of motor, with the added advantages which accrue from direct and individual drive to units.

As regards cascaded sets, these are essentially suited to large powers. The brush shifting motion not only controls speed but it can also be manipulated to give p.f. compensation, correcting the p.f. of induction motors in the circuit. For rolling mill work in conjunction with a flywheel, the arrangement has proved satisfactory for powers up to about 500 h.p. For heavier duties it is satisfactory when operated on the Kramer or Scherbius systems, the former involving a rotary converter in cascade with the main motor, and the latter a commutating machine in cascade with the main induction motor. In the case of the Kramer system, the slip energy that would be lost as it is converted into d.c. energy by the rotary and then supplied to a d.c. auxiliary motor. Altering the shunt excitation of this motor

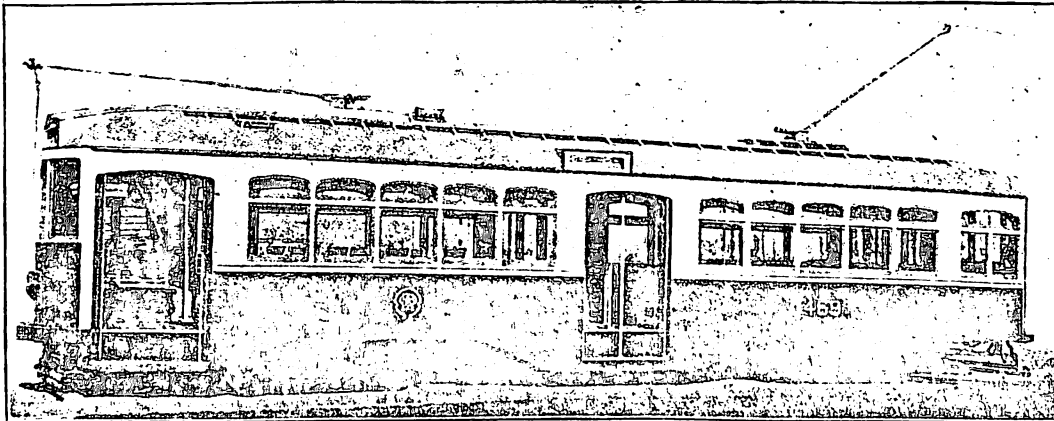
controls the speed, which remains constant even at no load. The auxiliary motor may be either direct coupled to the main motor or caused to drive an alternator. The former method, while proving rather more costly, is generally to be preferred as it is simpler and has a higher efficiency.

With the Scherbius system, in place of the slip energy being converted into d.c. it is supplied directly to a three phase commutating motor which can be either mounted on the same shaft as the main motor or coupled to an induction machine forming a regulating set. As a full description of this interesting equipment would call for considerable space it is sufficient to say that it is usually arranged in conjunction with a small frequency converter for super synchronous operation, which enables the entire plant to operate at all loads at practically unity p.f., and with good efficiency throughout the speed range. A rolling mill so equipped can be operated for a large part of the time on the main motor alone, since synchronous speed is in the middle of the speed range which is the most common.

New Bogie Car for Melbourne Tramways

The Melbourne and metropolitan tramways board has recently constructed a car of the double end, closed, bogie type, which is new to Australia, though fairly common in some parts

cally operated doors. It differs also from other bogie cars operated by the board in having an all-steel framework, and in the provision of cross seats, louvred sun shades in lieu of blinds,



New Bogie Car for Melbourne Tramways, Class Y

of America. It is to be tried out on various routes in order to ascertain its suitability for traffic in Melbourne and suburbs. The car was designed by the engineering staff of the tramways board, and built in the board's workshops at Preston. Its special features are the low, one-level floor, front and centre entrance and exit, internal well steps, safety devices and pneumati-

adjustable motorman's windows, and anti-climbers on the bumpers. It is intended for operation with either a one-man or a two-man crew.

The car body is 33 ft. 6 in. long over corner posts, and the length over bumpers is 45 ft. 6 in. The width is 8 ft. 4 in. and the end platforms are each 5 ft. 6 in. long. The underframe con-

sists of 3 in. x 3 in. x $\frac{3}{8}$ in. angle side sills reinforced at the bolsters and centre doors, 7 in. x $2\frac{1}{2}$ in. x 9 $\frac{3}{4}$ lb. channel end sills and 4 in. x 2 in. x 7 lb. channel floor bearers. The platforms are supported on the door sides by 7 in. x 3 in. x 14 $\frac{1}{2}$ lb. channel platform sills and on the other side by the side sill and side girder construction carried beyond the corner posts. The side and roof framing has 2 in. x 2 in. x 3/16 in. tee side posts and 3 in. x 2 in. x 3/16 in. angle corner posts extending from the side sill to the side or top plate angle, with a 14 $\frac{1}{2}$ in. pier at the centre and corner posts. The steel carlines at each side post and pier are of 1 $\frac{1}{2}$ in. x 1 $\frac{1}{2}$ in. x 3/16 in. tee inverted. The strength of the framework lies in the girder construction



Interior of Bogie Car, Class Y.

of the sides. The side sill is the lower member and the belt rail of 3 in. x 1 $\frac{3}{8}$ in. x 5/16 in. angle, and side plate of 3 $\frac{1}{2}$ in. x 2 $\frac{1}{2}$ in. x $\frac{1}{4}$ in. angle constitute the upper members, with a sheathing plate of 14 s.w.g. steel. The letter-board is of 16 s.w.g. steel, and the outlines for doors and windows are curved in form and pressed to shape.

The car roof is of the board's standard type, arched in form, with the centre portion raised 2 in. for the full length for ventilation. The roof boards, of 2 $\frac{1}{2}$ in. x $\frac{3}{8}$ in. t. and g. oregon, are screwed to furring on the steel carlines and to intermediate wooden carlines. The roof covering is of jute canvas. The side window sashes and louvres drop into pockets, and are arranged with a minimum thickness of pillar. The upper sash is hinged at the bottom for ventilation. The side windows on the platforms are fixed, but the front windows drop and may be fixed at any desired opening.

The floor is at one level through platform, passage way and centre of car, with a 3-in. rise at the cross seats, which are over the wheels. The flooring is of $\frac{7}{8}$ -in. t. and g., covered with Malthoid floor covering. In the body of the car

the seats are placed transversely, and are reversible, but on the platforms and at the centre they are longitudinal, providing ample room for movement around the doors. The step wells on the off side of the car are covered by folding seats. The car will seat 54 passengers. Stanchions of 1 $\frac{1}{2}$ -in. tubing at the doorways and at the end of the raised floor provide ample grab-rail accommodation.

The four doors are operated by overhead door engines controlled by the motorman. They are of the safety car type, i.e., the car cannot be started with the doors open, and the doors cannot be opened until the car has stopped. The doors open inwards into the step wells, so that there are no steps or doors projecting beyond the body outline.

The trucks are of the board's equal traction type with slight modifications. The wheel base is 5 ft. 3 in. and the wheels are 26 in. diameter. Two 40-h.p. motors are installed on each truck. The weight of the car completely equipped is 38,800 lb.

The controllers are of the four-motor type, fitted with dead man handle, and operated in conjunction with a line breaker fitted with pneumatic circuit opening device. If the motorman releases his hand from the controller handle air is supplied to the pneumatic circuit-opening device on the line breaker, cutting off the current. At the same time the brakes are automatically applied, the rails sanded, and the doors all thrown into the balanced position so that they can be operated by hand. A foot valve is fitted which works in conjunction with the dead man's handle. This is to allow the motorman to remove his hand from the handle for short periods to collect fares, etc.

The brakes are of the Westinghouse straight air brake type. The brake valve has a special feature for opening and closing the doors, so arranged that the doors can only be opened when the brakes are applied and closed when they are released.

ELECTRICITY COMMISSION'S UNDERTAKINGS

The quarterly statement of the Victorian electricity commission, covering the three months ended June 30 last, shows steadily increasing demand and revenue. The energy sold totalled 71,280,900 units, as compared with 45,301,470 units for the corresponding period last year, and the maximum demand on the system was 70,000 kw., against 42,000 kw. The revenue amounted to £269,844 as against £132,003, and the expenditure (including interest but not depreciation) was £248,776 against £177,855.