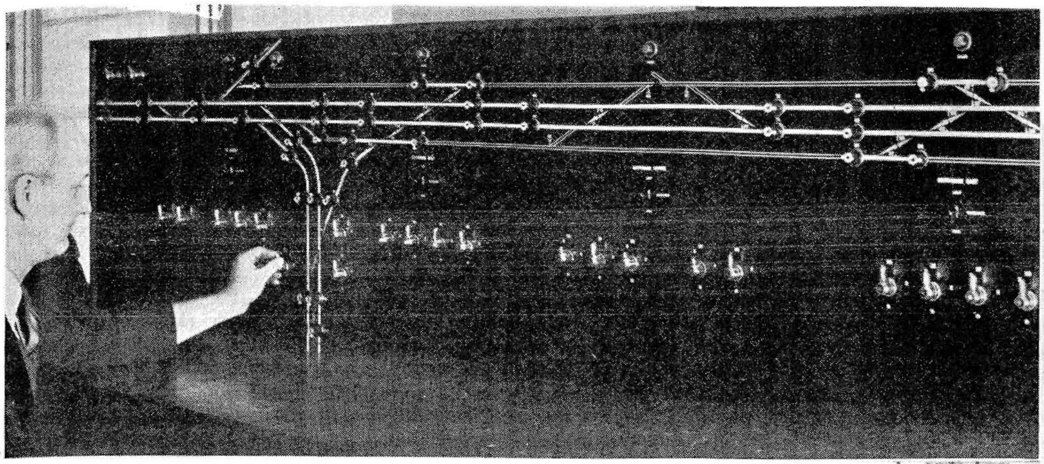
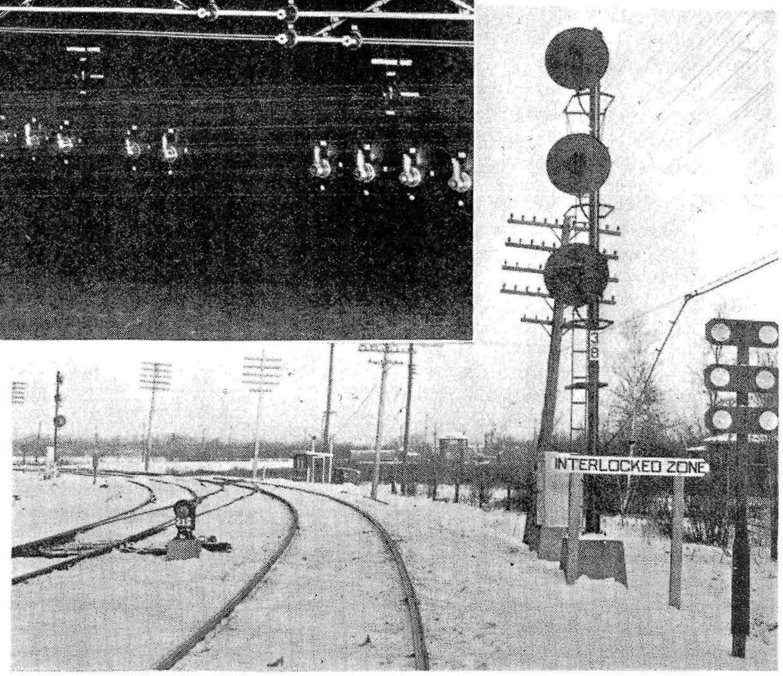
Left—Control machine. Below—Signals 36-38 and crossover 37 location, looking north toward the tower





New installation increases the flexibility of operations, minimizes train delays, improves utilization of tracks, provides for either-direction train operation, and promotes efficient coordination of many train movements

Canadian National Installs a Large All-Relay Electric Interlocking

At St. Lambert, Que., the Canadian National has installed a new all-relay electric interlocking which not only replaces a Model-2 electric interlocking installed in 1913, but also includes a more extensive track layout, and provides for either-direction train operation on each main track. The previous Model-2 interlocking machine, with conventional mechanical locking between levers, and with electric lever locks, had 41 working levers. This plant included Model-2 electric switch machines, Model-2A semaphore high signals and solenoid type dwarfs. The track layout included an eastbound-to-westbound crossover at the St. Lambert station, two switches on the Sorel branch, one on the west end of the south siding, and the switches at the three ends of the wye, as well as signals at these various locations. The signaling was arranged primarily for right-hand running on the double track. The operation of trains on the double track over the Victoria Bridge between St. Lambert and Montreal was right-hand running with automatic signal protection.

Because of the greatly increased number of train movements, and as a part of a terminal improvement program being carried out in this area, various changes and additions were required in the interlocking at St. Lambert. Crossover 1 was added to the interlocking in order to facilitate either-direction train operations on the two main tracks. Switch 9 with derail on the line to Sorel, which was formerly operated by hand-throw stand, was equipped with a switch machine. A new interlocked crossover, 37, was added at the south end of the wye, and the east leg of the wye was changed from double track to single track. At Southwark West, three new interlocked crossovers, 45, 47 and 49 were added as a means for facilitating train movement into and out of the yard, as well as to assist in making run around train movements. This arrangement of crossovers and switch 43, together with the signals, form the Southwark West portion of the new plant.

At Southwark Centre, crossover 61 had previously been operated by hand-throw stands. As a part of the improvement program, crossover 69 was added and it and 61, both between the two main tracks, were equipped with switch machines. Electric locks were installed at the west end of 59, at the east end of 63 and the west end of 67. This layout, including the signals, forms the Southwark Centre portion of the new interlocking.

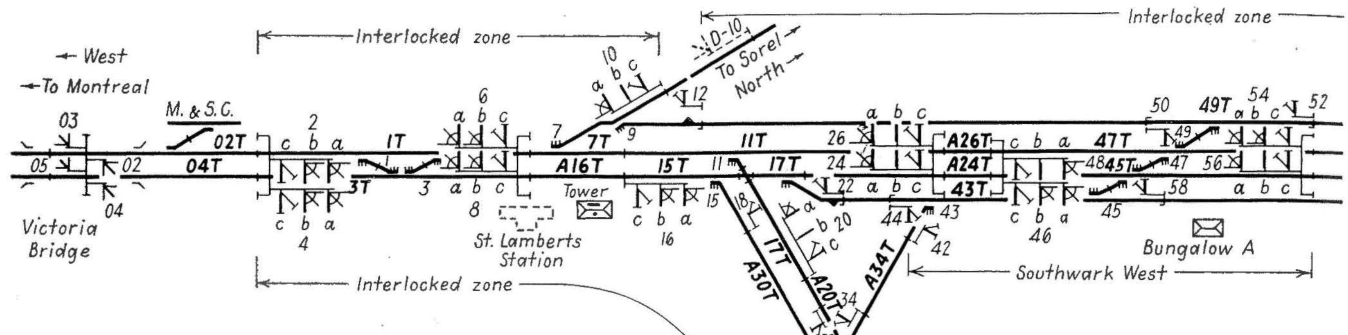
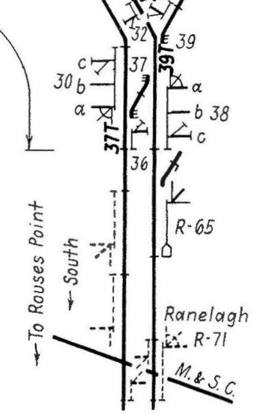
At Southwark East, a few changes were made in the track layout and the crossovers as shown, which had formerly been on hand-throw, were equipped with electric switch machines and interlocking signals were installed, this layout forming the Southwark East portion of the new interlocking. About 0.6 mile east of Southwark East, a crossover from the south siding to the main line existed. Here, a switch lock (95) was added, also controlled from the tower.

Thus the limits of the new plant extend from Victoria Bridge on the west to the east end of Southwark East, including 12 power-operated crossovers, 7 power-operated single switches, 4 electric locks on hand-throw switches, 23 three-"arm" high signals and 15 dwarfs and 4 one-arm approach signals. An important feature is that high signals are provided for either-direction train operation on all main tracks. Also, traffic-locking circuits are provided between the St. Lambert interlocking and another tower in Montreal, by means of which train movements are made by signal indication in either direction on both tracks over the Victoria Bridge. Thus the new interlocking, not only includes more switches and crossovers but also the either-direction train operation increases the flexibility of operations and increases the utilization of tracks, thereby minimizing delays to trains. By controlling the entire St. Lambert area from one machine, the train movements can be coordinated efficiently. As many as 135 trains including 34 scheduled passenger trains are handled through this new interlocking daily.

With the new interlocking, when yards cannot accept incoming trains, they can be held out at points best suited to the movement of other traffic. Then when the trains can be accepted, they can be directed to move by signal indication without delay in contacting the engine or train crews. The power-operated main line crossovers for trains moving to or from the Southwark yard facilitate movements, especially for tonnage trains.

New 110-volt d-c. switch machines were installed throughout the plant. The 19 switch machines located in the general vicinity of the tower and at Southwark West are the Model 5C, and the 12 remaining switch machines at Southwark Centre and Southwark East are the Model 5D with dual control. The four electric locks on hand-throw switches are the Model 9A, each having a pipe-connected facing-point lock extended to the far end of the crossover on which the lock is installed.

The operative signals are the d-c. searchlight Type SAs with quick-detachable plug connected mechanisms. The fixed "arms" on the high signals are Type W units with red lenses. All signals are located either on masts at the right of the track governed or on overhead bridges with each signal above the right-hand rail of the track governed. An interesting item, with reference to conservation of materials, is that the signal bridges on this interlocking were constructed with steel which was reclaimed from railroad bridges which had been dismantled recently.

Track diagram showing interlocked zones, important crossovers, and the position of switches and signals.

New Tower and Interlocking Machine

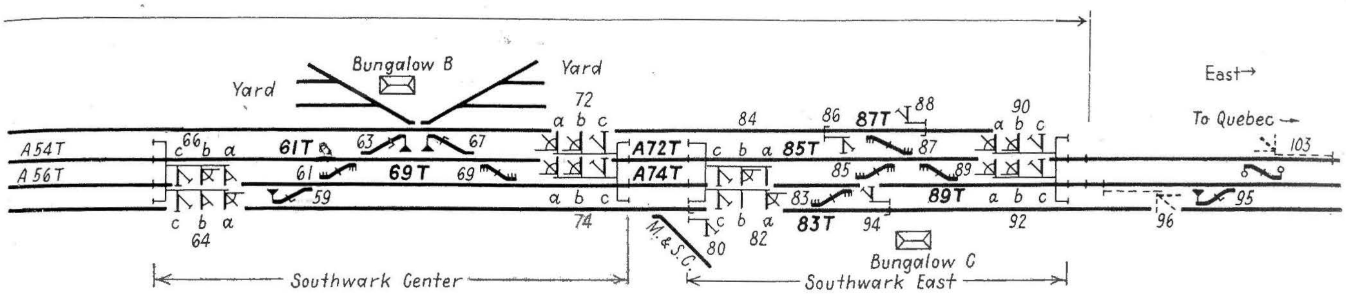
The old frame tower was abandoned, and a new two-story fireproof concrete tower was constructed south of the tracks and just east of the St. Lambert station. The upper floor of the tower, including the control machine, is the operating room. The ground floor is divided into two rooms, one for housing the relays and the 110-volt switch battery, and the other for maintainer's headquarters.

The new interlocking machine is a floor model with a vertical operating panel surmounting a desk shelf and at a height convenient to operate either from a standing position or sitting on a stool. The desk shelf includes drawers for storing stationery and for filing records. The panel of the new control machine is 22 in. high and 96 in. long. The diagram on the panel has solid white lines, 3/16 in. wide to represent the track circuited tracks, and two light lines to represent non-track circuited tracks, yard leads or holding tracks. Track occupancy is indicated by normally extinguished red lamps in the lines representing the tracks.

In the track diagram, movable points represent the switches and crossovers, these indicators being operated so that a solid white line, representing the track, continues through the switch locations in correspondence with the route lined up. These indicators are operated electrically, and repeat a true indication of the corresponding switches.

The switch levers are of the miniature type and are mounted in a row on the panel below the track diagram, each lever being approximately directly below the symbol for the corresponding switch on the diagram. As applying to the south leg of the wye, the switch levers are to the right of the corresponding portion of the diagram. The levers which control the electric locks on the hand-throw switches are similar to the switch levers, except that the lock levers have shorter handles.

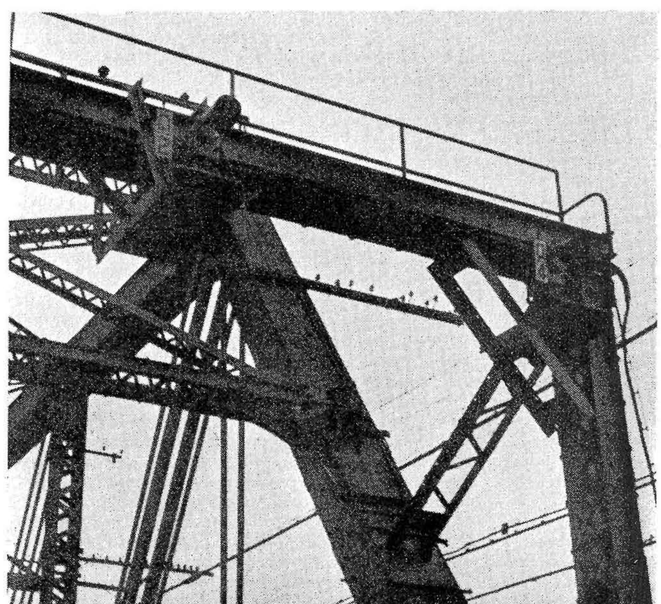
The switch levers stand normally with the handle pointing up, and are thrown 90 deg. to the right to control the corresponding switch or crossover to the reverse position. The hub of each switch lever is hollow, and encloses a lamp which is lighted to display a red indication when the corresponding switch is locked, because of track occupancy, the clearing of a signal, or when time locking is in effect. In other words, when the red lamp is lighted, nothing would be accomplished by throwing the lever. A small indication lamp is located in the face of the panel below each switch lever. This lamp is lighted white whenever the position of the lever does not correspond with the position of its switch or crossover. The lamp is extinguished as soon as the switch or crossover has operated to and been locked in the position called for by the position of the lever.



Each high signal is controlled by a combination knob and button which is located on the diagram on the "track" and at the place corresponding with the location of the signal controlled. The knob as a whole can be pushed or pulled to effect certain controls, or the outer rim can be rotated to effect other controls as will be explained later. The inside barrel of the knob does not rotate. The lens of the face of this barrel has a dark colored arrow which points in the direction which the signal controls. Behind the barrel are two independently controlled lamps, which are normally extinguished.

Having previously positioned the switches for a given track line up, the top or middle arm of a high signal can be cleared by pushing the knob corresponding to the signal to be controlled. When a train accepts and passes the signal, it is controlled to the Stop aspect, with stick control, and no further action is required on the part of the leverman. If a signal has been cleared by push operation of the knob as explained above, and the proceed aspect is to be taken away without the passage of a train, the knob is pulled.

To clear the call-on, which is the bottom arm of a high signal, the corresponding knob is rotated 90 deg. to bring the white marker on the edge of the knob to a position opposite the engraved signal number on the panel. Knobs for eastward signals rotate counterclockwise to clear a signal, and knobs for westward signals rotate clockwise to clear signals. When a signal has been cleared by rotating its knob, the knob must be restored to its normal position after the train has accepted and passed the signal, because the call-on aspects are not controlled by track occupancy. Knobs controlling dwarf signals are arranged to rotate only and the manipulation for clearing such signals, or for restoring them to stop, is the same as described for call-on signals.



Type SA dwarf signals bridge-mounted on Victoria Bridge

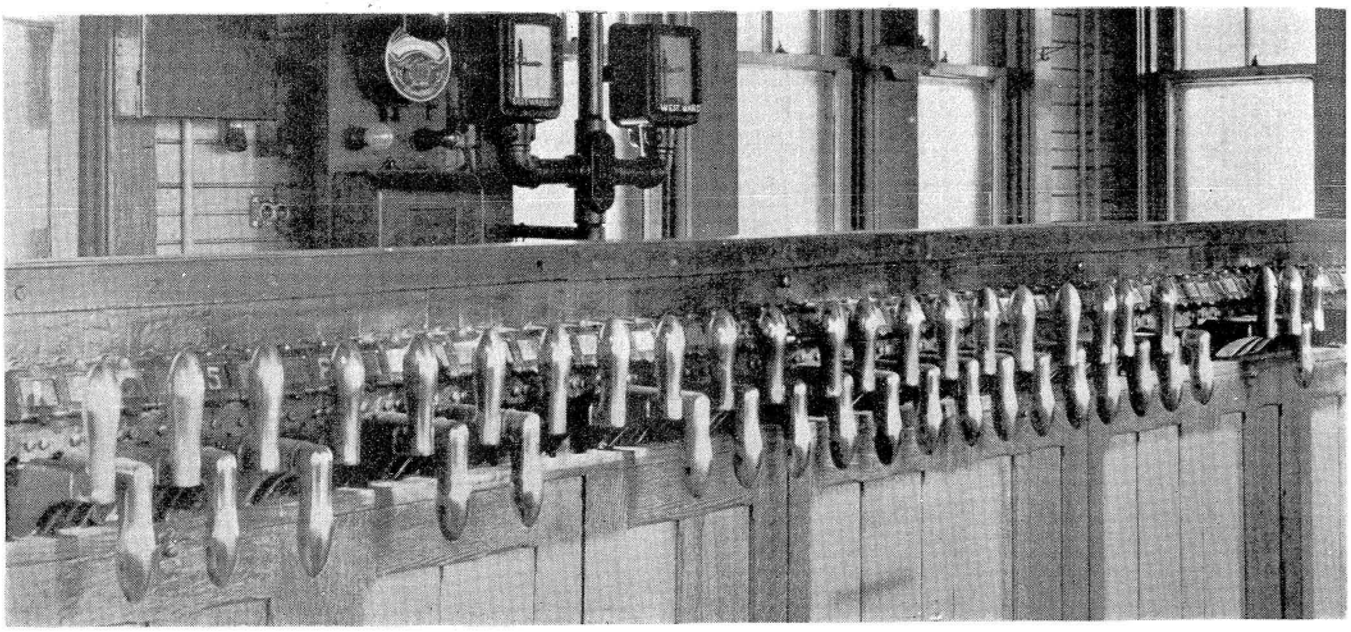
As previously mentioned, there is a dark colored normally non-illuminated arrow on the face of the center of each signal control knob. When a knob is manipulated with the intent of clearing a signal for a route having all switches properly positioned, and no opposing signal clear, a red light inside the barrel illuminates the arrow. When the signal clears, the red light is extinguished, and a green light illuminates the arrow.

Similar knobs are used for the control of traffic-direction locking for controlling signals to authorize train movements by signal indication in either direction on both tracks over the Victoria Bridge between St. Lambert and Montreal. In these traffic locking knobs, the arrow rotates with the knob to indicate the direction in which trains are to move, and when traffic direction has been established, the face of the knob is illuminated as a blue background around a white arrow. Only one lamp is used in each of these traffic direction knobs.

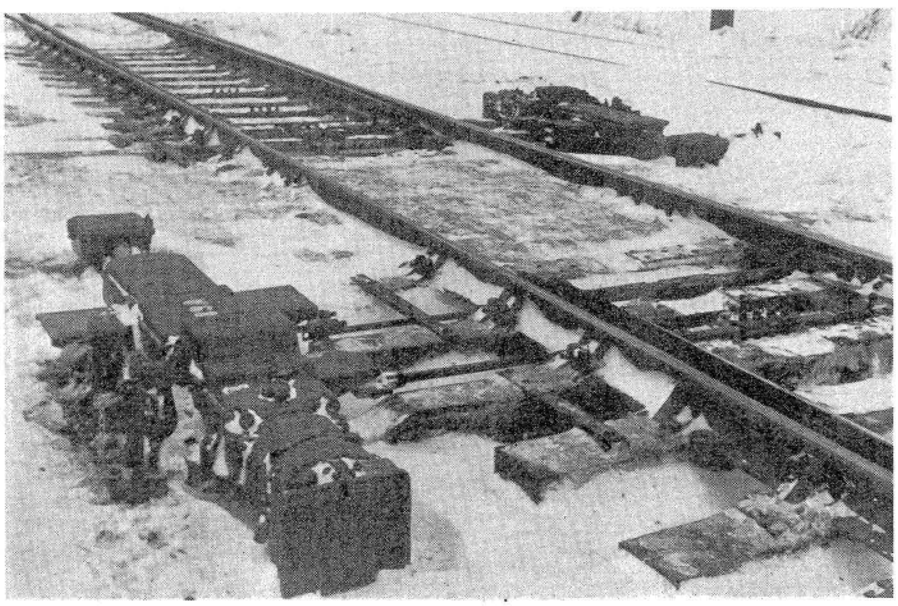
The crossing of the M. & S. C. R. R. with the Canadian National at Ranelagh, south of St. Lambert, is protected by an interlocking which is controlled automatically, except that, by means of a knob on the panel, the operator at St. Lambert can hold the northward signal (R-71), at Ranelagh at the Stop aspect. This feature was provided so that inbound freight trains can be held at Ranelagh where they are clear of other trains as well as street crossings, and also at that location the trains are on a slight down grade where they can be started easily.

Two rotary type levers are located in the upper left corner of the panel. One of these is used to vary the brilliancy of the indication lamps on the control panel, being set for "Bright" during sunlight hours, or on "Dim" during darkness or dull days, thus obviating eye strain for the operator. The other lever controls the brilliancy of the signal lamps, "Bright" for daytime, and "Dim" for hours of darkness.

There is a dead section of track through the diamond crossing where the east track of the west leg of the wye crosses the normally eastbound main track. A trap circuit provides protection for this dead section. If, on account of some unusual operation, the trap circuit is locked out, the plant would be tied up. In such an instance, the operator can look out the window and make sure that the dead section is not occupied. Then, after breaking a seal, he can operate a special pushbutton on the panel that will cause the trap circuit to be restored to normal.



The Model 2 interlocker which has been removed from service



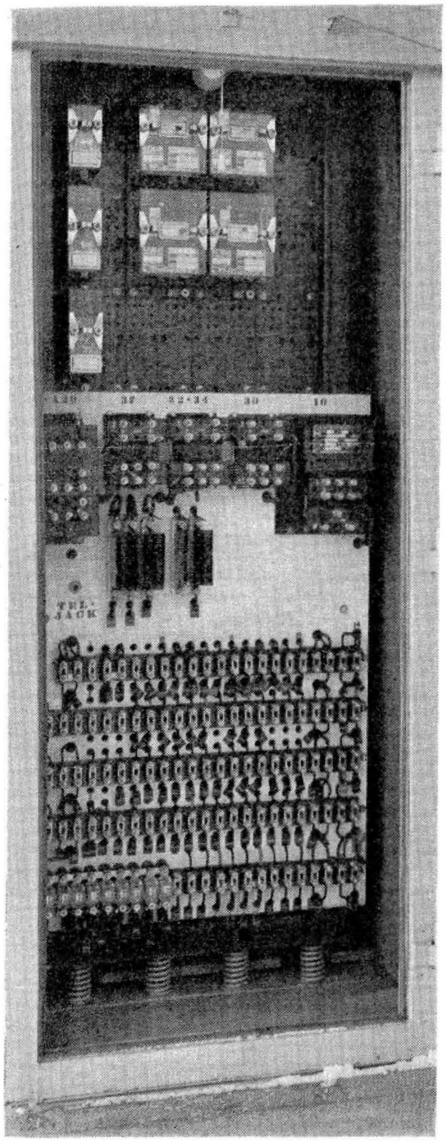
Model 5D switch machines, equipped with outboard brakes

On account of the extended area of the plant, a means for calling the maintainer was desirable. Across the control panel and immediately below the track diagram there are four little switches each of which controls a maintainer's call lamp and horn at four corresponding locations on the plant area. Normally these switches stand in the center position. When a switch is pushed to the down position and held, then at the corresponding field location a horn is sounded. When placed in the up position, where it may be left until the maintainer answers the call, an amber colored light will be displayed at the corresponding field location. The maintainer carries a portable telephone, which he can plug in at any field location to talk with the operator, a special circuit being provided for this purpose.

Power Off Indications and Controls

The track circuits throughout the interlocking are of the alternating current type, which means that, if the a-c. power fails then no switch can be operated, and no signal indication can be given, on account of a-c. lighting. Above the track diagram on the panel there are four buttons marked "POWER," each being located in a position corresponding to (1) the tower, (2) Southwark West, (3) Southwark Centre, and (4) Southwark East. A lamp is provided behind each button. Normally these lamps are extinguished, but if the a-c. power fails at any of these locations, the lamp in the corresponding button is lighted red. At the same time all track lights and lock lights for the area affected will be lighted and no switches can be moved.

When the a-c. source again becomes energized, the track circuits will automatically become energized as will signal and switch repeater circuits and any call-on or dwarf signals previously cleared will again clear. In the case of high signals, it would be necessary to repeat the manipulation of the knob to again clear them. However, as a safety feature, a contact in a power-off relay is incorporated in the source of energy for the local switch locking circuits which will prevent the lock relays from picking up until such time as the operator pushes the "POWER" button on the control panel and then awaits a predetermined time interval, introduced by a thermal time element relay in the field. This prevents the possibility of a momentary power outage occurring at the time of a train approaching a signal from releasing the route locking and subsequently permitting the possible throwing of a switch in front of a train without the necessary time delay being introduced the same as required in conventional approach locking.



Relay housing with spring-mounted B relay rack

By placing the restoration of normal operation under the control of the operator, he is kept alert and informed of any abnormal conditions arising in the field.

Quick-Detachable Plug-In Relays

In the tower, one room on the ground floor is assigned for housing the relays, battery, rectifiers, etc. At each of the field location areas, Southwark West, Southwark Centre, and Southwark East, there is an 8-ft. by 10-ft. welded sheet metal house. Welded sheet metal cases are located at various signals and other points on the plant area.

The track relays are the double-element vane type, and the remainder of the relays are the d-c. 10-volt type. All of the relays are the quick-detachable plug-in type. Plugs, protruding from the molded bakelite plugboards fit into receptacle contacts on the rear of the relays. Each of the racks supporting the plugboards is 24 in. wide, thus affording space in a horizontal row for four relays of the B-2 type or eight relays of the B-1 type. Eight such horizontal panel rows, and two groups of terminal boards, one at the top and the other at the bottom are bolted to channel iron uprights, the whole of which constitutes a rack, which is about 8 ft. high. This same type of construction for mounting the relays is used in the tower and in the outlying sheet-metal houses as well as in the separate cases. Each rack in bungalows and cases is mounted on springs to absorb vibration which may be caused by passing trains. The racks were assembled and wired in the factory, so that insofar as these racks are concerned, the only wiring required in the field was to run the incoming cables and attach the wires to terminals or arrestors mounted on terminal racks separate from the relay racks.

Features of the Route-Selection Network Circuits

The circuits at this St. Lambert interlocking are conventional except that the route selection networks include several novel and interesting features. By properly arranging the networks, and taking advantage of the large number of contacts available in the Type-B plug-in relays, it was practicable to locate all of the networks entirely within the tower. An advantage is to minimize the number of control and indication wires between the tower and the remote points, and also the localizing of such selections in the tower facilitates inspections and maintenance.

Typical route-relay and signal control circuits are shown in the accompanying diagrams Fig. 1 and Fig. 2. A special operating feature is that all the switches in a proposed track line-up must be over and locked in position for the route desired, as indicated by the movable-point indicators and correspondence lamps

Relays—Name, and Use

GZ	=Signal Control Relay	Controls operation of signal
CGZ	=Call-on Signal Control Relay	Controls operation of call-on signal
RR	=Route Relay	Prevents setting up opposing routes
NWC	=Normal Switch Correspondence Relay	Checks switch control relay and switch repeater in normal position
RWC	=Reserve Switch Correspondence Relay	Checks switch control relay and switch repeater in reverse position
TP	=Track Relay-Repeater	Repeats position of T relay
RP	=Red Signal Repeater	Repeats red position of signal
LR	=Lock Relay	Electrically locks operation of switch machine
TES	=Time Element Stick Relay	Provides time or approach locking
CTES	=Call-on Time Element Stick Relay	Provides time or approach locking with call-on signals
ES	=East Route Stick Relay	Provides release route locking for east-bound moves
WS	=West Route Stick Relay	Provides release route locking for west-bound moves
YGP	=Yellow-Green Signal Repeater	Repeats yellow and green position of signal
M	=Home & Distant Signal Repeater	Repeats home signal at red and distant at red and yellow
RK	=Red Signal Indication Relay	Repeats red position of opposing signals at remote locations
WP	=Switch Repeater	Repeats position of switch machine
WCP	=Switch Correspondence Repeater	Repeats position of NWC and RWC relays
WZZ	=Switch Control Relay	Controls operation of switch machine
LP	=Lock Relay Repeater	Repeats position of lock relay

Key to symbols used on page 361

below the levers, before the operation of a signal knob will be effective. The method of attaining this objective will be evident from the following discussion.

Network for Remote Locations

The circuits shown in Fig. 1 apply with reference to a signal knob associated with a signal which is remote from the tower; for example, signal 90 at Southwark East is the most easterly interlocking home signal, and signal 84 is the opposing signal. Push operation of signal knob 90 closes a contact which completes a circuit starting with battery NL, through the push contact, through a front of 85TPP, the coils of 90GZ, back 1 of 90RR, front 1 of 84-90RK, normal polar and front neutral of 89WCP, front neutral and normal polar of 87WCP, front neutral and normal polar of 85WCP, the coils of 84RR, back 3 of 84GZ, back 1 of 59RR and/or neutral front and normal polar of 61WCP, back 1 of 72RR, through the closed N contact of 84 knob and to battery BL. This energizes relays 90GZ and 84RR in series. Relay 90GZ sticks up through its own front contacts so that it is not released when the operator removes his finger from the knob and it springs back to its normal position. Then circuits are closed to energize relay 90RR in series with 84RR. Battery BL now feeds through front 3 of 90RR, front 4 of 90GZ to energize 90GZP with the polar contacts to the left. In the meantime lock relays 89LR, 87LR and 85LR have been released, thus completing the circuit to energize the operating coil of searchlight signal unit signal 90A, which causes a Proceed aspect to be displayed.

If the track line up had included crossover 85 reversed, then relay 85WCP would be reversed and the GZ-RR network would have been completed through 82RR, the opposing signal route relay with crossover 85 reversed. 85NWC would have been down and 85RWC up with the result that the operating coil of searchlight signal unit signal 90B would be energized to display a Proceed aspect on the middle "arm."

If a call-on aspect is to be displayed on signal 90, the knob is rotated which closes the R contact and opens the N contacts, and a circuit is completed to energize relays 90GZ and 84RR in series, but 90RR is not energized because its circuit is open at the N contacts in knob 90. As a result relay 90GZP is energized with its polar contacts to the right which completes the circuit to energize the operating coil of searchlight unit signal 90C.

The feature of this arrangement is that, with the selections of the high or diverging route signals made by local circuits at the remote location, it is possible to control the two top "arms" as well as the call-on "arm" of a signal by one GZP relay, which is located in the relay house at the remote location; in this instance at Southwark East. One advantage is to minimize the number of wires between the tower and Southwark East.

A Different Arrangement for Near Locations

An arrangement different from that discussed above was used in the area in the general vicinity of the tower. Referring to Fig. 2, when signal knob 16 is pushed, a contact is made which completes a circuit from battery NL through the knob push contact, through the upper coil of relay 16GZ, front contact of 15TP, back of 16RR, back of 15RWC, front of 15NWC, back of 11RWC, front of 11NWC, back of

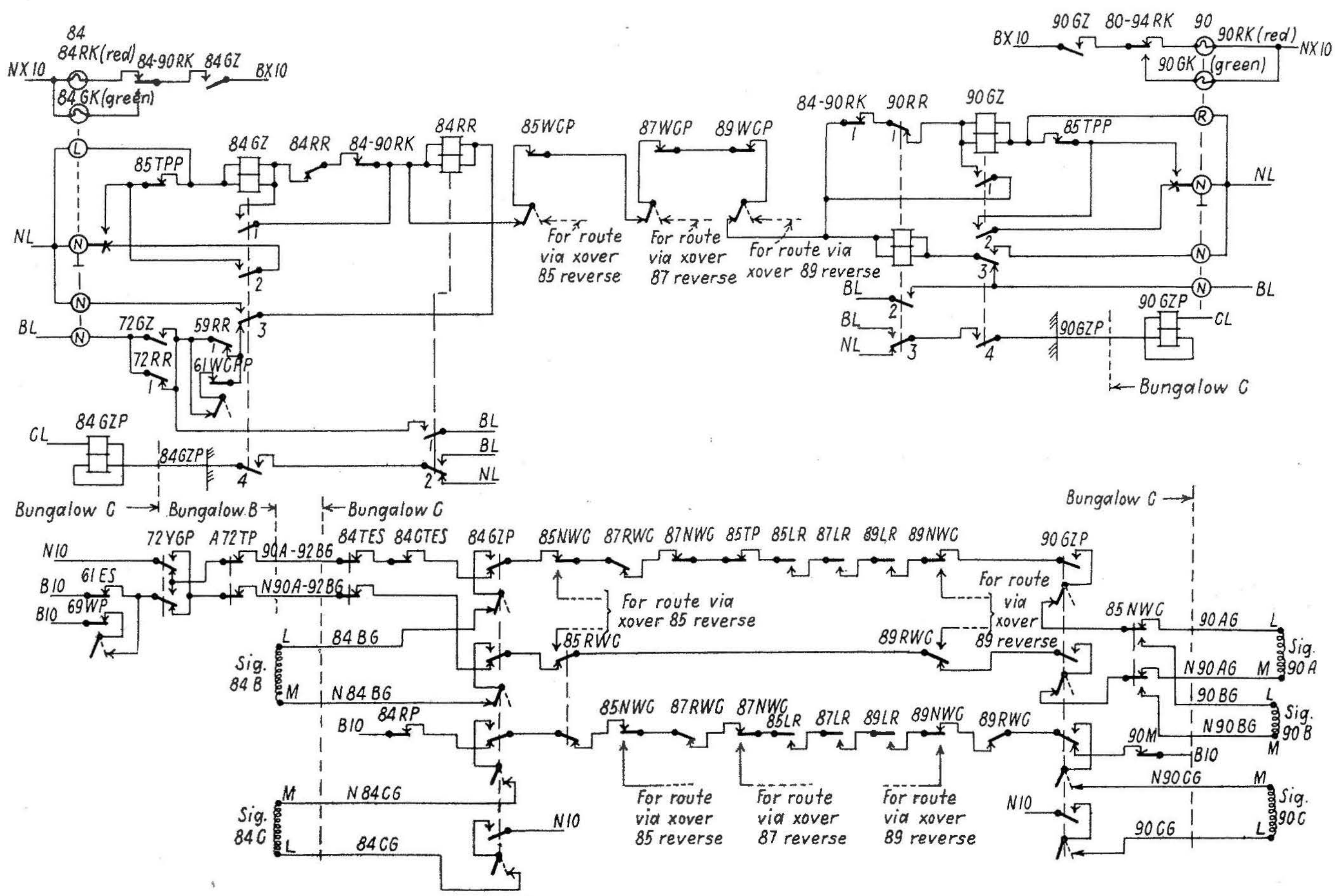


Fig. 1—Typical route, GZ and GZP relay circuits, remote location

17RWC, front of 17NWC, back of 24GZ, back of 24CGZ, coils of 24RR, back of 46RR, closed contact N in knob 24 to battery BL. Thus the push of knob 16 causes its corresponding GZ relay, 16GZ, and the RR, route relay 24RR, at the exit end of the track line up, to be energized in series.

With 16GZ energized, front contact 1 completes the circuit to feed the lower coil of 16GZ. Front contact 2 of 16GZ completes the circuit to light the red lamp in the face of the 16 knob. Front contacts 3 and 4 of 16GZ close in the circuit to the operating coil of searchlight signal 16A. Also with relay 24RR energized, front contact 2 completes the circuit for the operating coil of searchlight signal 16A so that the signal then clears. Then relay 16RP is released and contact 1 of this relay extinguishes the red lamp and lights the green lamp in face of knob 16.

If the second "arm," 16B, is to be cleared, the operation would be similar to that discussed above, except that in this instance switch 15 would be reversed and dwarf signal 18 would be the opposing signal. As a result, relay 15NWC would be down and 15RWC up, which would select the circuit to the operating coil of signal 16B instead of 16A.

If the call-on "arm" 16C is to be cleared, the 16 knob is rotated 90 deg. which closes the L contact thus completing the circuit to energize relays 16CGZ and route relay 24RR in series. Contact 2 of 16CGZ operates the indication lamps in the face of knob 16 as previously explained. Contacts 3 and 4 of 16CGZ and contact 3 of 24RR complete the circuit for the operating coil of the bottom "arm" 16C.

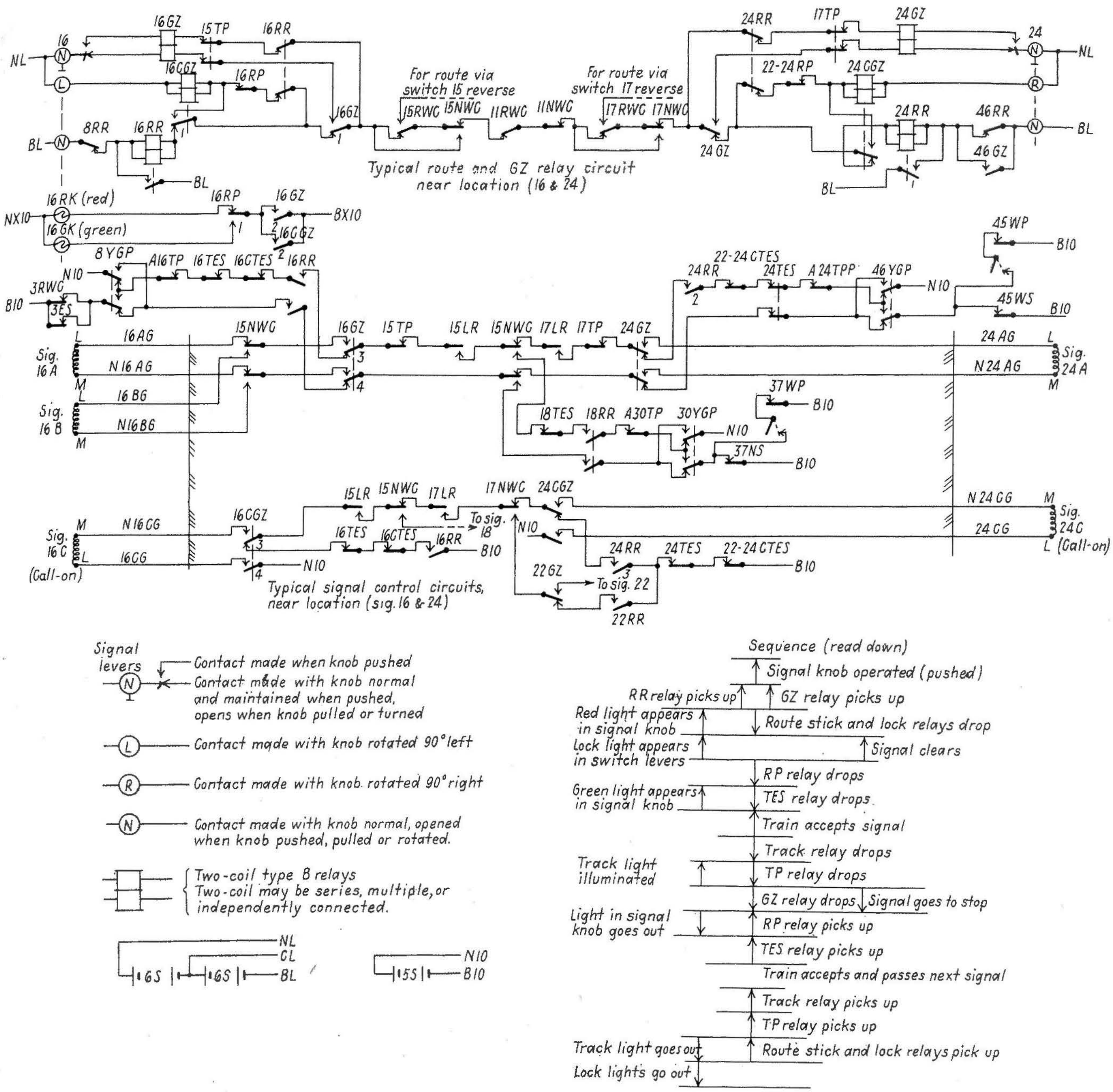


Fig. 2—Typical relay and signal control circuits, near location (Sig. 16 and 24)

In the circuits shown in Fig. 2 and discussed just above, it will be noted that two relays, GZ and CGZ, are used in connection with the push, pull or turn of a signal knob. The positioning of these relays is dependent on whether the knob is pushed or rotated, and this determines whether a high or a call-on signal is cleared; therefore the operation of the RR relay at the entrance end of the route network is not required.

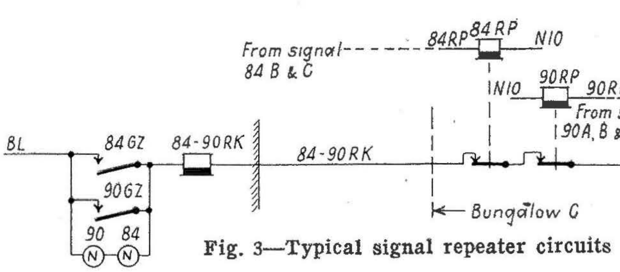
How Preconditioning of Signal Control is Prevented

The signal control circuits are so arranged that they, in addition to the route selection network (GZ and RR), check the positioning and locking up of all switches in the route. In order that the operation of a signal knob prior to the completion of the positioning and locking up of all switches in the desired route will not subsequently cause the GZ relay to pick up and possibly cause a signal for an undesired route to clear, the rule of waiting until all switches have indicated locked up in positions called for, is enforced by the following:

In near groups, Fig. 2, the negative side of the RP relay circuit is broken through a normal contact of the signal knob in multiple with front contacts of the associated GZ relays (see Fig. 3), and a front contact of the RP is incorporated in the pickup circuit of the respective GZ relays that are energized by rotating the signal knob. If the route is properly set up, the GZ relay will pick up immediately upon operation of the signal knob. If, however, the switches have not completed operations when the signal knob is operated, the GZ relay cannot pick up immediately and the RP relay will drop. The dropping of the RP relay will prevent subsequent picking up of the GZ relay, and it then becomes necessary to return the signal knob to normal in order to pick up the RP relay before again attempting to clear the signal. The RP relay is slow release so it will hold up during the time interval between the opening of the normal signal-knob contact and the closing of the GZ relay front contacts.

A similar circuit organization is used in connection with remote locations except in this case, the RK relay circuit (Fig. 3) is broken in a manner similar to the RP circuit just described. This feature was incorporated in GZ relay circuits controlled by push as well as rotating operation of the signal knob, where circuit simplification would result, but it is not considered essential in these cases as it would be necessary for the operator to deliberately hold the signal knob pushed in longer than usual to cause a GZ relay to subsequently pick up.

Note that typical remote location signal indication circuit, 84-90RK, shown in Fig. 3, provides, through the selection made through the GZ relays as shown in Fig. 1, the required indications, RK and GK, for all units of two opposing signals. Since route networks are broken through switch correspondence relays or repeaters thereof, depending on whether a near or remote location, and thus make it impossible for a GZ relay to pick up and subsequently put route locking into effect before all switches in the route have completed operation, it was unnecessary to provide a lock-stick relay for each single switch or crossover.



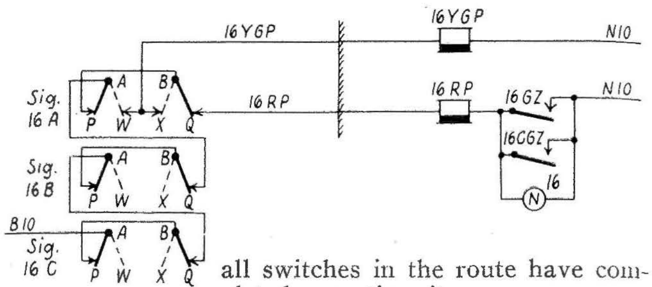


Fig. 3—Typical signal repeater circuits

A typical remote location switch or crossover control and indication circuit is shown in Fig. 4. In this instance, the lock relay indication and the control are combined in the one circuit, WZZ. The two positions, normal and reverse and the out-of-correspondence indications are handled by the switch and correspondence repeater circuit, WCP. Other contacts in the relays shown are used in the selection networks, directional route stick circuits, etc. The diagram Fig. 5 shows a typical of the circuits used for the control and indications of a switch located in the general vicinity of the tower.

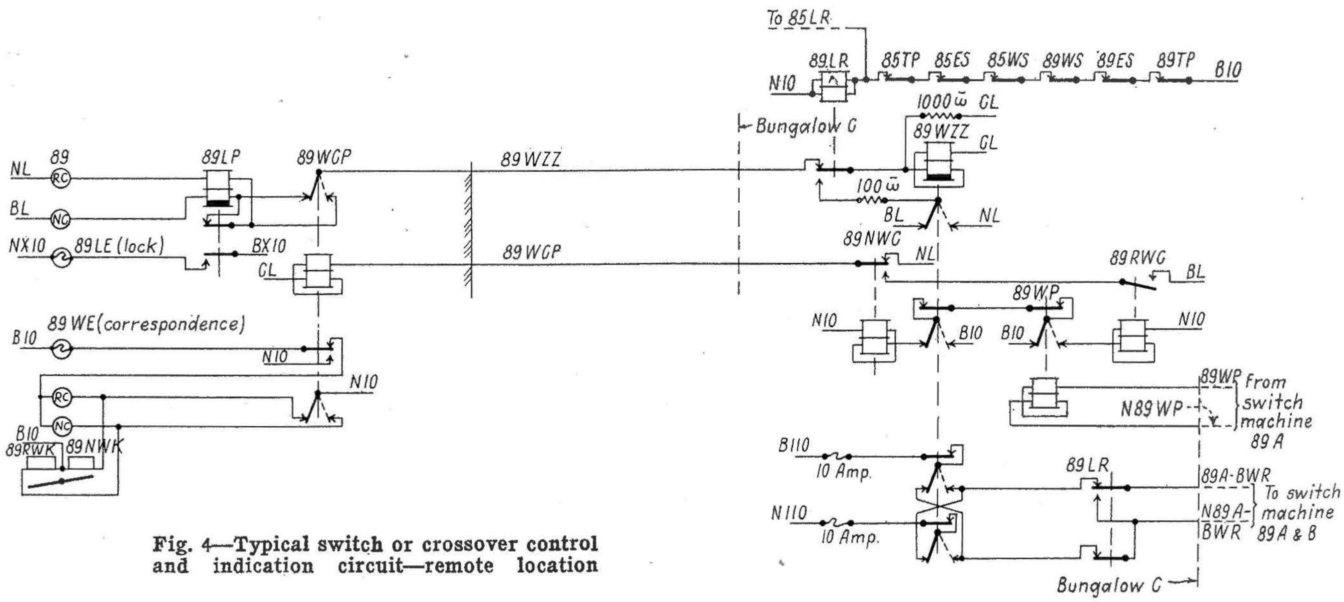


Fig. 4—Typical switch or crossover control and indication circuit—remote location

Pre-condition Control of Switches Prevented

As previously mentioned, nothing would be accomplished by throwing a switch lever when the red lock light is lighted. Likewise, the fact that the lock relay was down at the time the lever was thrown would prevent any subsequent movement of the switch after the locking does release.

This is accomplished by breaking the initial pickup circuit of the WZZ through the lock relay and in turn controlling the pickup circuit of the lock relay (for near locations), or the lock relay repeater (for remote locations), through NC and RC contacts on the lever in conjunction with polar contacts of the switch repeater or switch correspondence repeater relay, depending on whether a near or remote location.

Referring to Fig. 4, it will be noted that a movement of the lever to the reverse position, with lock relay 89LR picked up, will permit NL to flow through the RC lever contact, the top coil of 89LP, the front stick contact of 89LP (89LP is made slow release to bridge lever movement and WCP pole-changing time), the normal polar contact of 89WCP, the front of 89LR and the two coils of 89WZZ to CL, picking 89LP and 89WZZ up in series, pole-changing 89WZZ to reverse. Switch movement to reverse will now be effected. If, however, 89LR had been down at the time the lever was moved reverse, the 89LP-89WZZ series circuit would have been open at the front of 89LR and the 89LP would be down. With the front stick contact of 89LP open, a completion of the 89LP-89WZZ series circuit in event the 89LR eventually picked up would be impossible. Under such conditions, it would become necessary to restore the lever to normal long enough to re-establish the 89LP-89WZZ circuit and permit the 89LP to close its front stick contact.

A circuit arrangement basically the same, is shown in Fig. 5 for near locations. In this case, the pickup circuit of the LR relay is controlled through the WP and the lever, and the WZZ circuit is an independent circuit broken through contacts on the lever and the LR.

Power Supply

Alternating current power at 2200 volts single phase is distributed over the plant area with 2200/110-volt transformers at the tower and at the sheet metal houses at the more remote locations. The track circuits are fed from low-voltage transformers, using reactance feeds for the long circuits and resistor feeds for the shorter circuits. Ten-volt signal lamps are used throughout the entire interlocking home signal limits and are fed direct from 115/10-volt transformers the primaries of which are supplied 80 or 110 volts, depending on the position of the "DIM" relay for the particular location. All the "DIM" relays are controlled by the one lever previously mentioned as being on the control panel.

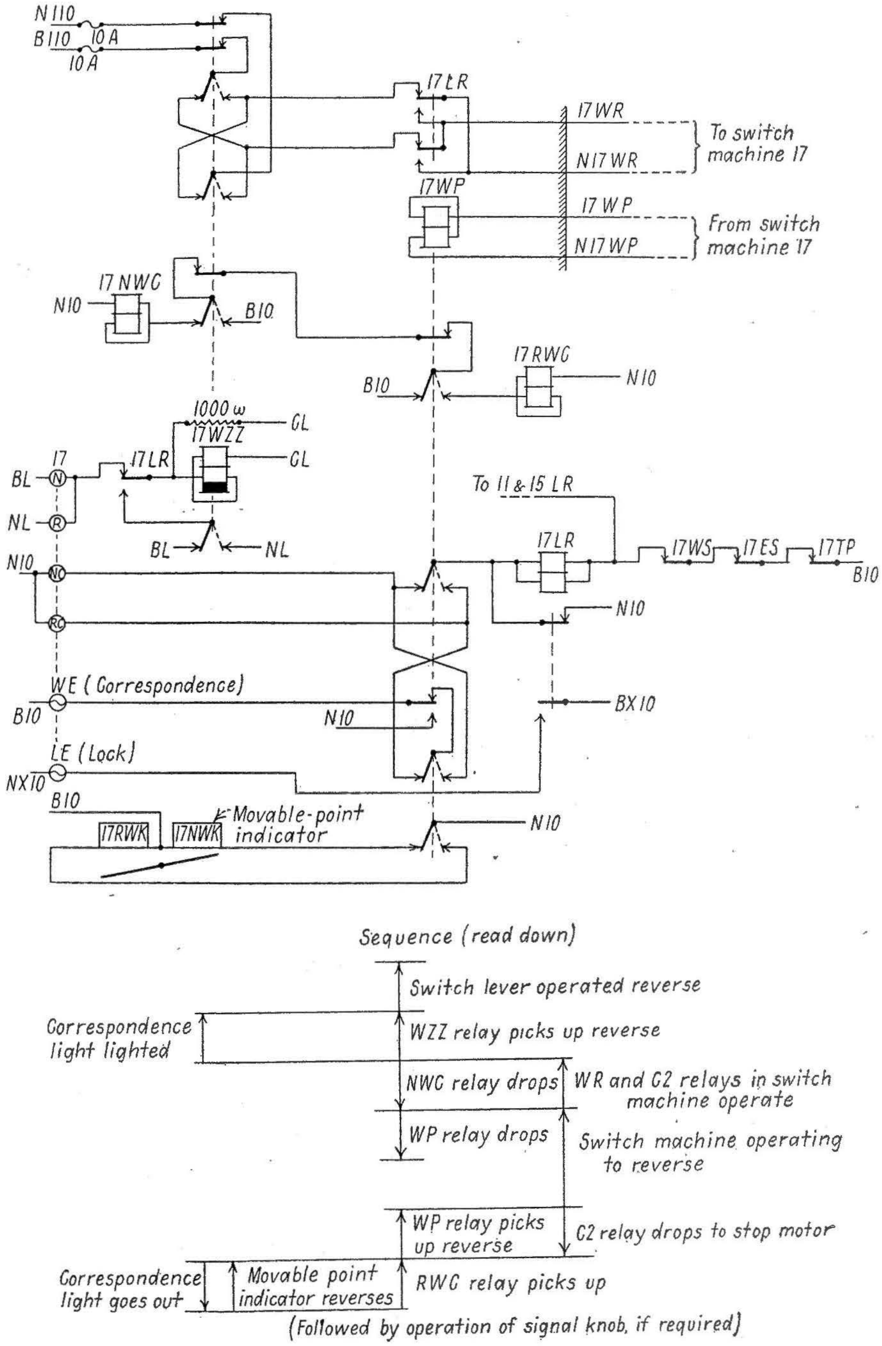


Fig. 5—Control and indication circuit for switches near the tower

The tower relay room contains three sets of storage batteries. Fifty-five cells of 120-a.h. lead type battery charged from a Type BP248 rectifier are used for operation of switch machines in the vicinity of the tower. Five cells of 120-a.h. battery charged from a Type BP248 rectifier are used for local circuits in the tower and control circuits originating at that point. In addition, a 6 plus 6 cell split battery, of 54-a.h. capacity, charged from 2 Type BT232 rectifiers is used for remote control and indication circuits to the three bungalows.

Each of the three bungalows contains two sets of storage batteries, all of 54-a.h. lead type. Fifty-five cells charged from a BP248 rectifier are used for switch machine operation, and 5 cells charged from a BT132 rectifier for local circuits and control circuits originating in the bungalow. Energy for remote control and indication circuits is supplied directly from 2 Type BK116 rectifiers feeding 12 volts d-c. direct-

(Continued on page 372)

Interlocking on C.N.

(Continued from page 363)

ly to the busses. Where energy is required in outside relay housings to feed switch and signal indication circuits, track repeater circuits, etc., this too is supplied directly from a rectifier of suitable capacity.

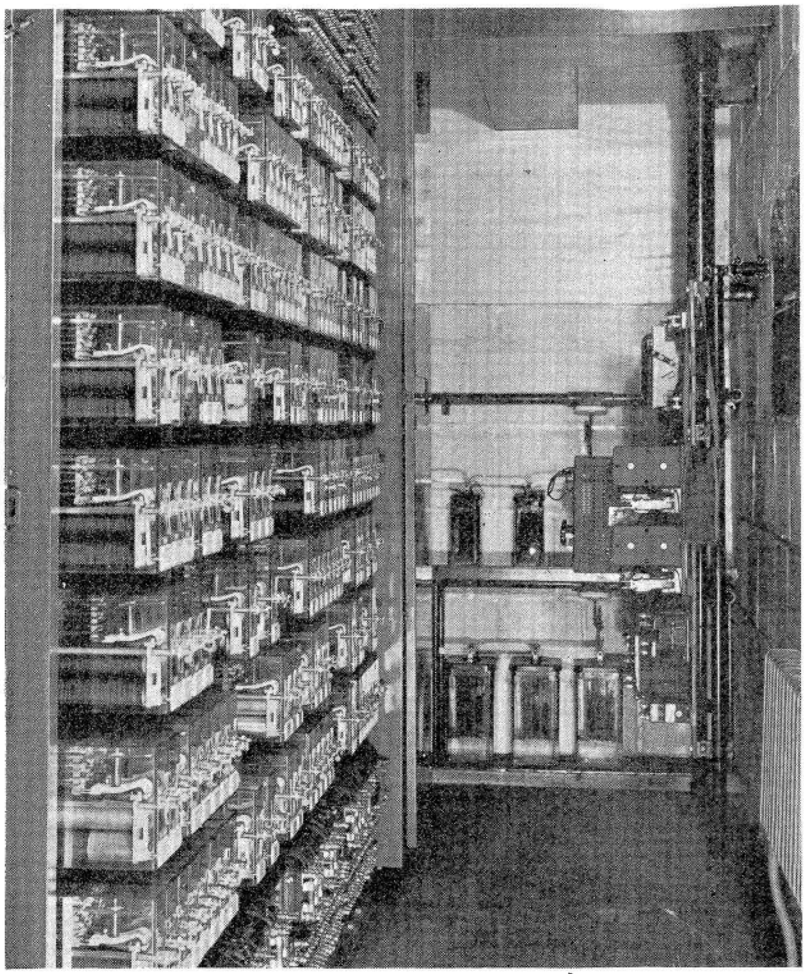
The relatively small capacity of the storage batteries will be noted. Since a-c. track circuits are used, the entire plant will be tied up by an a-c. failure. The storage batteries are thus provided primarily to serve as a "flywheel" to smooth out variations in load and maintain a more uniform voltage than would be obtained if direct feed from rectifiers had been used.

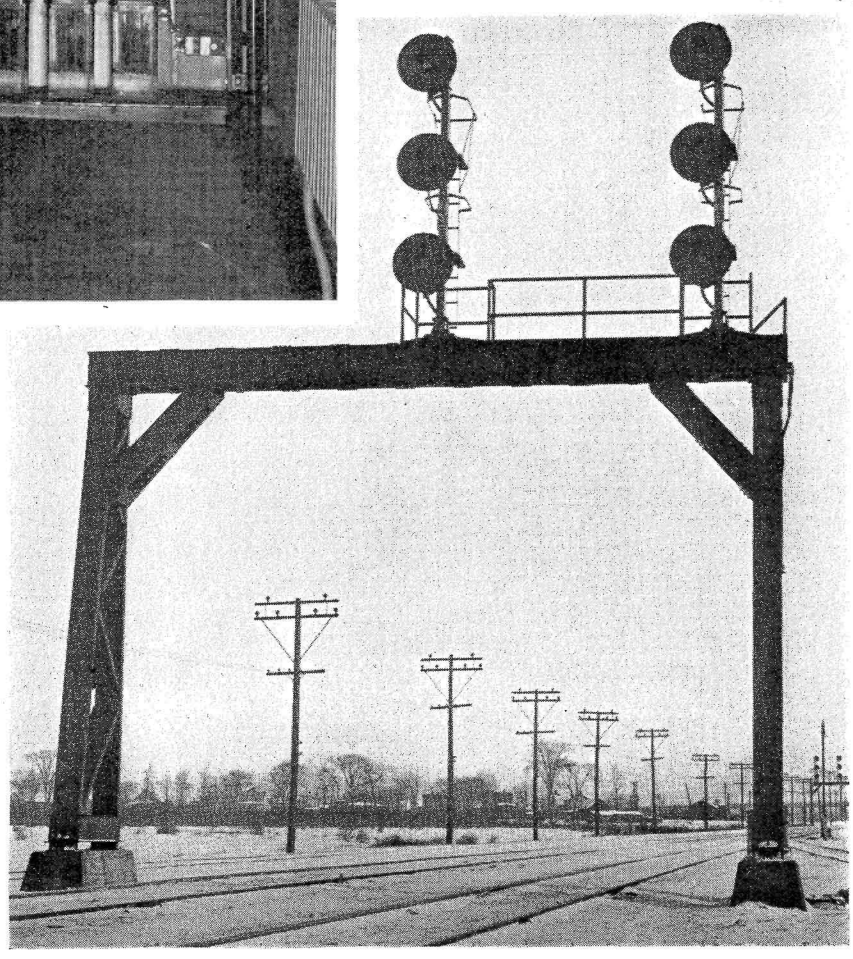
The circuits west from the tower to signal bridge 6-8, east of the tower to Southwark West, and south on the wye to signal 38 are in underground cable. East of Southwark West and westerly from signal bridge 6-8 over Victoria Bridge, and south from signal 38 to approach signal R-65, the circuits are carried in aerial cable on pole lines.

Throughout the interlocking underground cable is used for cross-runs to switches and signals as well as for track connections. The track connection cables are No. 9 single-conductor extending to individual cast-iron bootleg pedestals where the conductor is soldered to a double strand of No. 6 Copperweld which is pinned into the rail. A 9-conductor No. 14 cable extends to each switch machine, and a 7-conductor to each dwarf signal. A pedestal mounted junction box is provided near each switch machine and dwarf, the cable wires being terminated in these boxes, with 19 strand No. 14 with 5/64-in. insulation extending to the machine or signal.

At the ground mast high signals a separate cable, either 5 or 7 conductor extends to each searchlight signal unit, thus eliminating jumpers between signal units. At each signal bridge there is an instrument and terminal case near the bridge leg. Nineteen strand No. 14 single-conductor wires with 3/64-in. insulation are made up in cable from the case to the bridge structure, and extend up and across the bridge into the masts in conduit to protect against locomotive smoke fumes.

The installation of this new interlocking was made by the General Railway Signal Company of Canada, Limited, under the general supervision of R. G. Gage, Chief Electrical Engineer, and J. J. Ginty, Signal Superintendent of the Canadian National Railways. The signal equipment was furnished by the General Railway Signal Company; the switch fittings, bootleg castings, and outside wire as well as aerial and underground cable being purchased in Canada.





Above—Type B relays, power rack, etc. in tower. Right—Eastbound signals 46 and 48 at Southwark West.