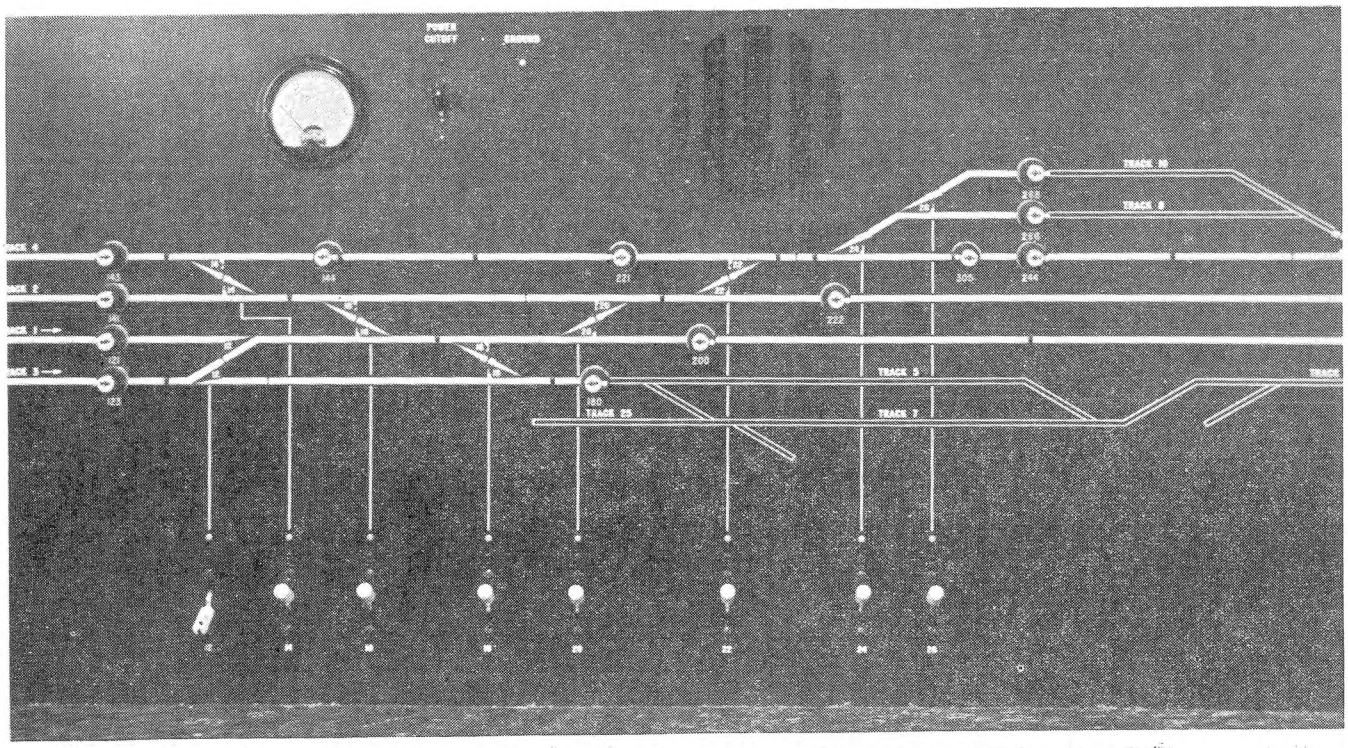


Close-up view of major portion of the panel of the new interlocking control machine

New York Central

Modernizes an Interlocking

All-relay control system installed at plant near Mt. Vernon, N. Y.

THE New York Central recently renewed the interlocking at Mt. Vernon, N. Y., which is on the electrified zone on the Harlem division, 14 miles from Grand Central Terminal in New York City. The old interlocking machine, which had been in service for nearly 38 years, was worn to the extent that it was decided to discard this machine and install an all-relay control system, including a panel-type interlocking machine, as shown in one of the accompanying illustrations. Toggle levers, control the switches and crossovers, and rotating knobs control signals, as will be discussed later.

Mostly Suburban Passenger Traffic

Aside from a few local freights, the traffic through Mt. Vernon consists of suburban passenger business which is handled by multiple-unit cars using 660-volt d-c. propulsion with third-rail power distribution. On week days there are 130 scheduled passenger trains operated through Mt. Vernon and, in addition, a number of freight switching moves.

In the morning, a considerable number of trains start out of the yard at Mt. Vernon and run to New York. Similarly in the evening these trains from New York terminate at Mt. Vernon. From Mt. Vernon eastward toward New York there are four main tracks, as shown in the accompanying diagram. Track 1 is for westward express trains which stop at only certain stations en route. Track 3 is for westward local trains which stop at all stations between New York and Mt. Vernon. Similarly, Track 2 is for eastward express trains, and Track 4 is for eastward local trains.

As shown in the diagram, three main tracks extend west from the Mt. Vernon interlocking. Track No. 6 is used in both directions by certain suburban trains between Mt. Vernon and Fleetwood, which is 1 mile further west. In the morning, certain trains originate at Fleetwood and use Track 6 eastbound to Mt. Vernon. Similarly in the evening, these trains use Track 6 westbound. All other trains which operate in the territory west of Mt. Vernon use Track 1 for westward trains and Track 2 for eastward trains. Thus the track layout at Mt. Vernon is a junction between 4 tracks to the east and three tracks to the west. Also, the interlocking includes connections to the coach yard west and south of the station, as well as connections to the freight house and the house track west and north of the station. The interlocking includes six crossovers and two single switches, as well as 13 home signals.

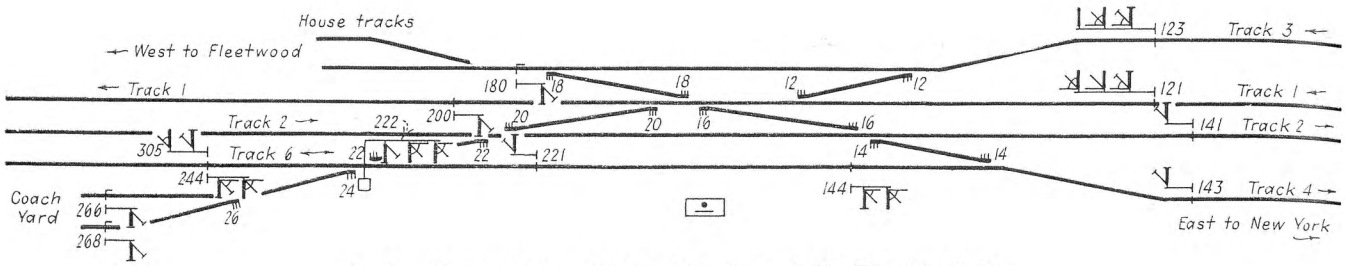
Interlocking Control Machine

The track-occupancy indication lamps in the track diagram on the machine are red and are lighted when

a corresponding section of track is occupied. A transparent button, enclosing a lamp, is located on each of the four sections of the diagram which represent main line normal direction applying to the approach section which has just been occupied, in contrast with others which also are occupied.

On the lines representing the tracks on the diagram, there is a knob at the speed signal. When the corresponding signal clears, a lamp is lighted in the face of the button.

Approach locking is in effect as applying to normal-direction train move-



Track and signal plan of the interlocking at Mt. Vernon, N. Y.

approach sections. When a train enters such a section, a buzzer is sounded in the machine, and a lamp in the corresponding section is flashed 75 times per minute. The leverman can stop the operation of the buzzer by pushing the button, and then the lamp stops flashing but continues to location corresponding with each signal. The outer ring of each knob can be rotated. Inside the outer ring there is a fixed transparent lens with a black arrow which points in the direction which the signal controls. On the rim there is a white dot which normally is positioned at the base of the arments on the main tracks. The releases are set in operation automatically. Time-locking, set at 15 seconds, is in effect for all dwarf signals. The time-element relays are of the d-c. motor-driven type.

On the control panel there is a small toggle-type lever for the control

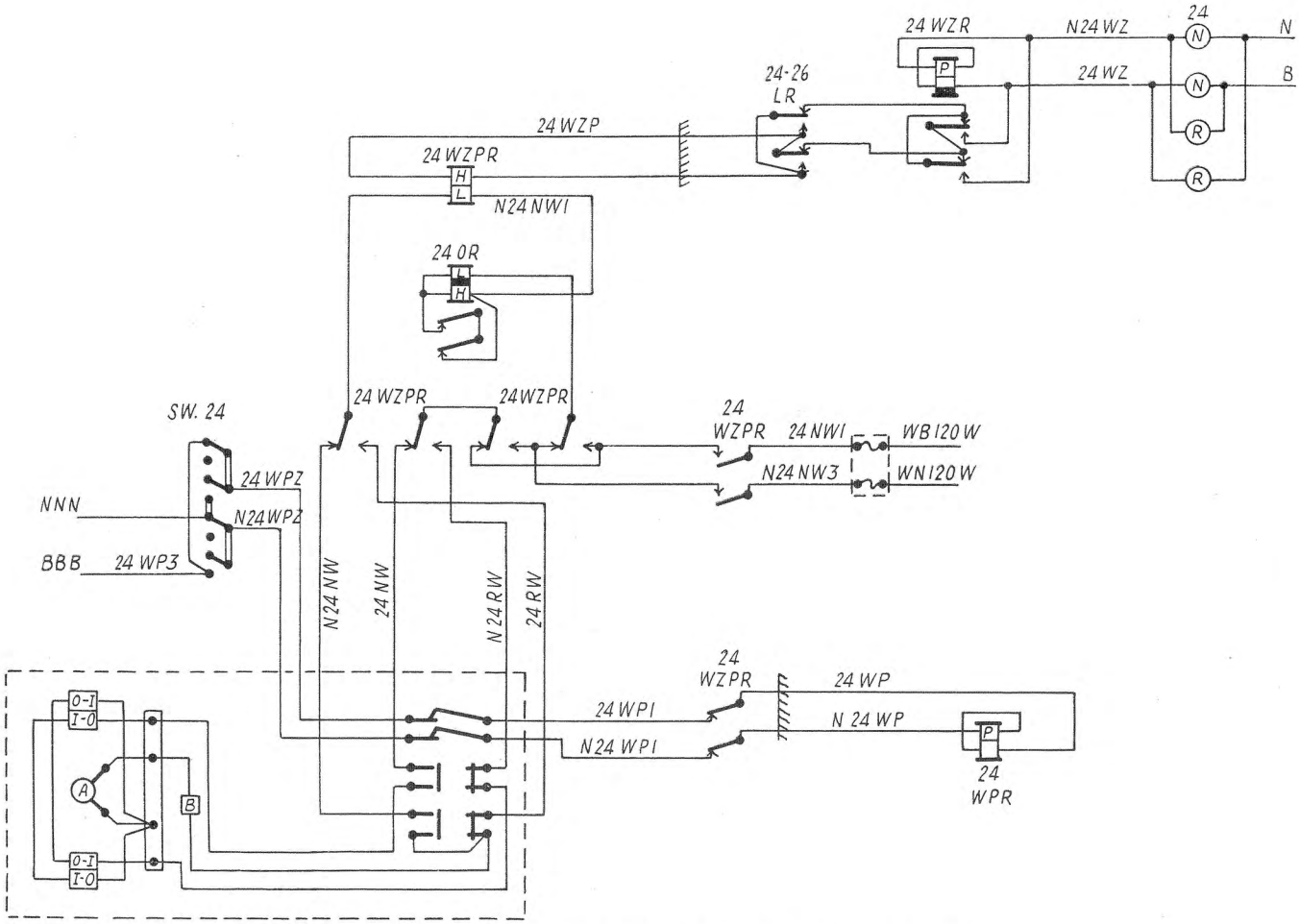


Diagram of the control and operating circuits for a typical switch

burn steadily until the train departs from that section. The objective of this operation of the annunciator is to provide a distinctive difference, as row over the "track." The rim of the knob is rotated 90 degrees upward to control a high-speed signal, or 90 degrees downward to control a restricted-

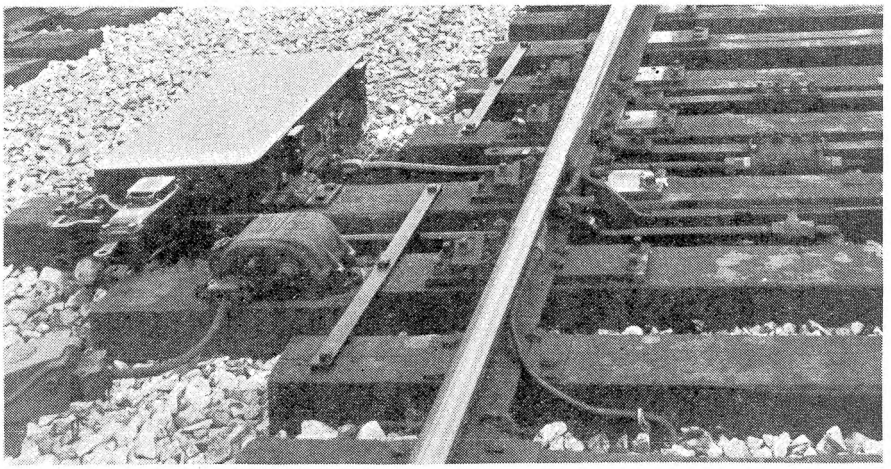
of each single switch or crossover. These levers are in a row near the lower portion of the panel, each lever being located under the symbol for

the switch which it controls, and a white line extends from the lever to the corresponding switch so that the leverman can be certain that he is operating the proper lever. These levers are normally in the lowered position, being swung upward to the raised position to control a switch to the reversed position. In the track diagram, there are small triangular sections which are operated when a corresponding switch lever is thrown, so that the track line up, shown as a white stripe ¼-in. wide, extends through the switches.

Above each lever there are two small indication lamps. The upper lamp which is white, is lighted at any time when the corresponding switch is not over and locked in the position corresponding with that of the lever. This is known as the out-of-correspondence lamp. The second switch lever indication lamp is red and is lighted whenever the electric locking is in effect to prevent the switch from operating, even if the lever were thrown. The circuits are so designed that operation of a switch lever while the locking is in effect will not result in operation of the switch after the locking is released. In order for the switch to be operated, the lever must first be returned to the position where it was before the electric looking went into effect.

Features of Switch Circuit

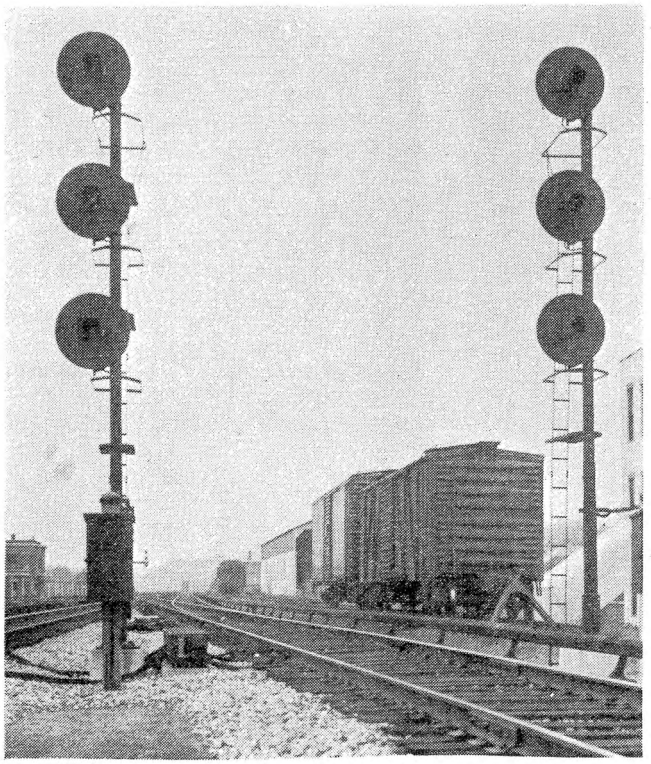
A typical circuit for the control of single switch No. 24 is shown in Fig. 2. Normally the lever repeater relay 24WZR is energized by a circuit through the N lever contacts. When the lever is thrown to the reverse position, the polarity is reversed in the coil of relay 24WZR. This causes the contacts to be released, and the back contacts stay closed for a second or more because of the slow pick up characteristics of the relay. During this interval, a circuit is complete from the low-voltage battery N, through the R lever contacts, the back contacts of 24WZR, front contacts of lock relay 24-26LR, and through the high resistance coil of repeater relay WZPR. The feed to this circuit is in effect only during the slow pick up of 24WZR, but this interval is of sufficient duration to close the front contacts of 24WZPR, and to operate the polar contacts of this relay to the reverse position. This completes circuits to feed the switch machine motor to operate the switch.



Switch machine with circuit controller for point detector on the tie

A point of importance is that if electric locking had been in effect, then lock relay 24-26 would have been released so that the circuit for the H coil of relay 24WZPR would not have been complete during the brief interval when energy was being fed through the back contacts of relay 24WZR. For this reason, switch control cannot be stored as a result of operation of a switch lever while electric locking is in effect.

Returning now to a discussion of the operation of the switch, the L coil of relay 24WZPR is in series with the motor so that, as soon as the feed to the motor is complete, the L coil of relay 24WZPR holds this relay in the energized position although the circuit from the lever through the H coil is opened when relay 24WZR picks up. On this account also, a switch when once started will continue its operation to the opposite position regardless of operation of the switch lever, even if the circuit from the lever to the H coil of relay 24WZPR is complete. This is true because the magnetic effect of the H coil is not strong enough to overcome the effect of the L coil. When the switch is operated to the reverse position, contacts in the controller open the circuit for relay 24WZPR so that it is released.



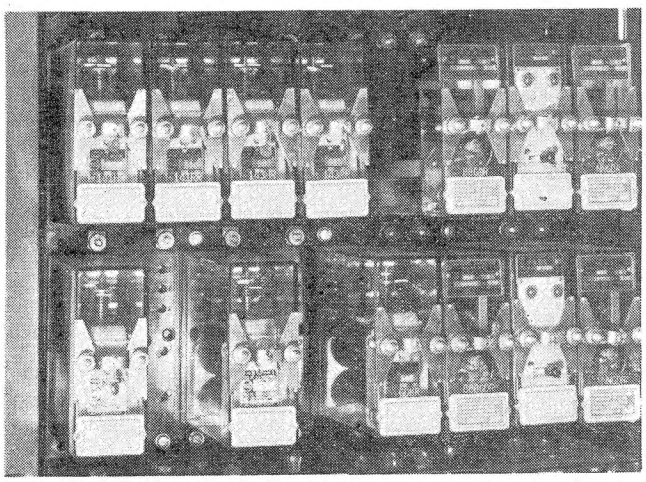
View looking west showing home signals 121 and 123

Signals and Switch Machines

The three home signals for normal direction moves on main tracks are high signals; these are signals No. 123, 121 and 222. The remaining 10 home signals are dwarfs. All these signals are Type-SA searchlights, operating on 10-volt d-c. These signals were installed several years ago to replace old semaphore signals which had been installed as a part of the original interlocking.

The switch machines are the Model

4A, operated by 110-volt d-c. motors. Most all of these machines have been in service at this plant for approximately 25 years or more. Repairs had been made from time to time, so that these machines are in good operating condition. When changing over from the old Model-2 lever-type interlocking machine to the all-relay control, certain changes were required in the switch machines. The previous dynamic indication feature served also as a buffing brake action, and in view of the fact that this feature was not to be included in the new all-relay system, the switch machines had to be equipped with magnetic disc brakes which are automatically released by coils in series with the motor. The old pole-changers operated by solenoids were replaced by new circuit controllers which are operated mechanically by the lock rod plunger. A Model-7 switch circuit controller on the tie serves as a point detector. The field coils were changed. In these machines, the current is always in the same direction through the armature. Two sets of field coils are provided, the motor being operated in one direction or the other by energizing one or the other of the two sets of field coils.

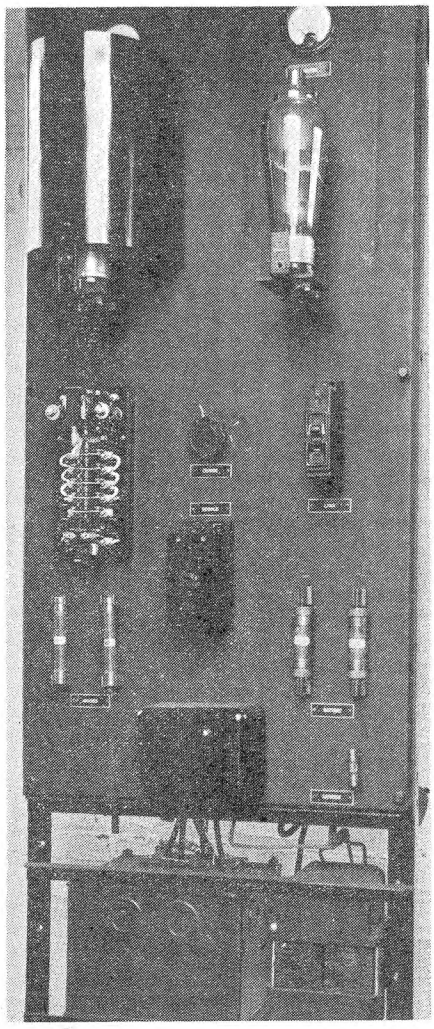


A small portion of rack showing the plug-in type of relays

Telephone Aids Maintainer

A telephone circuit which extends from the tower is connected to a jack in each switch machine. The maintainer has a pocket-type telephone set which he can plug in at any switch machine as well as at certain other locations on the plant. At the tower, the telephone circuit is connected to a loud speaker so that no ringing equipment is required on the maintainer's set. If the leverman wants to call the maintainer he can do so by pushing a button on the control panel which causes Klaxon horns to be sounded at each end of the plant layout.

Previously the relays were in boxes along the south side of the track, west of the tower. The ground floor of the tower was used as a furnace room and as the maintainer's headquarters. As a part of the change-over, electric heating units rated at 660 volts 68.5 watts were installed at various locations to heat the building, thus dispensing with the heating plant. By making this change, the ground story was available for housing the relays, and the former coal bin was converted to a maintainer's office.



The cover has been removed from the Phanatron tube at the right

The old interlocking and control circuits were kept in service until the new machine and controls were complete. The new machine was set up at the west end of the old machine. The old relays and wiring remained in service while the new relays and circuits were installed in the room on the ground floor of the tower. At 1 a.m. on a given Sunday morning, the change-over from the old machine to the new machine and circuits was made in a few minutes by cutting a few jumpers and making changes in a few connections. This change was completed between train movements, so that no train was stopped or delayed. The relays now in service are the plug-in type on racks, as shown in one of the illustrations. After the new control system was in service, the relays formerly used were removed.

Wiring Distribution

The change in interlocking machines and control circuits required certain changes in the cable distribution over the plant, but the old cables were in need of replacement so that these changes were to a large extent handled as maintenance. In the new arrangement the 110-volt d-c. distribution to the switch machines is on No. 6 wire. The control circuits are on No. 14 wire. Much of this cable was previously in service.

As shown in one of the accompanying illustrations, the cables from the tower to the various instrument cases and junction boxes is run above ground, being of the aerial-type cable supported by means of cable straps from ⅜-in. galvanized messengers on concrete cable posts. As a protective covering, Collins cable coating was applied to the cables after they were in place. The runs between the boxes and the signals or switch machines are in underground cable, but most all of these cables were in service prior to the recent changes.

No Change In Power Supply

On account of the d-c. propulsion in this territory, the track circuits are of the a-c. type, and the change-over to the all-relay control machine did not require any changes in these track circuits. On the main tracks, the track circuits are of the two-rail type, but in the yard tracks, single-rail circuits are used as a means for reducing the number of insulated rail joints and impedance bonds.

The various control relays, lock relays and searchlight signal mechanisms are all operated from 10-volt

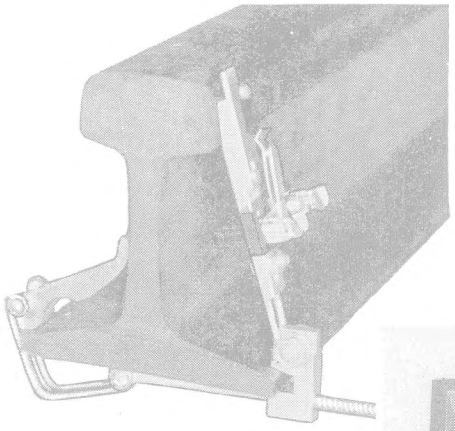
(Continued on page 687)

the side of the head of the rail, is adjustable to fit rails of various height.

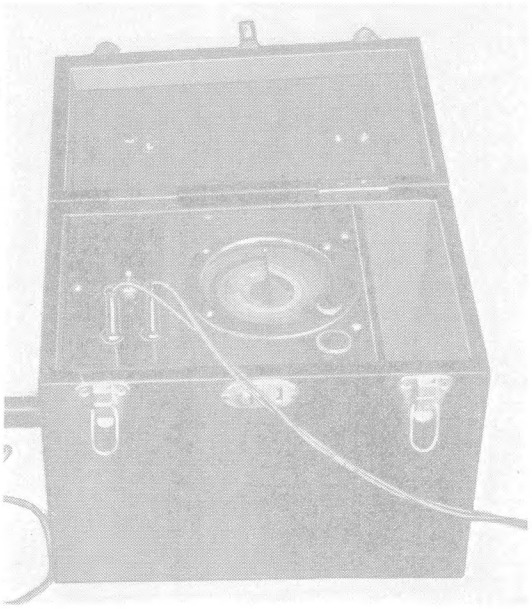
Using the thumb and forefinger, the operative member of the contactor is lifted to the raised position which is about 3/16 in. above the level of the top of the rail. When the first wheel of the locomotive passes, this raised section of the contactor is pushed down and stays down until it is again pulled up by the operator when starting another test. By means of plug connected flexible cables, the contacts in the two contactors are connected in series with battery and the coil of the clutch in the timer. The contact in the "start" contactor is arranged to close the circuit when the wheel passes, and this starts the operation of the pointers on the dial. Then the circuit is opened when the wheel passes the second contactor, thus stopping the movement of the pointers.

Reels of light-weight metal are provided to wind up the cables used between the timer and the rail contactors. The battery case has two extra compartments, one for the reel with the 88-ft. cable and the other for the rail contactors. The timer case has a compartment for the 25-ft. cable to be used between the timer and the first rail contactor. The case is made of quarter-sawed oak, 8 in. by 10 in. by 12 in., complete with carrying handle and locks, and weighs 19 lb. The battery case is 8½ in. by 9 in. by 15½ in. and weighs 34 lb.

This explanation above applies to a timer for use on one track only. If the speed of trains on two tracks is to be measured without changing the rail contactors, a two-track outfit can be furnished. This set includes a second set of two rail contactors and extra reels of wire, and on the panel of the timer there is a toggle switch to select between the connections for the two tracks.



Above—A contactor is attached to base of the rail by a clamp



Right—The timer is mounted in a case with the converter

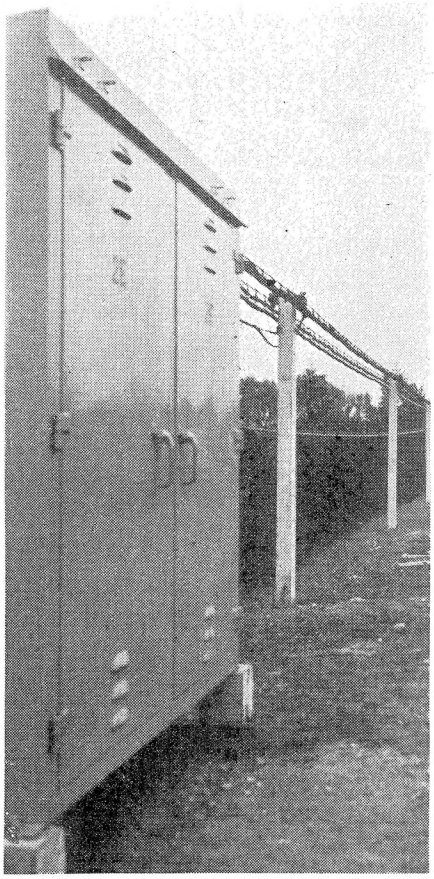
Request Your Index Now

In the past, a printed index, for the 12 monthly issues of *Railway Signaling* for the preceding year has been mailed with every January issue. In order to comply with the suggestions of the War Production Board in reducing the paper consumed and thereby aid in the war program, only a limited number of indexes will be printed this year. The proposal is to furnish an index to every reader who will have use for it to bind in with the issues for the year, or as an aid when looking for certain articles. The important difference with the past practice is that if you want an index for 1944, please send us a request before December 25, so that we will know the total number of copies to print. Please send your request to H. E. McCandless, Subscription Manager, *Railway Signaling*, 30 Church Street, New York 7, N. Y.

N.Y.C. Interlocking

(Continued from page 678)

d-c. which is supplied from rectifiers. These rectifiers are the Type-BPA, size 248, rated at 16 volts, 4.5 amp. output. No battery standby is necessary for these circuits because, if the power supply fails, no trains could be operated by the electric propulsion system. Therefore, no delays would be occasioned by the interlocking being out of service.



Aerial cable on concrete posts

The 110-volt d-c. for the operation of the switch machines is fed from a set of 56 cells of Exide Type EM-5 lead storage batteries, rated at 80 a.h. These batteries are on floating charge of 150 m.a. from a set of two Phanatron tubes operating in full wave. Each tube has an average rating of 6.4 amp., or a total of 12.8 amp. for both tubes. Material for the power supply was furnished by the General Electric Company, and the board was wired by the maintenance force. This 110-volt battery and new charging equipment were in service prior to the change-over to all-relay control.

The renewal of this interlocking was planned and performed by signal forces of the New York Central, the panel-type control machine being furnished by the General Railway Signal Company.