

Description.

The Westinghouse Magnetic Brake consists of:—

- 1.—A track magnet with detachable soft-steel track-shoes fixed to each pole. The shoes run just clear of the rails, and the magnet is energised by current from the car motors acting as generators.
- 2.—Brake-blocks or wheel-shoes of the ordinary type acting on the wheels.
- 3.—A simple link mechanism connecting the track-shoes and the wheel-shoes. By means of this the downward pull and consequent drag on the rails of the magnetised track-shoes is transmitted to the wheel-shoes, which act upon the peripheries of the wheels in the usual way.

The constructional details of the brake may be better understood by reference to Figs. 1 to 5. The track magnet is a horse-shoe magnet with the pole-pieces parallel with the rails, the poles taking the form of renewable track-shoes. The magnet core is horizontal, and the coil is enclosed in a

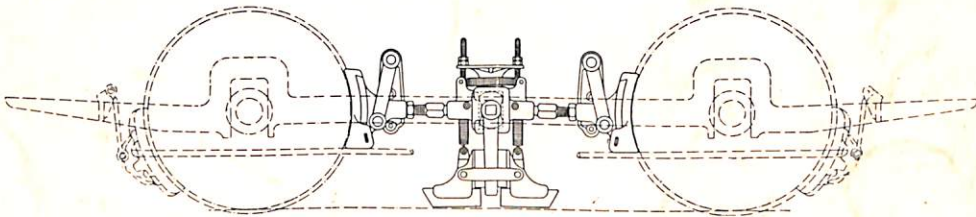


Fig 2.—Diagram of Westinghouse Magnetic Brake with inside-hung wheel-shoes fitted to Single Truck.

strong water-tight brass sheath. The whole is flexibly suspended by helical steel springs from the truck frame, thus allowing the track-shoes to ride over obstructions. The ordinary clearance between the shoes and the rail is $\frac{1}{4}$ inch. The electrical connections of the magnet consist of strongly armoured cables in duplicate.

The entire mechanism is of the simplest character and does not in any way interfere with the operation of the hand brake.

A single-truck equipment includes the above three elements in duplicate, a bogie or double-truck car being fitted with the equivalent of two single-truck equipments. As evidence of the adaptability of the brake, it is only necessary to mention that it has been successfully fitted to every type of truck in use.

Operation.

When the brake is applied the track-shoes are strongly attracted to the rail, and the following four distinct effects are produced:—

- 1.—A pronounced retardation by reason of the friction between the track-shoes and the rails.
- 2.—A maximum braking effect on the wheels, obtained through the transmission of the resultant drag of the track-shoes to the wheel-shoes by means of the link mechanism provided for that purpose.
- 3.—A positive braking effect on the car axles due to the loading of the motors as generators.
- 4.—A noticeable increase in the effective adhesion of the car wheels on the rails, due to the pull of the track magnets.

The net result of the combination of these four actions represents a **far greater retarding effect than it is possible to obtain with any other type of brake.**

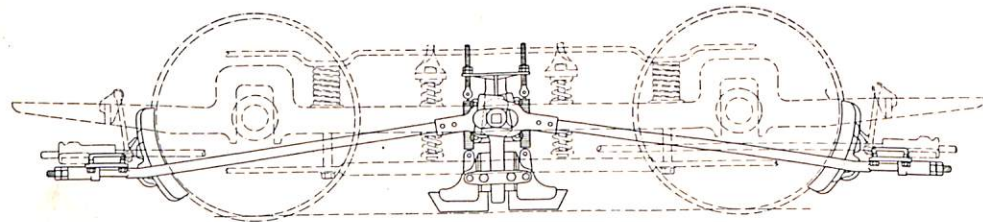


Fig. 3.—Diagram of Westinghouse Magnetic Brake with outside-hung wheel-shoes fitted to Single Truck.

An important characteristic of the Westinghouse Magnetic Brake is the method of using the drag of the track-magnets as the motive power for applying the brake-blocks to the wheels. When the speed of the car is greatest and the attraction of the track-magnets to the rails is proportionately great, the pressure of the brake-blocks on the wheels is also at its maximum. As the speed of the car decreases, the current generated by the motors also decreases, and there is consequently a reduction in the drag of the track-magnets and in the pressure of the brake-blocks on the wheels. This reduction of the brake-block pressure, however, is compensated for by the increase in the co-efficient of friction at the lower speeds, and smoother

Operation.—Continued.

action is ensured by this inherent automatic regulation of braking effect than is possible with any other type of magnetic brake.

All forms of electric and magnetic brake which do not apply brake-blocks to the wheels cause excessive wear and tear on the most expensive portion of the car equipment, as with these, the motor armatures are required to do the work of retardation, which, in the case of the Westinghouse Magnetic Brake is done by the brake-blocks on the wheels.

The proportion of the retarding effect exercised by the various elements of the Westinghouse Magnetic Brake remains practically constant under all circumstances, so that there is consequently no tendency for the wheels to skid on a greasy track.

The Brake is operated from the main controller handle, by moving it beyond the "off" position to the braking notches. Any type of controller

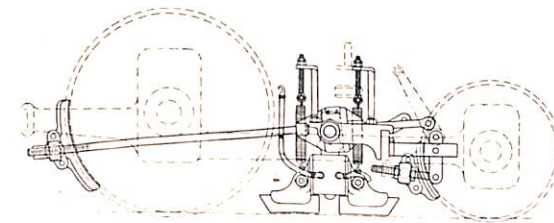


Fig. 4.—Diagram of Westinghouse Magnetic Brake fitted to Maximum-traction Truck.

equipped for rheostatic braking can be readily adapted for service with this brake, and the type of motor is also immaterial. By using the same handle continually both for "power" and "brake," the driver acquires a confidence and promptness of manipulation which enables him to control his car with **absolute safety on all conditions of track, and at all speeds.** This is a most valuable feature, as in emergency cases a motorman is never called upon to perform an operation which is not in his regular practice. The simple reversible action of moving the single controller handle in one direction for power and in the opposite direction for brake, reduces to a minimum the "human element" which is so frequently responsible for accident. In cases of extreme emergency a driver has only to follow his natural impulse to throw back the controller handle as far as it will go, in order to bring the maximum braking effect into immediate operation. These facts will be recognised by Tramway Managers to be of the greatest importance

Operation.—*Continued.*

The system of operating the brake by current derived from the motors acting as generators not only saves all expense for braking power, but also effectually prevents the possibility of accident through any sudden failure of the trolley current. The entire energy in the moving car is always available

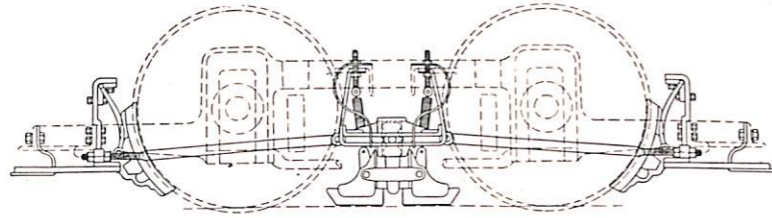


Fig. 5.—Diagram of Westinghouse Magnetic Brake fitted to Equal-wheel Bogie Truck.

as brake power, whether the car be running forward or backward. As the current is utilised to the best possible advantage, the amount necessary for energising the brake magnets is so small that it has no injurious effect on the motors, whatever may be the speed of the car.

BRAKES FOR TRAILER CARS.

The Westinghouse Magnetic Brake can be applied to trailer cars when required, the trailer brake-magnets being connected-up to the motor car wiring by means of simple plug and socket couplings.

COMBINED BRAKING AND CAR-HEATING SYSTEM.

The British Westinghouse Electric & Mfg. Co., Ltd., also supply a car-heating system for use in conjunction with the Westinghouse Magnetic Brake.

The heaters are fitted underneath the seats of the car, and are connected to the car wiring by means of a switch, so constructed that the braking and starting currents—which are ordinarily wasted in the car resistances—may be divided as desired, and the whole or any portion thereof used for heating. This method of heating involves no cost for current from the line.

**ADVANTAGES OF
THE WESTINGHOUSE MAGNETIC BRAKE.**

The principal advantages of the Westinghouse Magnetic Brake, which have made it **the recognised standard tramcar brake**, are enumerated below :—

- 1.—Absolute safety under all circumstances.
- 2.—Complete control of car with one single handle for both power and brake.
- 3.—Highest efficiency and maximum braking effect available with all conditions of track.
- 4.—Instantaneous and positive action, exerting greatest braking power at maximum speed of car.
- 5.—Reliability and certainty of operation at all speeds.
- 6.—Automatic control of speeds on long and steep gradients.
- 7.—Automatic regulation of braking power on track, wheel, and axle, and consequent prevention of flats on wheels, even when the rails are greasy.
- 8.—Increased adhesion of car to rails when braking, thus eliminating any tendency to derailment of car.
- 9.—Accessibility and simplicity of construction.
- 10.—Adaptability to all types of truck.
- 11.—Non-dependence upon trolley current, and consequent economy of operation.
- 12.—Minimum cost of maintenance.
- 13.—Minimum wear of gears and pinions.
- 14.—Increased life of motors owing to lower operating temperature
- 15.—Increased gross receipts owing to higher schedule speeds.

**2,000 WESTINGHOUSE MAGNETIC BRAKES HAVE BEEN SOLD
IN GREAT BRITAIN ALONE UP TO NOV. 1st, 1904.**
