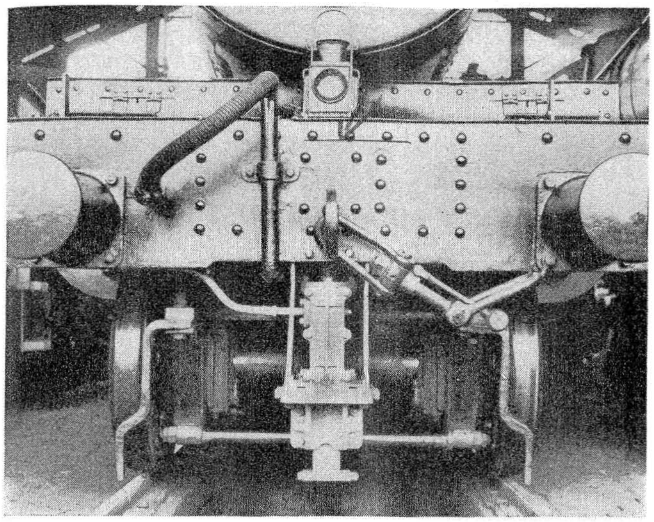


The engine shoe in its lowest position

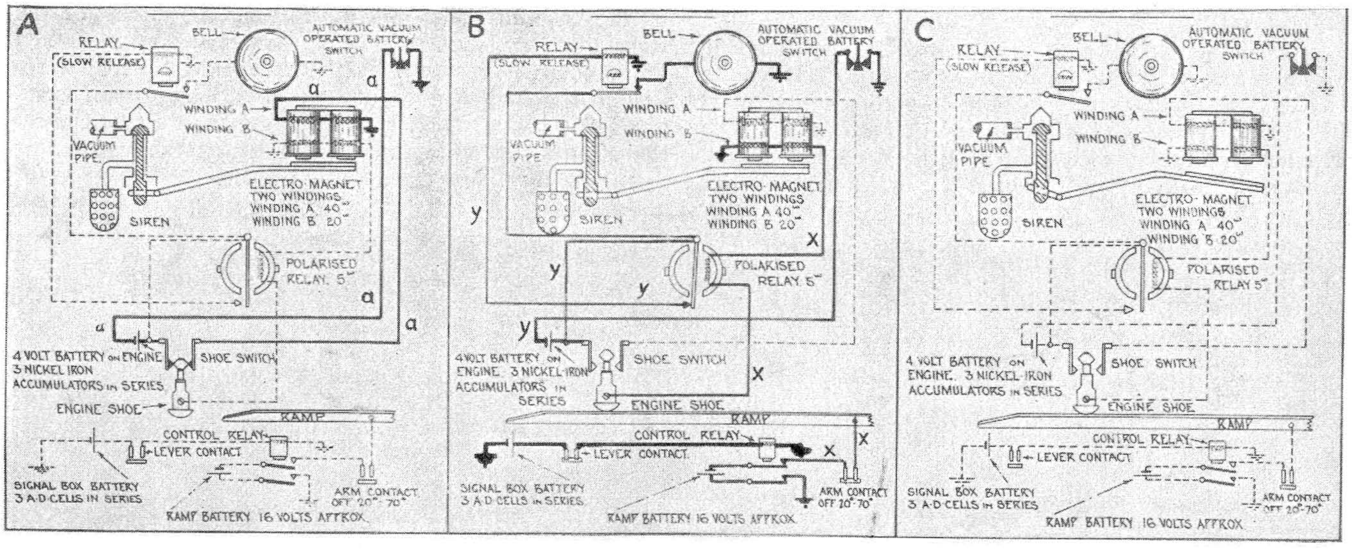
Automatic Train Control on Great Western of England

THE Great Western Railway of England has adopted plans for the installation of its automatic train control system throughout hundreds of miles of its lines. The present installation from London to Oxford, High Wycomb and other points, aggregating 372 miles of track, is being expanded to a total of 2,130 miles of track. Locomotives, including both passenger and freight, will be equipped to the number of 2,334. The estimated total cost of this enterprise equals about $1,000,000, and it is expected to complete the work within one year.

Contracts for the equipment on the locomotives have been let to the Westinghouse Brake & Saxby Signal Company, the British Power Railway Signal Company, and the General Railway Signal Company. The work of installation, including the manufacture and installation of the ramps, will be done by the railway company's forces.

This is a ramp system, with intermittent mechanical and electrical contact. It was introduced as a cab signal (without brake-setting apparatus) about 24 years ago on the Fairford branch, and its use has been gradually extended. The mechanical and electrical features of the system, as in use today, are described in the attached drawings.

The system, as here described, is operated in connection with manual block signals, and the brake is the automatic vacuum system. The control of the ramp to give a Proceed or a Caution signal is in the hands of the signalman, who opens or closes an electrical contact when he moves his distant signal lever, and the application of the brakes on the train is effected by admitting air to the normally exhausted vacuum brake pipe. The Caution indication is a siren in the cab, the admission of air to the brake pipe through the siren causing the sound. The Proceed indication is a short ring of a bell. The ramp, a steel bar, inverted T shape, fixed on the roadway, is 44 ft. 3 in. long. It is supported on a timber centrally located between the rails and is staggered 3 in. to the center line; that is to say, the entering end of

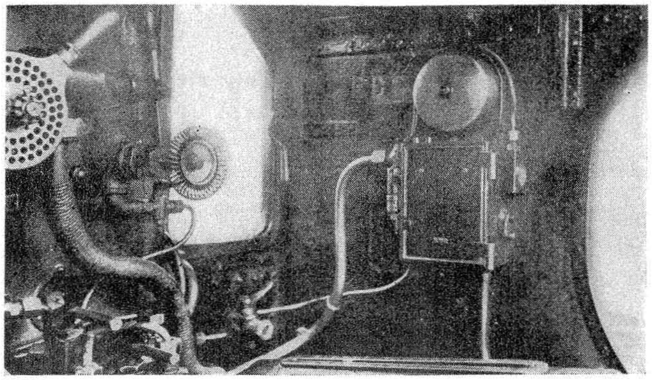


Engine and wayside control circuits

the ramp is 1½ in. to the right of the center and the leaving end is 1½ in. to the left. The top of the ramp at its highest point is 3½ in. above the top of the rail.

The electrical connections will be understood from the diagrams A, B, and C; the first one, A, shows the normal condition; B, Proceed, and C, Proceed with caution. Normally, the electric wire from the signal cabin to the ramp is dead. The placing of the signal lever to the Proceed position energizes circuit *x*, Diagram B, and the bell, indicating Proceed, is energized by circuit *y*, which is closed by the action of circuit *x* on the polarized relay. This circuit also energizes winding *B* of the electro-magnet, holding the brakes off.

The contact shoe which is supported on the frame of the locomotive beneath the cab, as shown in the illustration, is held in position by gravity, assisted by a power-

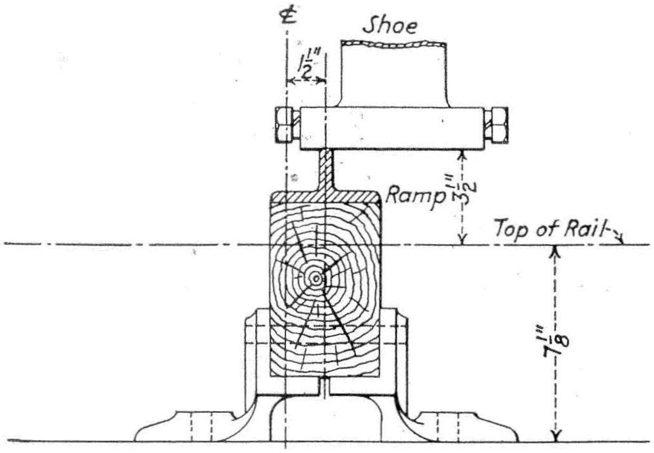


Locomotive cab

ful spring. It is raised vertically one inch whenever a ramp is passed over, and this movement opens the switch, which is a part of the shoe. This switch, closed, as in Fig. A, before reaching the ramp, completes circuit *a* and, through winding *A* of the magnet, prevents the brake valve from opening. The opening of the switch on reaching the ramp causes the admission of air through the siren and the brake valve to the train pipe, sounding the siren and applying the brakes. This happens when an engine passes over an unelectrified ramp. The engineman, by acknowledging the warning given by the sound, can silence the siren and forestall the application of the brakes. This he does by raising a handle (shown on the outside of the box which is fixed at the engineman's side in the cab) and his act prevents the dropping of the armature of the magnet.

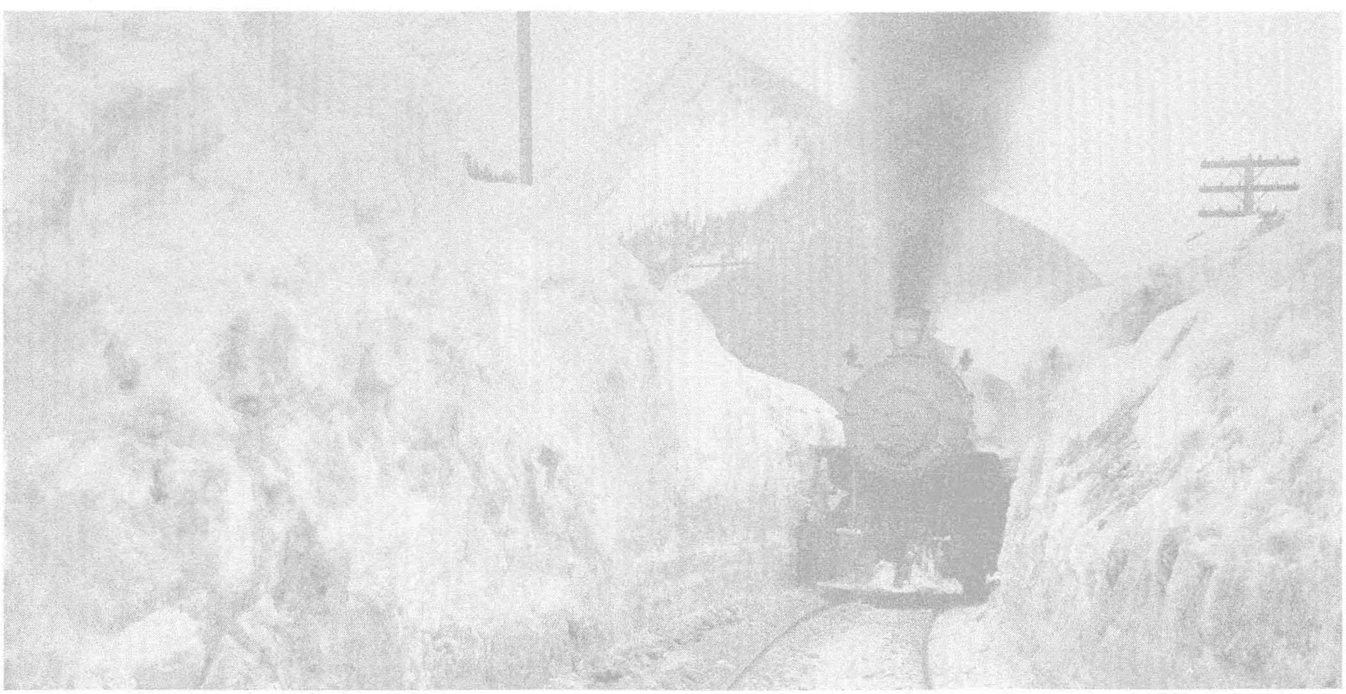
When the engine shoe is in its lowest position, and its switch is closed, a current of 100 m. a. flows from the 4-volt storage battery through the 40-ohm winding *A* of the electromagnet. This holds up the armature. The armature is coupled to a hinged lever, the opposite end of which is inserted in the stem of the brake valve. When the armature drops away, the lever end lifts and causes the brake valve to open; air is drawn through the siren, which is sounded, and the vacuum is partially destroyed.

When the ramp is electrified—meaning line clear—the contact shoe is lifted as before, but the current to the 40-ohm winding of the magnet is open at the shoe switch and a current of about 500 m. a. is picked up momentarily from the ramp. Circuit *x* is then energized through the 5-ohm winding of the polarized relay and the 20-ohm winding of the electro-magnet. Thus, though the shoe is lifted, the air valve is not opened, the magnetic field being maintained. The polarized relay contact closes circuit *y*, the effect of which is to ring the bell for one or two seconds.



The ramp on a curve

When a locomotive is laid up for the night or for any time over one-half hour, the automatic cutout, shown in the upper right-hand corner of the drawing, is operated by the vacuum brake system, opening the circuit of the engine battery, thus economizing battery power. When the vacuum is restored by the engineman, prior to releasing the brakes, the cutout pulls up and again energizes the brake magnet. The engineman then silences the siren (which is revived as soon as the vacuum is restored) by lifting the resetting lever.



A cut through a snow slide on the Canadian Pacific