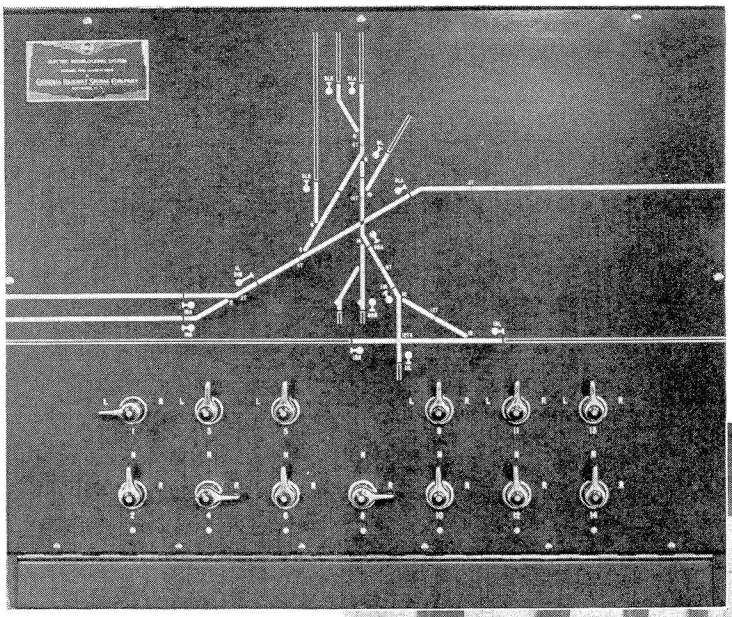
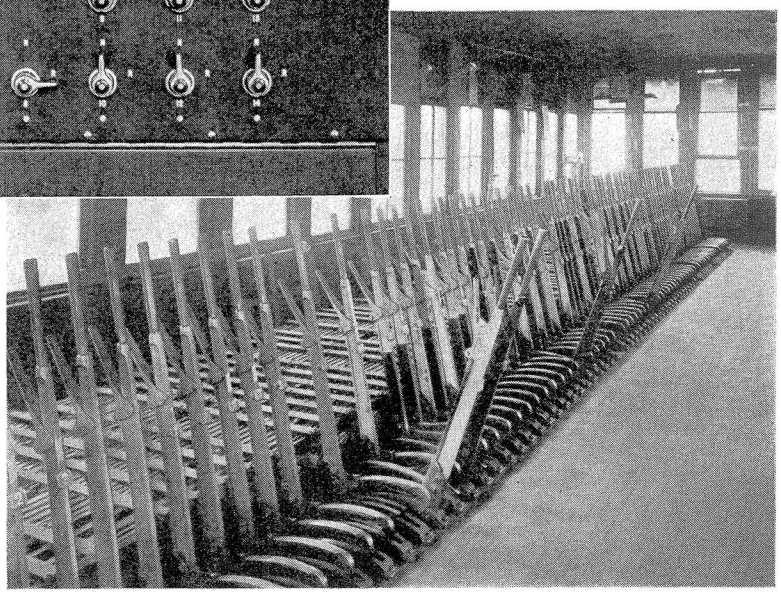


The panel of the new interlocking is 24 in. wide and 18 in. high, and it controls practically the same layout as the 76-lever mechanical machine



A total of 76 working levers in the old plant compared with 13 in the new – Signal aspects for special operating conditions in new project on Peoria & Pekin Union

All-Relay Interlocking Replaces Mechanical Plant

At Pekin, Ill., the Peoria & Pekin Union has recently replaced a 76-lever mechanical plant by installing an electric interlocking in which the controls are of the all-relay type, the interlocking being accomplished by interconnections of circuits so that the control machine utilizes miniature-type levers with no mechanical locking or electric lever locks.

Between Peoria, Ill., and Pekin, 8.5 miles, the Peoria & Pekin Union main line is double track, and this territory was equipped with centralized traffic control in 1931, as explained in an article in *Railway Signaling* for June, 1931. The south end of double track is at switch No. 2 in the Pekin interlocking. The P. & P. U. has no passenger service but operates freight trains between various industries and connections in Pekin and Peoria, and furnishes terminal facilities as well as switching service for seven roads at Peoria. Also the P. & P. U. interchanges cars with all roads (14 in number) in the Peoria-Pekin switch district. The single-track P. & P. U. main line extends through the interlocking and beyond the Pekin station where connections are made with the Chicago & Illinois Midland, which extends between Pekin and Springfield, Ill. The C. & I. M. has no passenger service but operates freight trains over the P. & P. U. between Pekin and Peoria.

The Peoria & Eastern, a subsidiary of the Cleveland, Cincinnati, Chicago & St. Louis, has a single-track main line between Indianapolis, Ind., and Pekin. The connection between the C. C. C. & St. L. and the P. & P. U. is via switch No. 4 and crossover No. 6. In addition the C. C. C. & St. L. line extends westward across the P. & P. U. track to an enginehouse and south along the river bank about 2 miles to various industries via what is known as its Whiskey main. The C. C. C. & St. L. operates 4 passenger trains, as well as several freight trains, daily over the P. & P. U. between Pekin and Peoria, and numerous switching moves are made daily by the C. C. C. & St. L. in the Pekin interlocking.

The Atchison, Topeka & Santa Fe has a single-track line connecting with its main line at Ancona, Ill., and extending to Pekin, the connection with the P. & P. U. at Pekin

being via switches No. 6A and No. 4. The A. T. & S. F. does not operate trains over the P. & P. U. between Pekin and Peoria, but does interchange cars with its own power to various lines at Pekin through this interlocking plant.

The Chicago, Rock Island & Pacific has a single-track freight transfer line between Peoria and Pekin, known as the Peoria Terminal Company. This Rock Island line crosses the Illinois river just west of the interlocking, then crosses the River track of the P. & P. U., and connects with the Peoria & Eastern, Whiskey main at switch No. 12A. Then by contractual arrangement with the Peoria & Eastern, this Rock Island route crosses the P. & P. U. main line and extends eastward through the interlocking plant and the P. & E. passing track and crossover, where deliveries are made to the Santa Fe. The Rock Island also uses the P. & E. Whiskey main track southward through the interlocking plant to a connection with its own yards and industries south along the river.

The Illinois Central has a single-track line from Mattoon and Decatur, Ill., which makes a junction with the P. & P. U. main line at a point 1,592 ft. south of the interlocking at Pekin. The Illinois Central operates freight service only over the P. & P. U. between Pekin and Peoria.

A check which covered an extended period prior to the construction of this new plant indicated that there was an average total of more than 80 movements through this interlocking plant in each 24 hour period.

Why the Old Plant Was in Need of Replacement

The mechanical interlocking, installed at this track layout in 1902, included detector bars and wire-connected mechanical semaphore signals. No track circuits or electric lever locks were provided. Thus the interlocking included numerous features which were not in accordance with the requirement of the Interstate Commerce Commission. Furthermore, the plant as a whole was worn beyond the stage of economical repairs and maintenance. Therefore, a decision was made to discard the old mechanical equipment, and to install a new electric interlocking.

Having arrived at this decision, representatives of the various railroads co-operated in making certain track changes in order to simplify the layouts. A crossing between the P. & P. U. River track and the P. & E. Whiskey main was eliminated by discontinuing the use of and taking up an old house track, and making some changes in switches beyond the interlocking limits, but no interlocked switches were added. A crossover on the C. C. C. & St. L. as well as certain other switches leading to industries were moved beyond home signal limits, and other switches and tracks, which were no longer required, were eliminated. Another point of importance was that the main-line derails were eliminated, the only derails in the new layout being on the enginehouse tracks of the C. C. C. & St. L. These derails are of the Hayes type and are pipe-connected to and operated by the switch machine at switch No. 14, so that no extra switch machines are required for derail operation.

The switch X on the lead into the C. C. C. & St. L. enginehouse is operated by a hand-throw stand. The remaining nine switches within the interlocking limits are each equipped with a 110-volt d-c. switch machine. These are the latest design of the G. R. S. Co. Model-5C machines with the outboard brake.

The various track changes reduced the number of switch machines required within home signal limits to only nine, as compared with 37 switches and derails in the old mechanical plant. Whereas 49 switch and facing-point lock levers were required in the old mechanical machine, only 7 levers are required in the new plant to control 9 switches. Both ends of the crossover No. 6A and No. 6B are controlled by lever No. 6. The switches 12A and 12B, at the two ends of the connecting track, are controlled by lever 12.

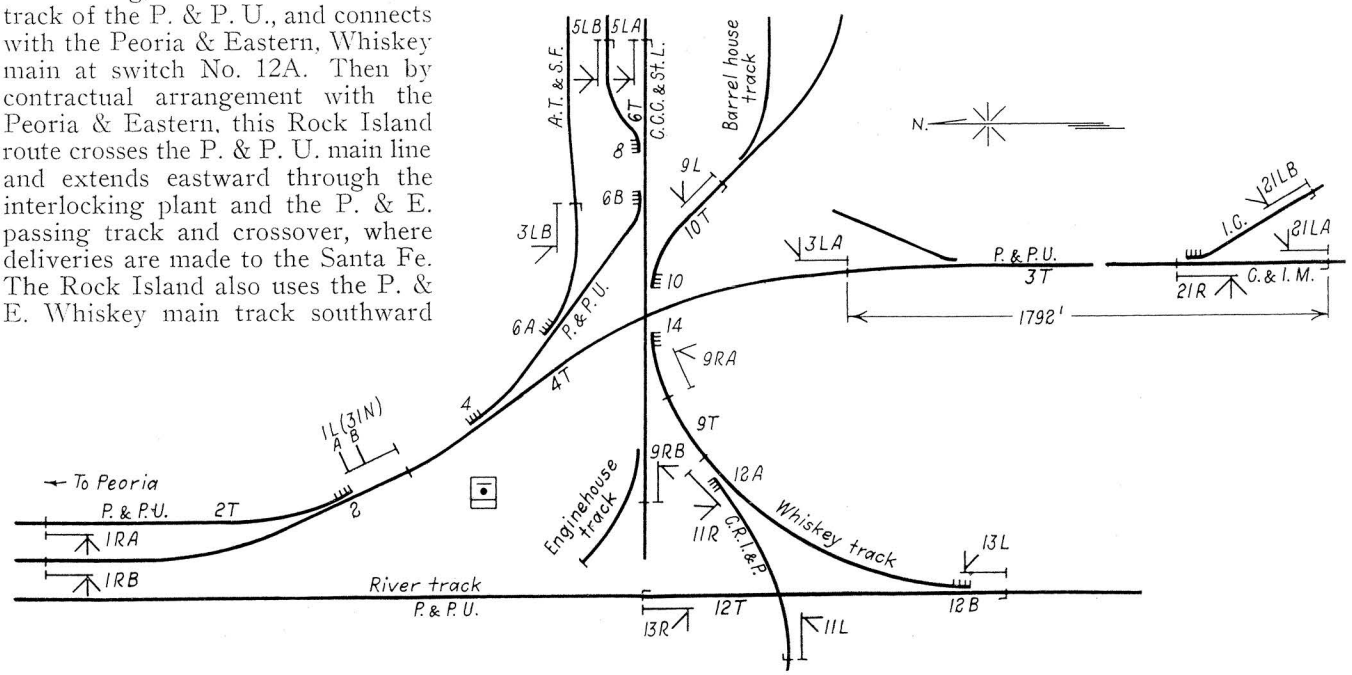


Fig. 1—Track and signal plan of the new all-relay interlocking at Pekin, Ill.

Special Aspects

On the old plant, wire-line connections were used for the operation of the two-aspect lower-quadrant semaphore home signals, including 15 high signals and 14 dwarfs. As a result of the various track changes, only 13 color-light home signals were required in the new interlocking. By using three-position levers, each of which is thrown to the left to control one signal and to the right to control another, only six signal levers are required to control 13 signals, whereas in the old mechanical plant, 15 signal levers were required to control 15 home signals.

Practically all the routes through this plant include tracks with heavy curvature, in some instances as much

as 12 deg. Another consideration is that the tracks cross several streets. For these reasons, the speed limit of all trains within this area is limited to 6 m.p.h. Therefore, no distant signals were required, and all home signals are of the dwarf type. Also, on account of the speed limit, the interlocking home signals do not display the Clear aspect, green. The "best" aspect displayed is yellow.

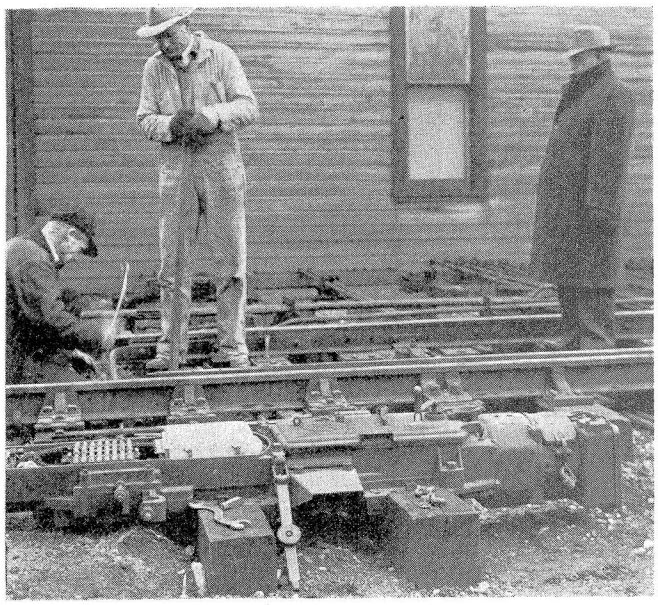
With respect to signaling, the train operation through this plant is peculiar. For example, the enginemen, especially of southbound trains of the C. C. C. & St. L., the A. T. & S. F., and the I. C. should be informed by the aspects and indications that the route lined up leads to their particular railroad or route through the plant. For this reason, certain signals display route aspects in addition to the ordinary single-yellow aspect. All Proceed aspects, however, require conformance with the 6 m.p.h. speed limit.

The unique feature concerning the signal aspects used on this plant is that advantage has been taken of the fact that electric lamps can be illuminated or extinguished as desired, whereas semaphore arms and constant-burning oil lamps cannot readily be made to appear or disappear. Each home signal consists of an assembly of either two or three G. R. S. Co. Type-F, light units, mounted vertically. Each unit is equipped with a 5⅜-in. lens. In a signal with only two lamps, one has a red glass and the other a yellow glass. In the signals which have three lamps, the center one has a red glass while the bottom and the top units have yellow glasses. Normally, a single red light is displayed at the Stop aspect by all interlocking home signals.

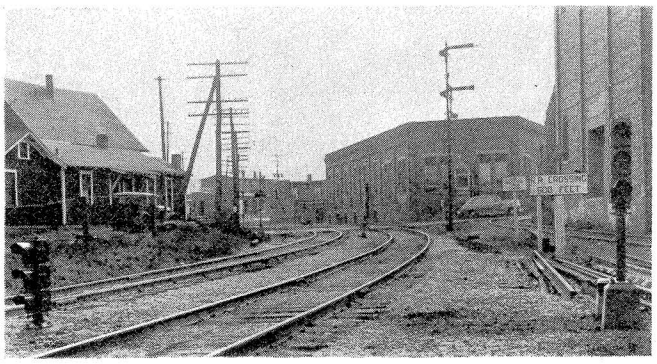
For a signal which can lead to only one route, such as southbound signal No. 13R on the P. & P. U. River track, the Proceed aspect, a single yellow light, is displayed in the upper unit. Thus this signal can display only two aspects, red for Stop or yellow for Proceed, this being accomplished by two lamp units. Likewise, signal No. 9RA has only two lamps. The normal aspect is red for Stop. An aspect of yellow-over-red is displayed for a route with switch No. 4 normal to lead up to C.T.C. signal No. 828. Thus signal No. 9RA can display either of only two aspects. Signal No. 9L on the Barrell House track, likewise, has only two lamp units, but it displays any one of three aspects. A single red in the upper unit is the Stop aspect. An aspect of yellow-under-red indicates that a route is lined up for a train to proceed as far as signal No. 11R, whereas an aspect of a single yellow indicates that a route is lined up for a move into the C. C. C. & St. L. enginehouse. Thus, three different aspects are derived from a total of only two lamps.

Other signals, for example No. 5LA on the C. C. C. & St. L., have three lamps. A single red in the middle unit is the Stop aspect. An aspect of yellow-over-red on signal No. 5LA indicates that a route is lined up via crossover No. 6 and single switch No. 4, both reversed, for a train to proceed as far as C.T.C. signal No. 828. An aspect of yellow-under-red indicated that a route is lined up with crossover No. 6 and single switches No. 8 and No. 14 normal, for a train to proceed as far as signal No. 11R. An aspect of a single yellow indicates that a route is lined up with switch No. 8 normal, crossover No. 6 normal, switch No. 14 reversed, for an engine to move into the C. C. C. & St. L. enginehouse. Thus the three lamps of signal 5LA can be used to display any one of four aspects. Likewise, signals No. 5LB, No. 1RA, and No. 1RB are capable of displaying any one of four aspects. The electric lamps in the interlocking home signals are rated at 25 watts, 110 volts, and are fed normally from transformers at about 108 volts as a means for increasing the lamp life.

The signals are set on concrete foundations. When located between tracks with 13-ft. centers, where the clearance is limited, the signals are set on the bases so that the maximum height is 2 ft. 8 in. above the level of the top of the rail to comply with regulations of the Illinois Commerce Commission. Where clearances are not restricted, the signals are mounted on short pipe masts which are long enough that the center of the lower lamp is 3 ft. to 4 ft. above the level of the top of the rail.



On the day of the change-over the old mechanical equipment was disconnected and the electric switch machines were put in service



New color light signal 1RA at left and 1RB at right with old semaphore in the background

The Interlocking Control Machine

The interlocking control machine is of the cabinet type, mounted on a well-constructed oak table with the top covered with a sheet of Masonite which is glued in place. The face of the machine is 24 in. wide and 18 in. high. The illuminated diagram includes white lines to represent the tracks. When a section of track is occupied, the corresponding section is illuminated by small lights in the track diagram.

The six signal levers are mounted in the top row. When a lever is in the normal center position, and the signals controlled are displaying the Stop aspect, no light is shown in the face of the lever. When the lever is thrown to the right or to the left, and the corresponding signal displays a Proceed aspect, a yellow light is displayed in the face of the lever. The seven switch levers are mounted in the bottom row. The lamp in the face of each switch lever is normally extinguished, being lighted when the switch is not in the position corresponding with that of the lever.

A red lock light is located below each switch lever, and whenever such a lamp is lighted this indicates to the towerman that the electric locking is in effect. Even if the switch lever were thrown while its corresponding lock light is lighted, the switch would not operate.

The relays, batteries and charging apparatus are located in a room on the ground floor of the tower. A point of importance is that all of the relays, including the signal control as well as track relays, are located in the tower, thus eliminating separate cases at various places on the plant. The relays are the wall type with spring hangers, and are mounted on 1½-in. by 10-in. planks which are bolted to angle iron uprights which were set in the concrete floors.

The main battery for operating the 110-volt d-c. switch machines consists of 80 cells of Edison B4H storage battery. The control circuits of the interlocking are fed from a set of 12 cells of Exide DMGO-9 storage battery, and one cell of the same type feeds each track circuit except track circuit 12T which is fed by a set of 3 cells of Edison 500-a.h. primary battery.

Crossing Signal Control

On account of the slow train speeds and the numerous switching movements, it is not practicable to use automatic track circuit control for the flashing-light crossing signals at Second street and at Margaret street. A small panel, 12 in. by 12 in., for the control of these flashing-light signals is mounted at the left of the interlocking machine. When a train approaches a crossing, the towerman turns the corresponding button, and the flashing-light signals at that crossing operate until the button is returned to the normal position. In the meantime, a pair of small yellow indication lamps on the panel are flashed to indicate that the flashing-light signal is in operation. This crossing control apparatus was in service in the old plant and was moved over to the new tower.

Remote Control at I.C. Junction

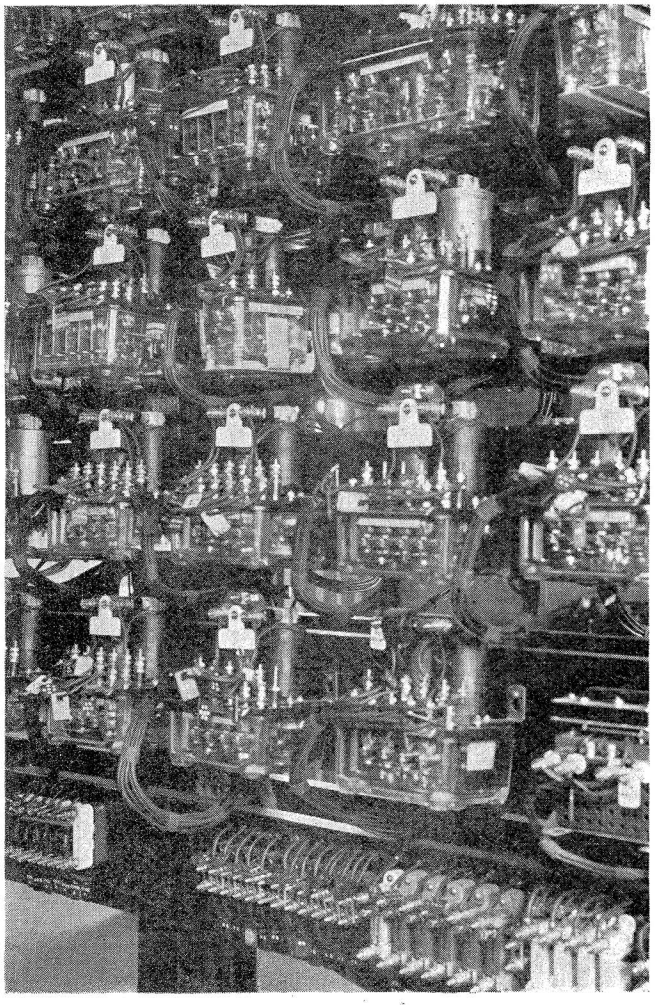
The junction between the Illinois Central and the Peoria & Pekin Union is located 1,592 ft. south of the northward interlocking home signal No. 3LA. Previously, this switch was equipped with a spring and buffer mechanism so that Illinois Central trains could enter the P. & P. U. main line without stopping to handle this switch. However, southbound I. C. trains had to stop to handle this switch by the hand-throw stand, which introduced too much delay, and was also objectionable because the trains blocked street crossings.

As a part of the improvement program, but as a separate project from the interlocking, a dual-control low-voltage electric switch machine was installed at this I. C. Junction switch, and signals No. 21R, 21LA and 21LB were installed to direct train movements over this switch. Signal No. 21R has three lamps. This signal displays an aspect of yellow-over-red for a southbound move on the straight track to the C. & I. M. with the switch normal. An aspect of yellow-under-red is displayed for a diverging move to the Illinois Central with the switch reversed. Signal No. 21LA displays yellow-over-red for a northward move on the main line with the switch normal. Signal No. 21LB displays yellow-over-red for a move from the I. C. to the P. & P. U., with the switch reversed.

The power switch machine and the three signals are controlled from a separate panel which is mounted to the right of the interlocking control machine in the new tower of the Pekin interlocking. One lever controls the switch and another lever controls the three signals. The lever is operated to the right to clear signal 21R, and to the left to clear either 21LA or 21LB depending on whether the switch is normal or reversed. The switch machine is fed from a set of 12 cells of Exide DMGO-9 storage battery.

New Brick Tower

The old tower was of frame construction and was in bad condition due to its years of service. The new



The relays for the entire plant are housed in the tower and mounted on planking bolted to steel columns set in concrete floors

tower which is of brick construction, was located on the west side of the main line, so as to provide a better view of trains. The new structure was built on a concrete foundation with no basement. The two-story portion of the tower is 20 ft. by 20 ft., this area being determined by the space required on the ground floor for the stairway, toilet facilities, relays and batteries. A one-story section at the north end, 9 ft. by 20 ft., includes the coal bin, a hot-water boiler for the heating system, and a room 5 ft. by 9 ft. for train crews. The interlocking control machine is on the second floor of the main section of the building.

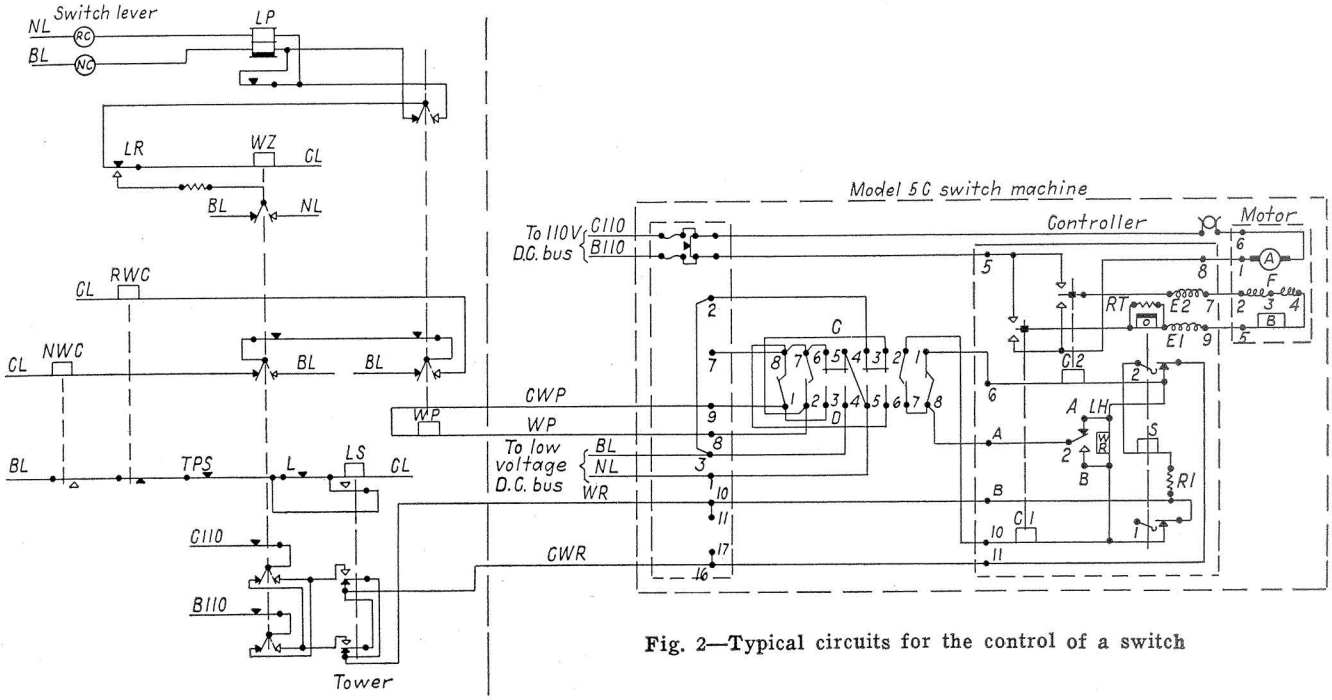


Fig. 2—Typical circuits for the control of a switch

Interlocking Accomplished by Interconnected Circuits

In this new plant, all of the interlocking protection is accomplished by interconnected circuits, no mechanical locking between levers or electric lever locks being required. Although this general objectve is not new, the circuits used on this Pekin plant represent modern practices, and therefore the following explanations are given for the benefit of those readers who want to keep up to date on this subject.

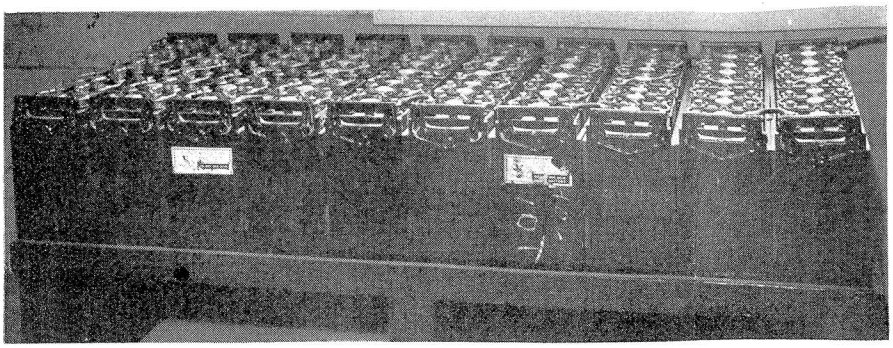
With the exception of the controllers in the switch machines, the relays are all in the tower, thus concentrating the circuit interlocking. No signal control relays are required at the signals because the signal lamps are each fed by a circuit extending from the tower. The 110-volt direct current for operation of the switch machines is distributed on bus circuits. The operation of each machine is controlled by a controller which is housed in the switch machine case. These controllers operate on the polar principle, and each such controller is controlled by a two-wire circuit which extends to the tower.

Typical circuits for the control of a switch are shown in Fig. 2, and the following discussion explains the sequence of operations when controlling and operating the switch from the normal to the reverse position. Each switch lever has two independent contacts. When the lever is thrown from the normal to the reverse position the NC contact is opened and the RC contact is closed. This causes the polar switch control relay WZ to reverse the position of its polar contacts, thus opening the control for the NWC relay which is thereby released. Also when the lever is reversed, a circuit is completed through a lever contact and a contact of the WP relay to light the lamp in the face of the lever, as an indication that the lever is out of correspondence with the position of the switch.

With NWC de-energized as previously explained, a circuit through a back contact of this relay, a back contact of RWC, a front of track-repeater stick relay TPS and lock relay L, closes the circuit to energize relay LS. With the front contacts of LS closed and the polar contacts of WZ to the right, a circuit is closed to apply B110 energy to the switch control wire CWR, and to apply C110 energy to the switch control wire WR. This energy causes the controller in the switch machine to operate from the normal to the reverse position. Contactor C2 in the controller assumes the energized position (upward) which in turn operates contactor C1 (mechanically) to the downward position. Then 110-volt d-c. energy from the bus circuit is applied to the motor, and it starts to operate.

When the switch is unlocked, a circuit is opened which causes the switch repeater relay, WP, in the tower to be de-energized. After the switch has been moved to the reverse position and is locked, the shunt contact 1-8 opens the circuit for contactor C2 which is then de-energized, thereby disconnecting energy from the motor. As the contacts in the point detector are now in the reverse position, the WP relay is energized with the polar contacts in the reverse position corresponding to the switch. This closes contacts to energize relay RWC which opens a contact to release relay LS, and the back contacts of LS place a shunt on the control wires extending out to the controller in the switch machine.

The energization of relay RWC is evidence of the fact that the switch has been operated to and locked in the reverse position, as checked through the contacts of WP, and also that the switch is in the position corresponding to that of the lever, as checked by control of RWC through contacts of WZ. Also when WP is energized with polar contacts to the right, the circuit for the out-



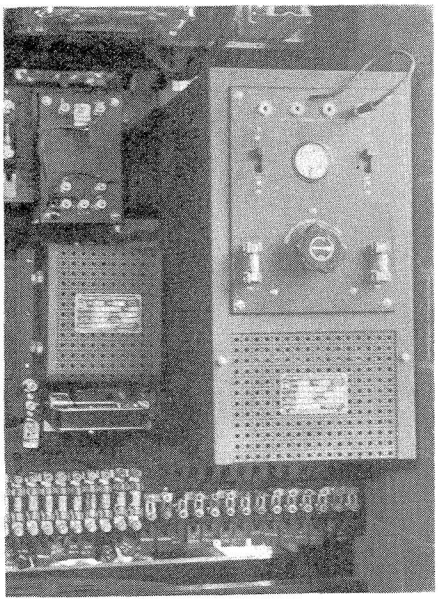
The 110-volt storage battery for operation of the switches

of-correspondence lamp in the face of the lever is opened, thus extinguishing this lamp. This completes the operation of the controls of a switch from the normal to the reverse position.

Pre-Conditioning Prevented

The arrangement of circuits controlling the WZ relay prevents preconditioning. In other words, if a switch lever is moved before the electric locking is released, such action will not be effective in operating a switch *after* the locking does release. This is accomplished as follows: When a switch line-up is complete and a signal cleared, then relay LR is released, which opens the control between the lever contacts and relay WZ. Also, through the back point of the same contact of WZ, energy is fed to the coil of WZ to hold it in its existing position. The relay LR remains de-energized as long as the signal is clear, as well as during the time a train is occupying any part of the route within interlocking limits. If the lever were operated from the reverse to the normal position, for example, while the lock relay is released, the circuit from the lever to the WZ relay will remain open after the passage of a train and until the switch lever has been restored manually to the center position. This is accomplished by using the front contact of relay LP in combination with the polar contact of relay WP in the control circuit for WZ.

The energy for control circuits is taken from a split battery, connection BL being the positive and NL the negative of the 12 cells of the battery as a whole. The center tap CL is negative to BL but positive to NL on 6 cells in either instance. When the lever and switch were in the normal position, BL which is positive to CL, was fed through the lever contact, through the lower coil of relay LP, the left point of the polar contact of WP, the front contact of LR and through the coil of WZ to CL. When the lever was thrown to the reverse position, NL, which is negative to CL, is connected through the RC lever contact, through the upper coil of LP, through the contact of LP, through the left point of WP, the front of LR, the coil of WZ to CL, but NL is negative to CL and, therefore, WZ is blown down, and then picked up with the polar contacts in the position to the left.

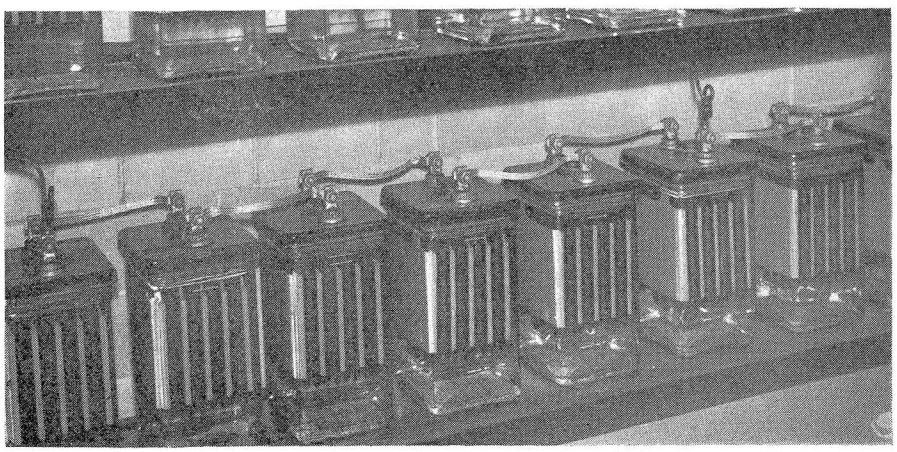


Rectifiers for charging the batteries

The two separate coils of LP are so connected that the magnetic flux in the core of the relay is in the same direction regardless of the fact that CL is fed through the lower coil and BL is fed through the upper coil. Therefore, relay LP is not released when the lever is reversed. The slow release of LP is provided just to be sure that the relay does not release between the time the CN contact opens and the CR contact closes.

The point of importance is that if the switch lever is thrown while LR is released, relay WZ is not operated. By these means, circuit locking is provided such that the throwing of a switch lever, during the time that locking is in effect, will not, at a later time after the locking is released, result in operation of the switch. In a conventional interlocking with mechanical locking between lever and with electric lever locks, the switch lever could not be moved when the electric locking is in effect. The same result, in effect, is secured for a miniature-lever machine with no mechanical locking or electric lever locks, by the circuit arrangement discussed above.

Relay LS is energized, to complete the circuit for the switch controller, only when the switch is not in the position and locked to correspond with the position of the lever. A stick contact is provided on the LS relay to by-pass the contact of the lock relay L, this arrangement being required due to the fact that the lock relay L is released by other controls which will be explained later. The stick holding circuit prevents interruption of the control of LS while the switch machine is operating. If a switch lever and a signal lever were thrown in quick succession, the switch would complete its operation. Although the



Storage battery for feeding control circuits and track circuits

throwing of the signal lever breaks the LR circuit, the stick circuit in the LS keeps the LS energized until the switch is over and locked in the position corresponding with the lever.

Lever Route Stick Relays

After positioning the switch levers to set the switches for a certain track line-up, the direction in which this track line-up is to be used is determined by throwing a signal lever; for example, from the center position to the left to clear a southward signal, or to the right to clear a northward signal. Lever 13 controls signals 13R and 13L. Likewise, one lever can control the signals for two or more conflicting routes which cannot be lined up or used simultaneously; as for example, lever 9 controls three signals, 9RA, 9RB and 9L. The contacts operated by the levers do not, however, directly control the signals, but the lever contacts, as shown in Fig. 3, control LGZ relays which are controlled by contacts in route relays. The circuits for energizing the route relays, GRR, are completed when the switches are in position and locked for a certain track line-up as is checked by contacts in switch relays such as 4NWC and 4RWC. Furthermore, the control of a route relay is checked through contacts of the RGZ relays of opposing as well as conflicting signals to determine that no such signal has been cleared or that a signal lever has been positioned to clear such a signal. The control of the RR route relays also checks through lock and lock stick relays which in turn check switch position as well as track occupancy for detector and time locking.

A portion of the signal control network is shown in Fig. 3. Say, for example, that signal 5LA is to be cleared for a move by a C. C. C. & St. L. train on a route to signal 1L with switches 8, 6B and 6A normal, and switch 4 reversed. With the switches having previously been controlled to these positions, lever 5 is thrown from the center position to the left. In the circuit for relay 5LGZ, battery BL feeds through the lever contact, 5L, through a back contact of 5LAGRR to check that no route is established and a signal cleared on that route, through a back contact of 5LBGRR to check that the conflicting signal 5LB has not been cleared, or, if cleared and placed at stop, that the time locking period has expired. Relay 5LGZ is then picked up and sticks up with a stick circuit which runs around the back contacts of 5LAGRR and 5LBGRR. When 5LGZ picks up, it closes its front contact 2 in the circuit for 5LAGRR.

Referring now to Fig. 4, it will be seen that the switch lock relays such as 4L, 6L and 8L are controlled through contacts of RWC and NWC relays of other switches, contacts of the crossing relay SS and time locking relays. For example 8L is normally energized if switch 4 is normal, the feed to 8L being from battery BL through front contact 3 of 4NWC, a front contact of time-element stick repeaters 9RTESP and 5LTESP. In the example under discussion, however, switch 4 was reversed, thus releasing 4NWC so that 8L was released when switch 4 was over and locked in the reverse position in correspondence with the lever position. Similarly, the relays 6L and 4L were released so that prior to the attempt to clear a signal over a track line up, the switches are locked the same as if mechanical locking had been used. The point of importance is that before a signal can be cleared, the corresponding route relay must be energized, and before the route relay can be energized, the switches must be locked.

Referring now to Fig. 3, and following the circuit line which is drawn heavy, it will be seen that the circuit is complete between NL through front contact 2 of 5LGZ

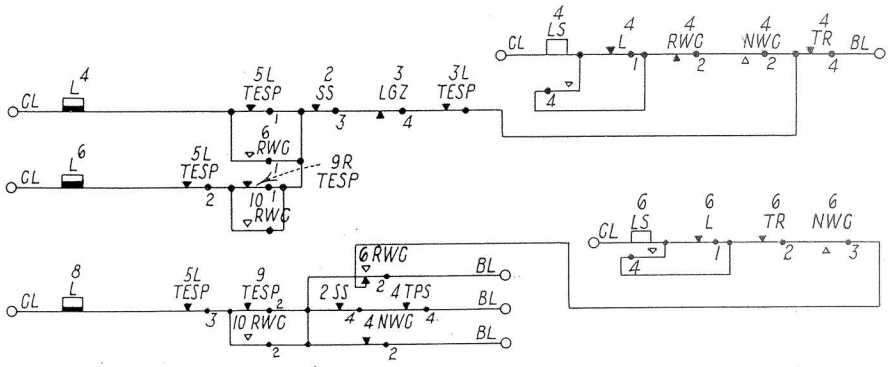


Fig. 4—Typical controls for switch lock relays

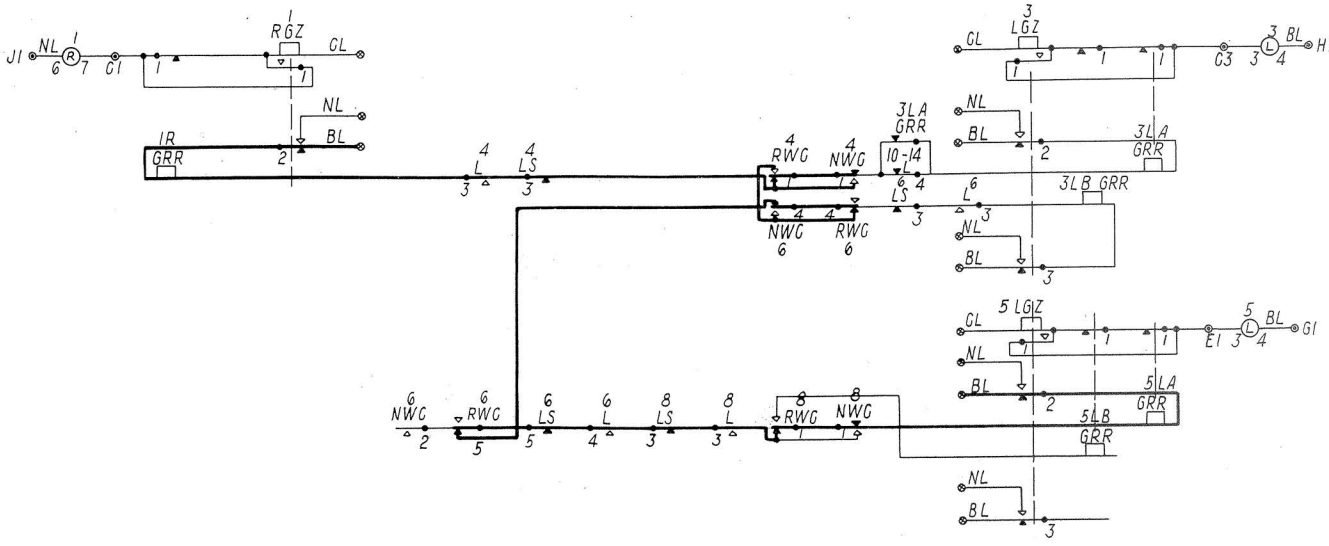


Fig. 3—Diagram of a portion of the signal control network

to BL through back contact 2 of 1RGZ to check the switch relays, lock relays and lever-repeater relays to energize both 5LAGRR and 1RGRR. When 1RGRR picks up, its back contact 1 opens the pick up circuit for 1RGZ, so that even if lever 1 is thrown, relay 1RGZ cannot be energized. With relay 5LAGRR energized, signal 5LA displays the aspect.

Crossing Protection and Time Locking

In a track line-up involving switches only, the route relay control checks the position of the switches, but when a track line-up leads over the crossing, there is nothing about the crossing which operates to afford a means for selection. For this reason a special relay, SS, is provided and is controlled so that when a lever-repeater GZ relay is picked up, for a route leading over the crossing, the SS relay is released which locks out all other track line-ups and signals leading to the crossing on the same or different tracks.

If a proceed aspect is taken away by lever control before a train accepts the signal and enters home signal limits, no changes can be made in the position of switches, and no opposing or conflicting signal can be cleared until after the time locking period has expired.

Signal Levers Must Be Restored

For the signals which are operated "stick," the signal lever must be restored to the center position and again thrown in order to clear the signal for a second train after the first train has cleared interlocking limits. This feature is accomplished by track-repeater stick relays. For example, as shown in Fig. 5, relay 4TPS is de-energized when a train occupies track circuit 4, thus releasing relay 4TR. Although 4TR is again picked up when the train leaves track circuit 4, the relay 4TPS will not pick up until the lever 3 is placed on center to release relay 3LGZ, thus closing a back contact which completes the circuit to energize 4TPS which then sticks up until track relay 4TR is again released.

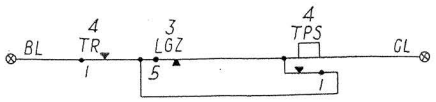
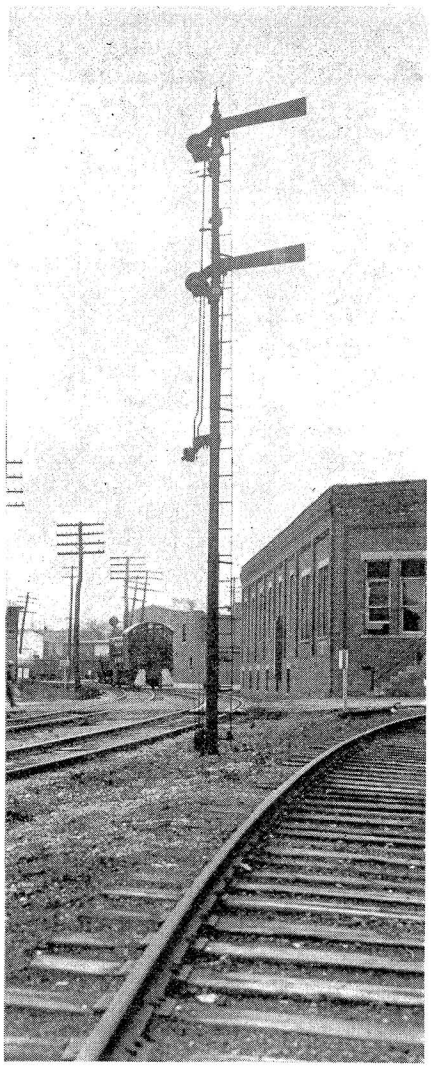


Fig. 5—Control of track repeater stick

This interlocking project was planned and installed by the forces of the Peoria & Pekin Union under the direction of E. H. Thornberry, chief engineer. L. R. Coleman was the foreman in charge of construction, and John Dunker is signal supervisor. The major interlocking equipment was furnished by the General Railway Signal Company.

The insulated wires and cables for this project were manufactured according to the Emergency War Time Specifications of the Signal Section, A. A. R., using 3/64-in. insulation wall instead of the customary 5/64-in. wall. The outer covering on the underground cables are of the mummy type which includes no metal. These cables are buried at least 28 in. At the tower, these cables extend up through a 10-in. clay tile set vertically through the floor, and the wires are terminated on terminals on the bottom board.



The old signals were of the wire-connected mechanical semaphore type

The insulated wires and cables were furnished by the Kerite Insulated Wire & Cable Company.

View, made on the day of the change-over, showing the new brick tower at left and old frame tower at right