

## Types of brakes in general use.

The following types of tramway-brakes are in common use :—

1. The hand-applied wheel-brake.
2. The mechanical slipper, or track-brake.
3. The pneumatic wheel-brake.
4. The pneumatic track-brake.
5. The rheostatic brake.
6. The electro-magnetic track-brake.
7. The Newell electro-magnetic combined track and wheel brake.
8. The electric emergency brakes.

Shortly described,—

1. *The hand-applied wheel-brake* arrests the motion of the car by the forcible application of cast-iron blocks to the wheels. Since this application is effected by the manual effort of the motorman, this brake is only suitable for the control of comparatively light cars.

2. *The mechanical slipper or track-brake* is applied by hand, and, when in action, a portion of the weight of the car is transferred from the wheels to the slipper-blocks, which press directly on the rails. This brake is chiefly used for keeping the speed of the car within safe limits when descending steep gradients, its function being to compensate for the effect of gravity.

3. *The pneumatic wheel-brake*.—Here air under pressure is admitted to a cylinder, where it acts upon a piston connected by levers and rigging with brake-blocks, which are thus forced upon the wheels. A reservoir capable of storing sufficient air for many applications of the brake is attached to the car. The supply is maintained by an air-compressor, usually motor-driven.

4. *The pneumatic track-brake* differs from the pneumatic wheel-brake in that the brake-blocks are applied to the track instead of to the wheels.

5. *The rheostatic brake* is applied by moving the handle of a suitably arranged controller in the opposite direction to that which is required for the application of power. The retarding effect is obtained by the use of the motors as generators, in parallel, with resistances in circuit which are gradually taken out, until at the last notch the generators are short-circuited upon themselves. This method of braking, by throwing the duty of retarding the car upon the motors, in addition to that of accelerating it, calls for the use of larger motors than would be fitted for propulsion alone, especially in hilly districts.

6. *The electro-magnetic track-brake*.—The mode of operation of the electro-magnetic track-brake is similar to that used in rheostatic braking; but instead of current-energy being dissipated in “resistances,” it is utilised to energise electro-magnets suspended over the rails, to which the magnet pole-pieces are forcibly attracted, thus forming powerful track-brakes, the retarding effect of which is added to that produced by the motors acting as generators.

7. *The Newell electro-magnetic combined track and wheel brake*.—The arrangements for actuating this brake are similar to those of the electro-magnetic track-brake; but, in addition to the braking action previously described, the drag of the track-magnets is, by means of a system of levers, utilised to apply blocks to the wheels, the total retarding effect being that due to—(1) the retardation arising from the motors being used as generators; (2) the retardation due to the drag of the track-magnets; (3) the retardation accomplished by the pressure of the brake-blocks upon the wheels. This combination constitutes the most powerful brake known.

8. *The electric emergency brakes*.—What is known as the “first electric emergency” is applied by pulling the reversing-key (with the power-lever at the “off” point) into an extreme backward position, only to be found on some controllers. This has the effect of short-circuiting each motor upon itself. The “second electric emergency brake,” which can be applied with all controllers, is brought into action by pulling the reversing-key into the “backward” position, and then giving one or two notches of power. The “third electric emergency brake” is applied after the “second” by opening the canopy switch (or the coming-out of the automatic cut-out), and the placing of the power-handle at full parallel. This short-