

Division Train Control Installation on C. & E. I. Approved by I. C. C.

Commission Tests All Roadside and Engine Equipment of 106 Mile Section of Miller Apparatus

THE Interstate Commerce Commission on March 30 made public its report, approving, after inspection and test, the installation of the automatic train-stop system of the Miller Train Control Corporation, with forestalling feature, which has been in service since November 17, 1914, on the Chicago division of the Chicago & Eastern Illinois. The report is by Division I of the commission, Commissioners Esch, Lewis and McManamy, and is dated March 27. As a result of the inspection and test, completed January 21, the report finds that the installation meets the requirements of the commission's specifications and states that it is approved except as to three details, one of which affects only six locomotives and another of which finds unnecessary the ramp-displacement detectors applied to six ramps. Four recommendations are also made for precautionary measures involving the signal system, to be complied with by the railway company.

Inspection of Way-Side Control

During the inspection made by the Interstate Commerce Commission, a special train of an engine and one coach was used for the road inspection, which served not only as a means of transportation, but also gave an actual train test. A systematic program expedited the work. As the train proceeded with traffic a stop was made at a ramp where the "ramp crew" got off. A voltage reading was noted from the ramp to the running rail. As the locomotive passed the signal the first reduction of the ramp voltage checked the track relay circuit. As the train backed up and the signal cleared the return of the voltage to the ramp checked the circuit breaker on the signal. A code of locomotive whistles assisted materially where the signal was not visible from the ramp. By these tests an actual operating check was made of the circuits to see that they conformed to the plans. The gage and alignment of each ramp was checked by a gage board.

Locomotive Apparatus Tested

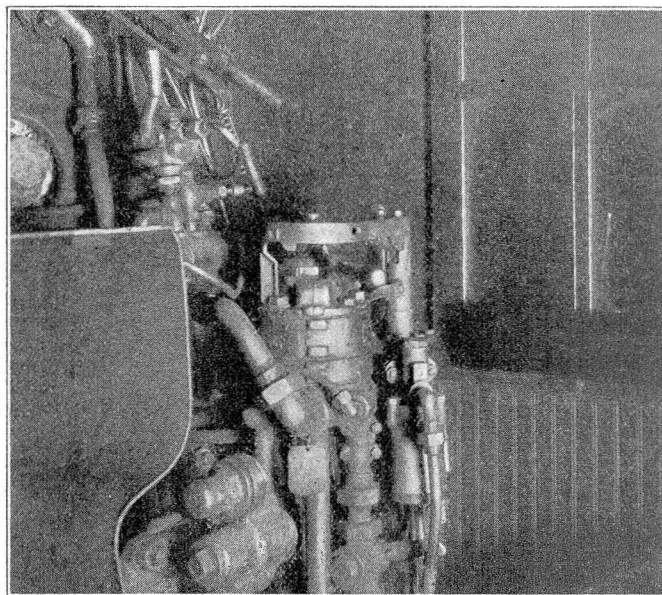
The train control equipment on all of the locomotives was given a test in the roundhouse. If the air pressure was not pumped up a connection was made to the air line in the house. By the use of a bar to raise the shoe to duplicate the movement over a ramp and by applying current from a portable battery, the following tests were carried out: (1) forestall at a stop ramp; (2) stop ramp, and (3) forestall at stop ramp. Record was also made of the condition of the apparatus, the air pressure at which the test was made.

Following the completion of the tests, the inspectors rode the engines in service to check the operation of the apparatus in regular train operation.

The Chicago & Eastern Illinois is one of the forty-nine railroads required by the commission's order of June 13, 1922, to install automatic train-stop or train-control devices on portions of their respective roads, and its installation was one of the three in service at that time upon

which the commission's order was predicated. The first of the forty-nine installations to be approved was that on the Chicago, Rock Island & Pacific, which was approved on December 17, 1923. The Chicago & Eastern Illinois installation is the second one of the forty-nine and the first plain automatic stop with forestalling feature to be approved after inspection. The commission's original

WASHINGTON, D. C.



Electro-Pneumatic Valve and Mechanism for Operating Brake Handle

specifications did not provide for the forestalling feature but the order was attended to permit it on July 18, 1924. The report of the commission, given in abstract, is as follows:

REPORT OF THE COMMISSION

The device is an automatic train stop of the intermittent electrical-contact type with forestalling feature. This device was first placed in service on the northward track of the Chicago & Eastern Illinois between Danville, Ill., and Hoopestown, a distance of approximately 24 miles, the installation being completed on October 9, 1913. On December 9, 1913, the installation was completed on the double track from Watseka, Ill., to Momence, a distance of approximately 27 miles, and on the double track between Momence, Ill., and Chicago Heights, approximately 23 miles, it was completed October 9, 1914. The final installation from Chicago Heights, Ill., to Dolton Junction, approximately 10 miles of double track, was completed November 1, 1914.

The installation inspected and tested was placed in service on November 17, 1914, and extends from North yard at Danville, Ill., to Dolton Junction, Ill., approximately 106 miles, double track, with 176 ramps controlled through automatic and interlocking signals.

The automatic signal system throughout this territory consists of normal-clear, three-position, upper and lower quadrant, electric, ground, semaphore signals. Red, yellow, and green are the night indications for stop, caution, and proceed, respectively.

Of the C. & E. I. locomotives, 104 are equipped with this

device, and in addition 30 locomotives of the Elgin, Joliet & Eastern have also been so equipped, the latter being completed September 29, 1924. These E., J. & E. locomotives operate over the train-stop equipped territory of the C. & E. I. for a distance of about 81 miles.

From May 1, 1921, to July 31, 1921, and from February 1, 1922, to April 30, 1922, the installation was under continuous observation by representatives of the Bureau of Safety of the Interstate Commerce Commission and the joint committee on automatic train control of the American Railway Association.

The wayside apparatus consists of ramps located in the rear of automatic or interlocked signals in the normal direction of traffic, with the necessary wiring to connect the train-stop system with the signal system. For test purposes six of these ramps were provided with a ramp-displacement device through which is carried the control wire for the next signal in the rear in such manner that lateral displacement of the ramp outwardly will open the circuit and cause the signal in the rear to assume the stop position, de-energizing its ramp.

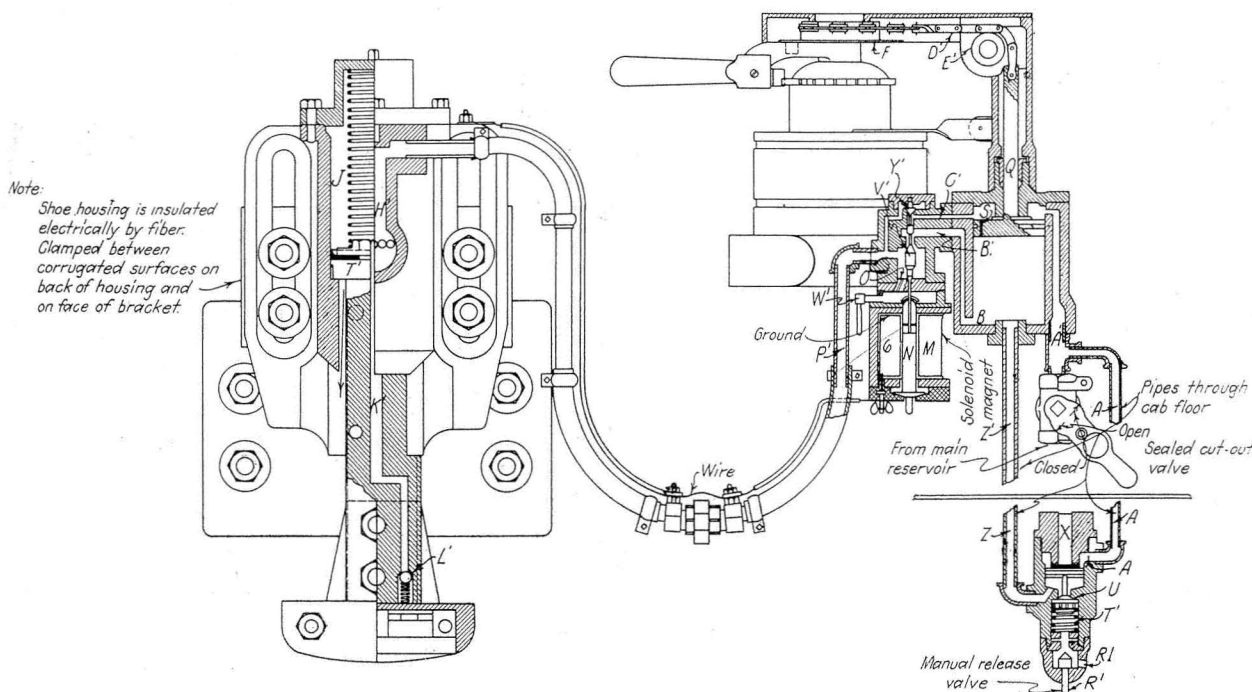
The locomotive apparatus consists of the following:

1. A ramp-shoe mechanism securely attached to the

the sheave wheel abuts the brake-valve handle at the release side so that this handle may be turned to service application position in automatic applications; a shield casting being applied to protect the operating chain and mechanism from external interference.

4. A solenoid magnet located in the assembly directly beneath the pneumatic control-valve portion, which when energized raises the pneumatic double-seated control valve to its upper seat and by means of this valve closes the passage leading from the operating-piston lower chamber to the ramp-shoe plunger cylinder; at the same time opening the passage to the warning whistle (this valve also constitutes the forestalling feature of the device); a wire connection between the ramp plunger housing and the solenoid magnet; and a stop-valve to prevent the release of the brakes after automatic application until after the train has been brought to a stop; the necessary piping and conduit connection for air from the main reservoir to the control-valve chambers and thence by piping and flexible conduit to the ramp-shoe plunger piston spring chamber.

Ramp shoes, one on each side of the engine, may be employed where it is desired to provide for automatic applica-



Details of Construction of Shoe, Electro-pneumatic Valve and Manual Release

tender-truck arch bar; a combined leather-packed shoe plunger piston and shoe plunger, provided with a central air passage extending from the air-pressure face of the plunger piston to the ramp-shoe face of the plunger; a shoe plunger tension spring of helical form; a shoe plunger piston housing and cylinder provided with slotted bolting flanges, corrugated at the back, for securing adjustable attachment to the truck bolting bracket; a shoe plunger piston cylinder-cap nut which forms the abutment for the shoe plunger-piston spring, an air-tight inclosure for the shoe plunger piston; and the necessary electrical wiring, air-pipe connection, and fittings.

2. An automatic brake-valve control valve having a vertically disposed cylinder with main-reservoir air connection to its upper end and a connection leading from this end to the manual-release valve; a piston and rod suitably enclosed in the cylinder, the piston being provided with an upper and lower cylinder-chamber connecting port; a double-seated pneumatic plunger valve which controls the air passage between the control-piston lower chamber and the ramp shoe plunger-piston chamber, and that also controls the air passage between the control-piston lower chamber and the control warning whistle; a quick-recharging valve located centrally above the double control plunger valve, and a housing with means for attaching it to the operating-piston cylinder housing.

3. An operating chain of the sprocket type, one end of which is connected by means of a pivot bolt, riveted at the ends, to the end of the operating-piston rod, and the other, after the chain wraps partially around a sheave wheel, to a lug on the sheave by means of an eyebolt and nut. A lug on

tions in either direction of heading of the locomotive, and in reverse movements.

Operation of System

When a signal in advance is at clear or caution the locomotive shoe receives energy from the ramp and so causes a clear or proceed indication to be transmitted to the locomotive apparatus. When a signal in advance is at stop the locomotive shoe receives no energy from the ramp.

As the shoe glides along the ramp the shoe plunger piston is raised, and if the ramp is de-energized the air quickly escapes, as the solenoid magnet in this case remains de-energized and does not lift its plunger, the pneumatic control valve remaining in its lower-most position, with an unobstructed or free passage from the lower-most chamber of the operating-piston cylinder to the atmosphere. This results in a sudden fall in the pressure of this chamber to a point below that in the chamber above the operating piston; this piston being forced to the lower end of its travel, during which, by means of its attached chain, sheave wheel, and the brake-valve handle lug on the latter, it pulls the handle of the automatic brake valve around to the service position and leaves it there. Brake-pipe air can then exhaust at the established rate for a service application of the brakes.

After the ramp shoe passes off of the ramp, combined spring and air pressure promptly returns the shoe plunger piston to its lower-most position, where it shuts off the exhaust from its cylinder and permits a quick recharging of the system, which results in balancing the pressures on the operating piston, permitting the sheave-wheel return spring

to pull the operating piston to its normal position. During this return movement, however, the brake-valve handle is not automatically moved.

In case it is desired to forestall an automatic application, the engineman may do so by holding the plunger of the solenoid magnet in the uppermost position, thus seating the valve and preventing escape of air from the lower chamber of the operating piston in the same manner as though the solenoid magnet had received energy from a ramp.

When forestalling, as above described, is not accomplished just before passing a de-energized ramp, the brake-valve handle will automatically be moved to service application position as stated, and will be held in that position by the operating piston on account of the simultaneous functioning of the positive stop valve. This positive-stop valve is located outside of the cab at a point sufficiently remote therefrom to require the engineman to alight and close it from the ground.

The brake-valve handle may manually be moved to emergency position at any time during an automatic operation.

Our order in *Automatic Train-Control Devices, supra*, provides:

That each installation made pursuant to this order shall, when completed, be subject to inspection by and the approval of the commission or any division thereof to which the matter may be referred.

Accordingly, the purpose of this inspection and test was to determine whether or not the installation was made in accordance with the plans furnished by the carrier and the specifications and requirements of our order.

As a result of this inspection and test, it was found that the installation meets the requirements of the commission's specifications and order in *Automatic Train-Control Devices, supra*, and it, therefore, is approved, except as hereinafter indicated:

1. Pneumatic control valve drawing, D-100-A, December 24, 1924, with forestalling and positive-stop feature, is designed in conformity with mechanical principles, substantially constructed, and is capable, when properly maintained, of functioning as intended. Provision should be made, however, for preventing the possibility of an accumulation of frost or ice from restricting the passageway in the conduit between the control valve and the ramp-shoe housing sufficiently to result in failure on the danger side. The pneumatic control valve, designated as "Reverted to No. 4 valve" on plan dated January 7, 1925, and applied to six locomotives (Nos. 626, 1001, 1009, 1014, 1020, and 1023) is open to such criticism that as at present designed it can not be approved.

Those locomotives, the train-stop equipment of which is not in accordance with plan D-100-A, December 24, 1924, as above, must be equipped in accordance with such plan to warrant approval.

2. To prevent any possible alteration upward of the adjustable height of the ramp contact shoe, a filler block should be placed in each bolting-flange slot between the lower bolt and the lower extremity of the slot.

3. With the ramp-displacement detector which was found to be applied to six ramps, there is a possibility of the line control wire which is looped through the detector becoming grounded, and with the rugged construction of the ramp used in this installation it is believed that such detectors are not necessary.

The Chicago & Eastern Illinois will be expected to comply at once with the following requirements as to inspection, tests, and maintenance:

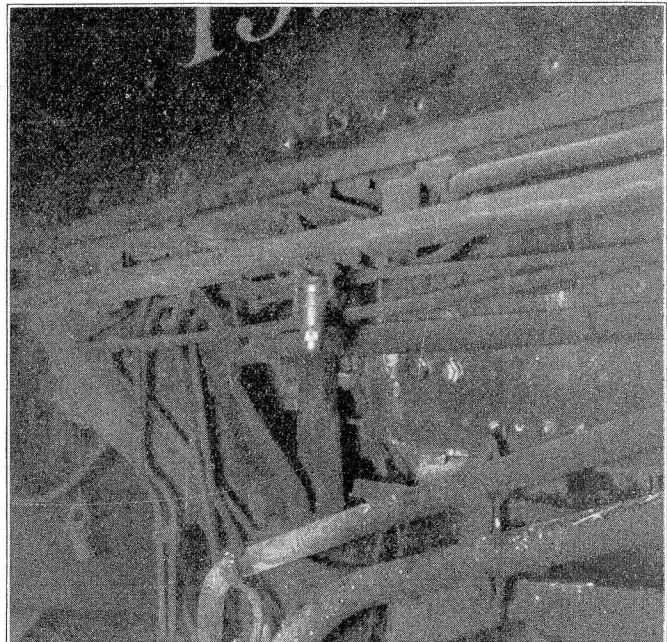
1. Arrangements should be made for careful inspection and test of the train-stop equipment on all locomotives operated in train-stop equipped territory upon arrival at and before departure from designated inspection and repair joints. The inspection and test should include all parts of the apparatus, and before each trip the sealed cut-out valve should be inspected to see that its seal is unbroken and the apparatus properly cut in for service. A daily report as to the condition of the

apparatus should be made on a form provided for that purpose and forwarded by the inspector to a designated officer.

2. The roadside apparatus should be frequently inspected and tested for crosses and grounds and the ramps frequently inspected to insure that they are in proper operative condition; reports thereon being made on a form provided for that purpose and forwarded by the inspected to a designated officer.

3. A form should be provided for and used by each engineman in reporting failures of the apparatus and any irregularities in the operation of the device. All such information should be reported in detail.

Certain situations were noted which, in our opinion, should be corrected by the railway company as a precautionary measure in order to secure a greater degree of safety and to prevent a possible failure properly to protect train operations, in so far as it concerns the signal system upon which the train-control device is superimposed. In the following specific respects the railway



Release Valve Mounted Under Running Board

company should promptly take the necessary action to carry into effect the recommendations made:

1. The interval between a ramp and the signal in advance should be sufficient in all cases to provide adequate braking distance.

2. At crossovers such arrangements should be made as to afford maximum signal protection to main-track traffic.

3. All movements leading to main tracks should be protected through the signal system.

4. For movements at and through interlocking plants ramps should only be energized for high-speed routes.

While these recommendations do not reflect upon the train-control device itself, we feel that as a matter of precaution the carrier's attention should be called to them and it should comply therewith in order that the greatest degree of safety may be insured. The attention of the Chicago & Eastern Illinois officers has been called to these matters.

By the commission, division 1.

[SEAL.]

GEORGE B. MCGINTY,
Secretary.