

Westward view from end of platform

Automatic Interlocking on the Philadelphia Elevated

Station layout involving scissor crossovers and signals controlled automatically

A DOUBLE-TRACK line of the Philadelphia Rapid Transit Company runs from the Market Street subway up on an elevated structure which extends for several blocks along the water front, terminating in a stubend station at South Street. The electro-pneumatic interlocking plant, which had been in service at this South Street station layout for years, to control the switches and signals for rerouting the trains, has been reconstructed to provide automatic control of the crossovers and signals.

The trains consist of three or more cars operated as multiple units by 600-volt, d-c. electric propulsion. In the ordinary procedure, an eastbound train approaching the station is diverted over crossover No. 13 to enter the station on the river side of the island platform. After unloading and loading passengers, this train reverses direct and departs from the station on its westward track, crossover No. 13 having been placed normal in the meantime. During rush hours, when a second train arrives before the first one departs, the second train enters the station on the eastward track on the land side of the island platform, and when it is ready to depart it is diverted over crossover No. 15 to proceed on the westward track. A study of the train operation revealed the fact that the operation of the crossovers and signals, to permit these train movements, could all be controlled automatically, and the operation of the plant since the changeover has proved successful.

The 17-lever electro-pneumatic interlocking machine was left in place in the tower, the automatic control arrangement being superimposed on the existing arrangement. One of the interlocking levers, No. 9, is used as the master lever. When it is in reverse position, the plant is on automatic control, and when it is in this position all of the other levers are locked normal by the mechanical locking. When the master lever is placed in the normal position, the automatic control is cut out, and the



plant can be operated by the interlocking machine. Providing the plant is occupied when making this change, a time-release, set at 30 seconds, must be operated. The contacts on the rollers operated by the levers are utilized to transfer the circuits from one system to the other.

The electro-pneumatic switch machines were retained in service. Some of the electro-pneumatic semaphore interlocking signals were used, while new color-light signals were used for some locations. The trip-type trainstop system is used as a part of the signaling on this railroad, a trip being located opposite each signal.

The Control Circuits

When No. 9 lever is operated from the "N" to the "R" position, the automatic switch-control circuits are placed in operation. The position of the switches and the trains must correspond before the lever can be moved to the "R" position; this is to insure that the automatic circuits have responded.

On completion of the stroke of No. 9 lever, the automatic signal circuits are placed in service. When the station track sections are clear the route will be set for train No. 1 to arrive on the westward track over No. 13 switch, reverse. After train No. 1

clears the switch section, the routelocking relays become energized, and after a predetermined time No. 13 switch moves from the reverse to the normal position, and the route is set for train No. 1 to depart. If train No. 2 approaches R16 signal before



Steel cases in the tower

train No. 1 departs, the route will be locked, and train No. 2 will arrive on the eastward track.

After train No. 1 departs and clears the switch track section the routelocking relay becomes energized, and after a predetermined time No. 15 switch will move from the normal to the reverse position, and signal LA16 will clear, providing train No. 1 has cleared its limits. Train No. 2 departs from the eastward track to the westward track over No. 15 switch reverse, and after clearing the switch track-section, the route-locking relay again becomes energized, and, after a predetermined time, No. 15 switch moves from the reverse to the normal position, and No. 13 switch moves from the normal to the reverse position, thus setting up the initial arrangement which permits the arrival of train No. 3 over crossover No. 13 to the westward track.

The route-locking relay LR is controlled through the MR and the switch track relays. The signal locking relays MR are controlled through the automatic train-stops in the tripping position and the signals in stop position. The switch operating relay WR performs the same operation as the spring combination on a switch roller. The position of this relay is determined by the position of the track relays and the push-button controlled relays. The switch-indicating relay checks the position of both ends of a switch and the WR relay.

Cut Out Arrangement

A special arrangement is provided to continue the automatic operation of the plant when one track is occupied by a stored train. This arrangement, mounted in a box on the north wall of the old tower, consists of four enclosed-type push buttons and a direct phone to the train dispatcher. One of the illustrations shows this housing with the door open. On the arrival of a train that is to be stored, the motorman goes to the box, opens the door and calls the dispatcher, and, if the train is on the land side, i.e., the west track, the order will be to operate push button W1, which is located in the upper right-hand corner on the side of the box toward the track to be put out of service. Operation. of the button will release the track from service. The fact that the track is out of service is indicated by illumination of an electric lamp at the right, which is so located as to shine through a lense in the outer door of the box. When the train is ready to depart, the motorman will

call the dispatcher and receive orders to restore the track to service by operating the lower right-hand push button marked W2, which will release the stick circuit and restore the automatic feature to the track. The push buttons E1 and E2 are to be used in the same manner for storing and releasing trains from the east track. The cut-out of a station track is effected by energizing a stick relay, which eliminates the respective track circuits from the automatic control, and holds the signal red and the train stop in the tripping position until the relay is released.

The wiring of the plant consists of multiple-conductor cables run in conduit to cast-iron junction boxes. Single wires are run in conduit from these boxes for all branch lines.

The following relays are used: Model-15, two-element, three-position for WR or switch control; Model-TV40, two-element, three-position for KR or switch indication; SV21 for time-element; DN-11 for TP or track-repeating, and SLV-13 for track relays. The track and light circuits are operated by alternating current. The alternating current is rectified for operation of the d-c. relays and switch valves.

This automatic control of the interlocking was designed and installed by the signal forces of the Philadelphia Rapid Transit Company, under the direction of C. R. Horn, Signal Supervisor, and under the jurisdiction of H. Thackray, Superintendent of Way & Structures.



Arrangement for cutting tracks out of service