

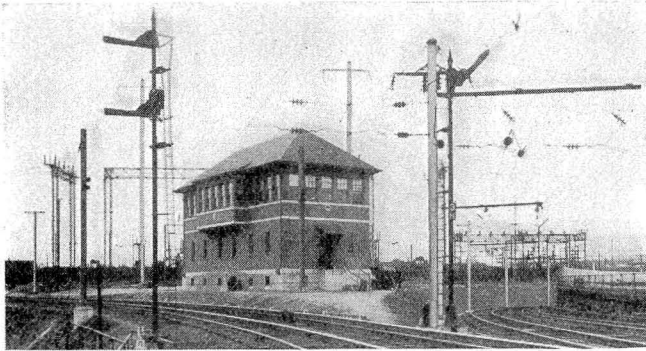
Pennsylvania Cuts Over Large Interlocking Plant

Without Delaying Traffic

Cutting over from the old to the new track arrangement—A continuation of last month's article by the same author

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"Zoo" interlocking tower

IN order to appreciate the vast amount of detail work and the great care that were required in order to provide safety in train operation while transferring operation from the old to the new track arrangement, one need only observe an account of the manner in which "K" interlocking was cut over to the "Zoo" machine. The first portion of the new Zoo interlocking was placed in service on September 14, 1930, and this cut-over was the first major operation that involved the signal department in the installation of the new suburban electric stations in the Philadelphia area.

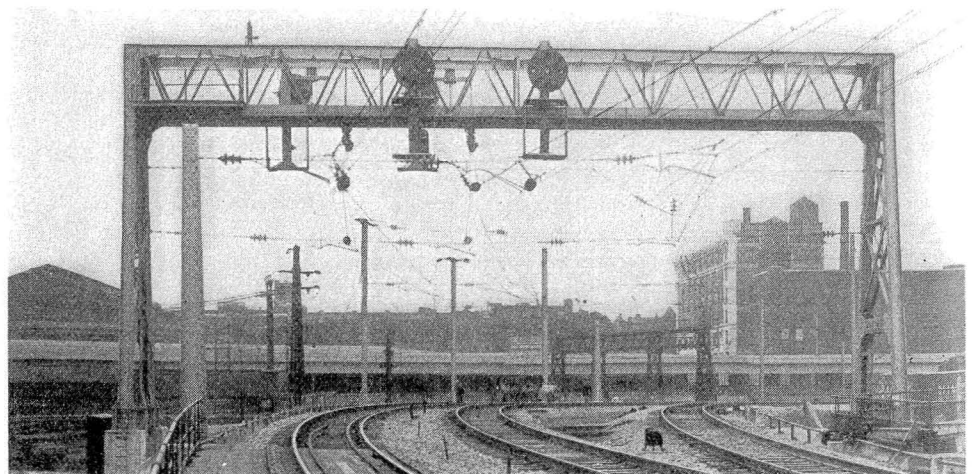
This cut-over involved the rearrangement of the tracks in the vicinity of the old K interlocking in accordance with the predetermined plan for incorporating four existing interlockings—namely, "Mantau", "JO", "D-1", and K—into a single plant to be known as Zoo. The track rearrangement consisted primarily in providing, at this point, a connection between the existing tracks and the tracks from the new stations in such a manner as to facilitate the abandonment of the old West Philadelphia station and the inauguration of service from the new stations.

The interlocking at K consisted of an old style Union 23-lever electro-pneumatic machine operating Type-14 switch-and-lock movements and both electro-pneumatic

and position-light signals. Preliminary signal construction work consisted of the substitution of Style-A1 switch-and-lock movements equipped with Style-CP valves and utilizing polarized indication. These movements were wired for operation from the old machine, with the new cables so arranged that the shifting of the control of the switches would require merely the disconnection of the old cables and the connection of the new. With the exception of certain signals which were so located with respect to the new layout that a change of their aspects was entailed, new position-light signals had been set in place and completely wired for operation from the new machine.

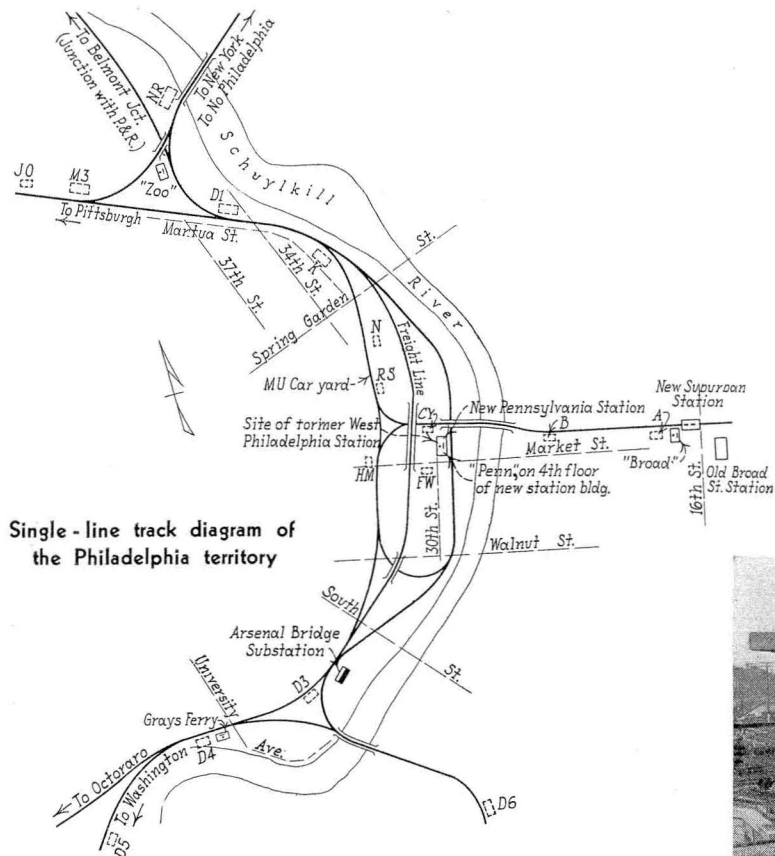
The testing and checking of the new work required several weeks' time, and included a thorough check of all circuits through the various functions, as well as a check on the operation of the machine. Spring combinations, electric locks, and segment adjustments were tested and checked for proper clearances and operation; wires and cables were megger-tested for continuity, crosses and insulation resistance to earth; relay housings were checked for cable conductor rotation, tagging of relay contacts, and general workmanship. The various transformers were checked for voltage taps, and instantaneous polarities, the latter check being made to insure the cor-

Standard signal mounting in electrified territory



rect operation of transformers that were paralleled. The track fouling and the bonding were checked and the mechanical locking was checked in accordance with the locking and dog sheets. In checking the circuits, due consideration was given to temporary arrangements affecting circuits involved in adjacent interlockings, and to points at which work could not be completed previous to the cut-over.

A portion of these changes in the track arrangements at K tower were placed in service between the hours of 7:00 a. m. and 3:01 p. m., Sunday, September 7, 1930,

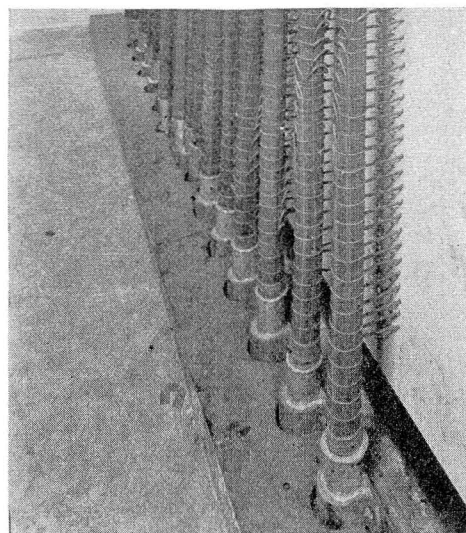


Single-line track diagram of the Philadelphia territory

thereby paving the way for the completion of the first step one week later. The change-over, made on September 7, necessitated a complete new set of mechanical locking to be placed in the old machine in K cabin. During the intervening week each switch was cut over to and operated from the new machine, and indication- and obstruction-tested to insure satisfactory operation at the time of the cut-over. Everything was then in readiness for the main cut-over, which took place September 14 between 12:01 a. m. and 7:01 a. m.

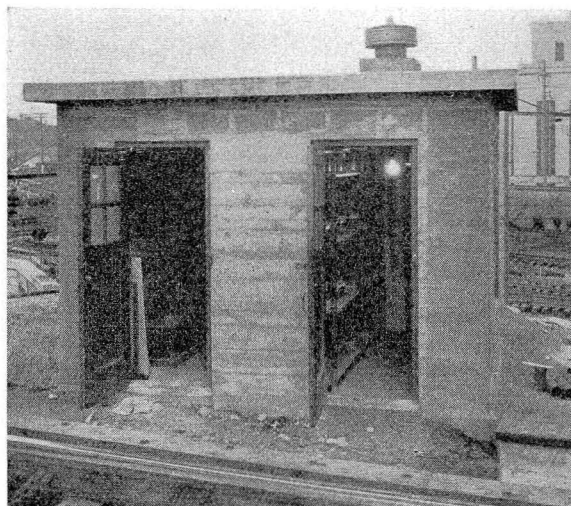
The cut-over was detailed and planned with a view to maintaining continuity of operation through the night and complete restoration of service in time for the handling of the dense traffic of the morning. Detailed work sheets were made up for all locations involved in the change-over, listing everything required to complete the work in hand. Men assigned to their respective locations were instructed in everything listed on the work sheets, and were drilled to ascertain their understanding of the necessary sequence. A man was assigned to telephone duty at each location, each man having an a-c. magneto set, connected to a line in communication with the interlocking maintainer's telephone cabinet at Zoo. The magneto sets were equipped with foot-switches, to exclude extraneous noises from passing trains. A test set-up was made with all stations cut in on the line to insure satisfactory operation under working conditions.

The signal forces were on duty at their respective stations at 11 p. m. on September 13, awaiting instructions to be issued from Zoo interlocking. With the exception



Signal cables terminating on back of terminal board at Zoo tower

Below- Combined instrument house and maintainer's supply house

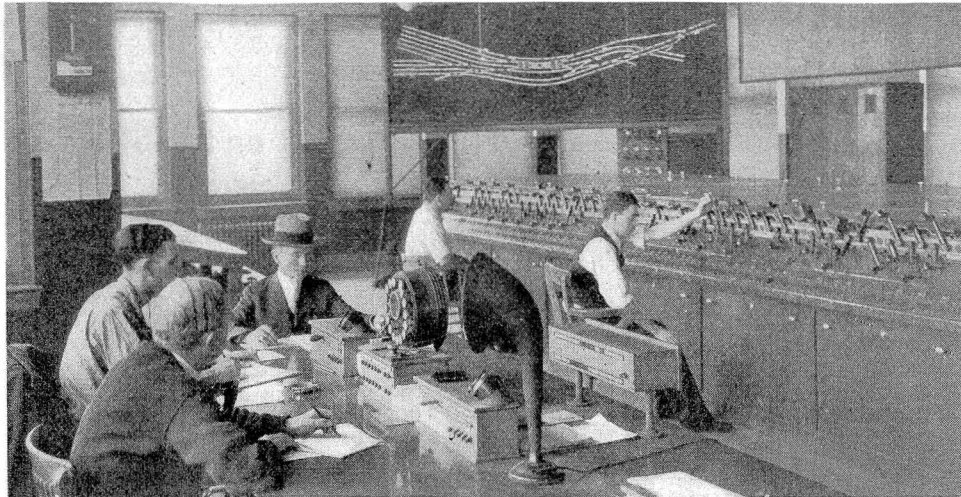


of five switches which could not be put out of service, the switches formerly operated from K tower were spiked and wedged as soon as the operating department was able to release them. At 12:01 a. m. use of K interlocking was granted for 10 min., during which time K interlocking was abandoned. The main d-c. battery was disconnected and all 60-cycle, 110-volt mains were cut loose, thereby discontinuing all sources of power at the old interlocking. The five switches which could not be secured previously were cut over to the Zoo machine, their track circuits were put to work, indication and obstruction tests were made, and the switches were then ready for operation from the new machine. The signals governing movements were permitted to display only "caution slow-speed" indications while the cut-over was in progress. All signal indications were verbally reported to Zoo interlocking for a check before being accepted by approaching trains. Operators and signal forces were in continuous touch with each other, and all train movements were followed closely at old K interlocking, those

on duty advising the forces at Zoo interlocking as to track conditions. Switches and signals were not operated until conditions on the ground were thoroughly understood.

several switch-and-lock movements, which were set up the new tracks.

The track indications were now obtainable directly from the model board for the major portion of the in-



In
Zoo
tower

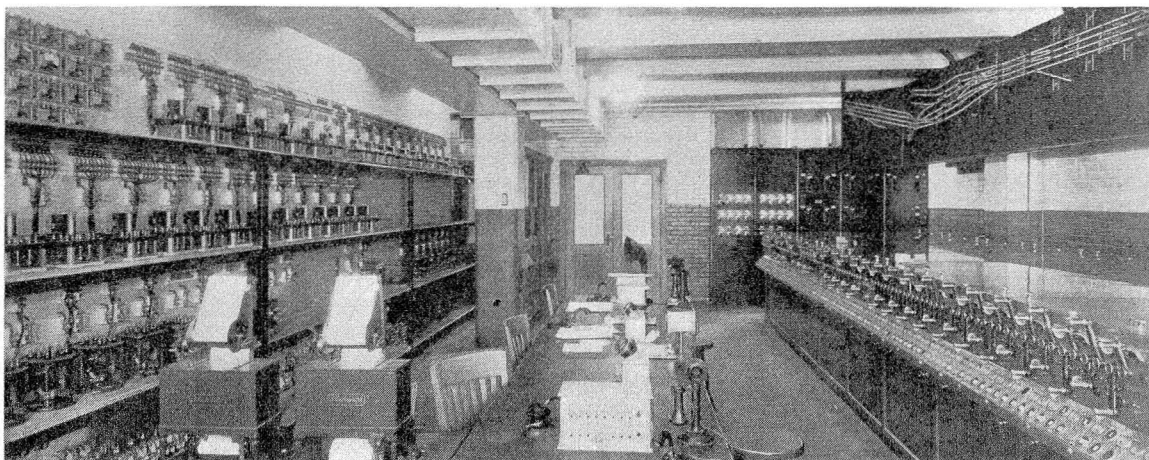
In the meantime, the entire force had been set to work in cutting in new signals, and removing old signals, for, in a few instances, old signals fouled the new right-of-way. As the new track circuits were completed and adjusted, the sections were shunt-tested at the fouling points, and the track relays and respective repeaters were observed for proper functioning. When this had been done and the man in charge was thoroughly satisfied that the sections were operating properly, the switches were released, tested, and placed in service from the Zoo machine.

At 1:35 a. m. all track circuits were operating and switches were in service, with the exception of switches and signals involved in the rearrangement of the outward tracks at the east end of the plant. This was one of the most critical points in the change-over, inasmuch as all outward tracks were involved, and the rearrangement of tracks had to be completed within specified and wired as soon as the timbers were in place. As soon as the rails were in condition to permit the passing of wire trains, they were admitted to the new tracks to change the catenary to conform with the curvature of limits of time in order to insure the availability of at least one outward track for train movements. The nature of the change at this point prohibited the installation of

terlocking, so that it was now deemed advisable to eliminate the use of the "caution slow-speed" signals in favor of higher speed indications, without, however, displaying the "clear" indications. The necessary circuit checking for the slow-speed and approach indications was obtained, together with a simultaneous check of the actual aspects displayed. After this checking had been completed at approximately 3:30 a. m., the clear controls were connected and a general check of these aspects was made.

A complete signal indication check was then begun for every possible combination of routes through the interlocking, checkers being guided by a complete set of aspect plans worked up in detail by the chief signal engineer's office.

Throughout the entire day communication was maintained between the operating forces in the cabin and the men at the telephones in the outlying locations, in order to check each aspect displayed for an approaching train before the train's arrival at the signal in question. At 7:00 a. m. all circuits not previously checked were completed and the final aspect check had been obtained over all possible routes. During the cut-over the operating department had no delays due to the transfer from old K cabin to the new Zoo interlocking.



In "Broad" tower on the Pennsylvania at Philadelphia