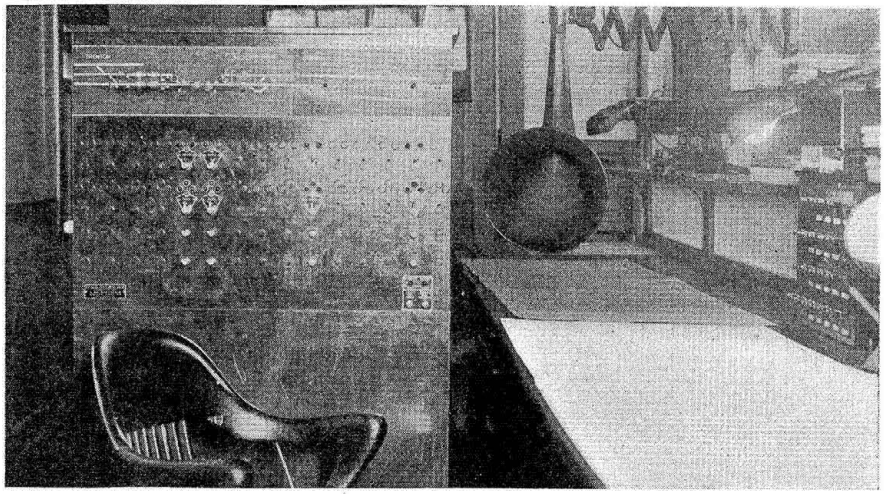
Railway Signaling

C. R. I. & P. Extends Centralized Control

System permits use of single track through section involving several bridges—

Spring switches used to advantage

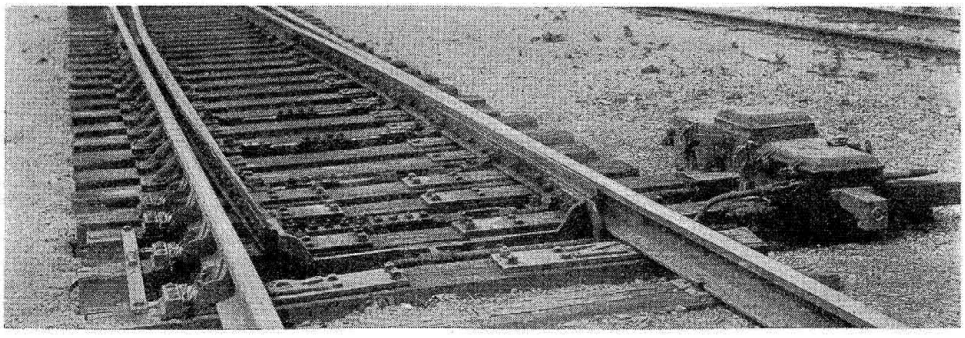


CENTRALIZED traffic control, automatic signaling, and spring switches are used to decided advantage on that section of the Chicago, Rock Island & Pacific's new line between Trenton, Mo., and Polo, 46 miles. The purpose of this new line and the details of its construction were described in an article in the Railway Age for November 21, 1931, and the application of centralized traffic control on the section between Polo and Birmingham, operated jointly with the Chicago, Milwaukee, St. Paul & Pacific, was explained in an article in Railway Signaling for November, 1931. The following article is devoted to the signaling facilities of the Trenton-Polo section.

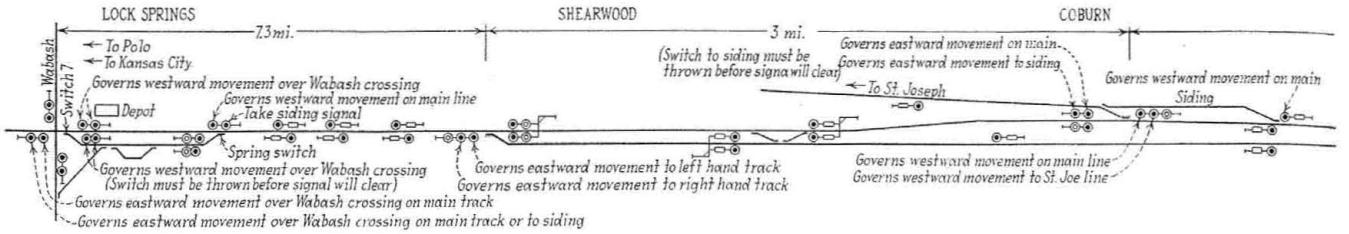
General Layout

Starting from Trenton, the Rock Island constructed 2.3 miles of double track to Lake on a revised alinement and reduced the grades to a maximum of 0.5 per cent, while between Lake and Hickory Creek, 2.8 miles, the alinement of the old single-track line was revised. It is of interest to note that this latter section includes crossings of two major streams involving steel bridges more than 720 ft. long and six trestles, ranging from 100 to 200 ft. in length, over minor streams and drainage ditches. It was estimated that the bridges which would have been required if a second track had been provided in this section, would alone have cost more than $175,000. A study indicated that centralized traffic control, including power-operated switches, would assist in increasing the track capacity of this section sufficiently to meet the requirements for years to come, thus obviating the necessity for second track. The result was that such a system was installed. As finally determined, the old single-track line was left in service between Hickory Creek and Coburn, 4 miles; beyond which point the old main line extends westward toward St. Joseph. A new second main line was constructed on a new low-grade alinement from Hickory Creek to Shearwood, from which point a track connects with the St. Joseph main line to Coburn. From Shearwood a new single-track line extends for 33 miles to Polo, at which point connection is made with the new double-track line used jointly with the Milwaukee. Passing tracks, long enough to handle tonnage trains, are located just east of Lock Springs and just east of Polo. At Lock Springs the line crosses a single-track line of the Wabash.

The signaling of this line between Trenton and Polo, therefore, involved not only automatic block but also the handling of the switches at the ends of double track at



Above—The control machine at Trenton is handled by the dispatcher Left—Dual-control power switch machine at Coburn



The track and signal plan of the centralized

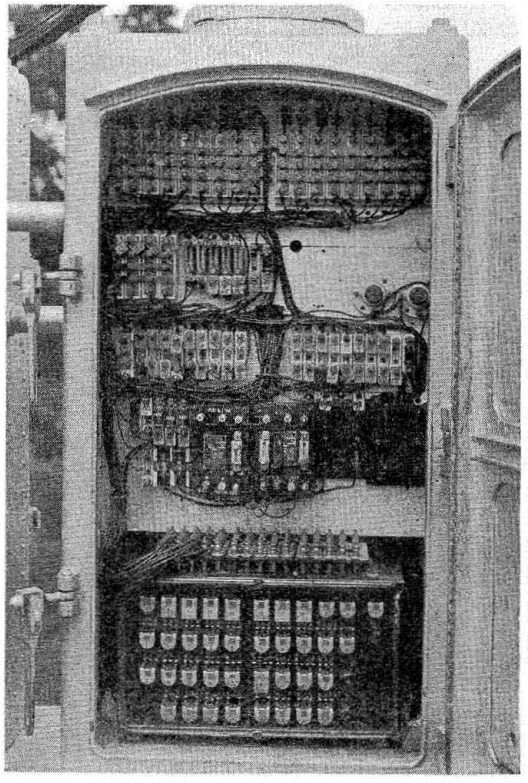
Lake, Scott and Shearwood, the junction switch at Coburn, and the passing track switches at Polo and Lock Springs, as well as the interlocking for the Wabash crossing at Lock Springs. The installation of an interlocking at Hickory Creek was considered, but this idea was discarded in favor of a centralized control system extending from Trenton to and including Shearwood, with power-operated switches at all ends of double track and principal junction switches.

The west end of the passing track at Polo is connected in an interlocking at that point, while a spring switch is used at the east end, signals being provided so that the operator can control the direction of train movements. At Lock Springs the operator handles the switch at the west end of the passing track while a spring switch is used at the east end, signals for directing train movements being controlled by the operator. Traffic-direction locking is in operation between Shearwood and Lock Springs, 7.3 miles. Therefore, all train movements between Trenton and Lock Springs are in effect directed by signal indication. The dispatcher at Trenton handles the centralized control machine at that point and directs the operators at Lock Springs. Trains are dispatched by train orders from Lock Springs to Polo.

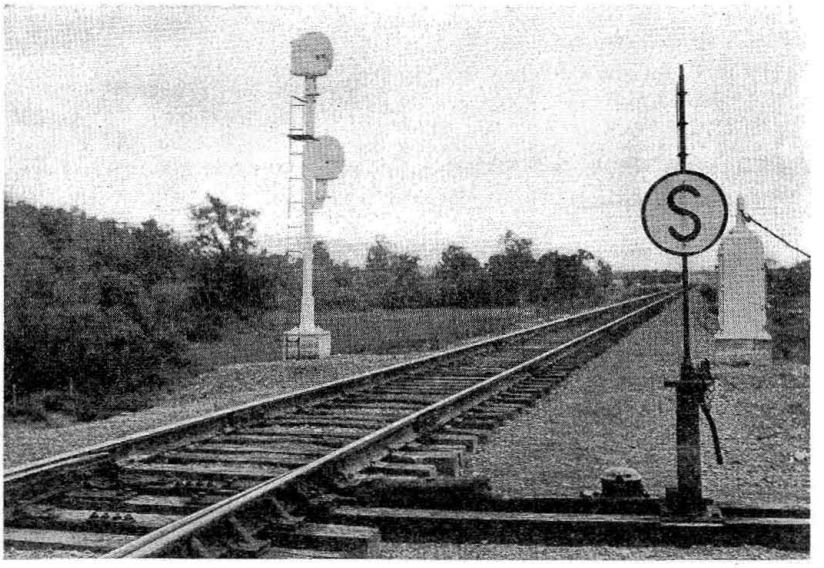
The traffic on the line between Trenton and Polo includes four passenger trains and four to five freight trains each way daily. In addition, one mixed train and one passenger train to and from St. Joseph run over this line daily between Trenton and Coburn.

The Control System

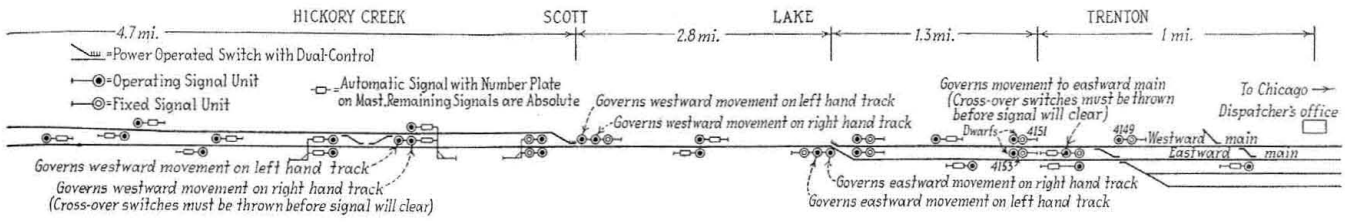
The centralized control used on this installation is the time-code system of the Union Switch & Signal Company. The machine, located in the dispatcher's office at Trenton, has four levers for switches and four levers for signals. Spare spaces are provided for 11 switch levers and 11 signal levers, so that when traffic returns to normal, power switches and signals for controlling train movements can be provided for the crossover layouts at the Trenton yard, as well as the crossovers at Hickory Creek and at Shearwood. The latter two crossover layouts are so located that a part of the main track can be used as a passenger track, thus facilitating passing or run-around moves. The code control circuit is extended from Trenton to the field stations on two line wires of No. 10 copper with weather-proof covering. The switch layouts are equipped with power machines well constructed with heavy tie plates and Morden adjustable rail braces on the four front ties. A heavy front rod, made practically according to the A. R. A. Signal Section standard, is used. The switch machines are the Union Model M22, equipped to operate in 10 sec. on 20 volts d-c. The signals used for directing train movements, as



Left—Sheet-metal instrument house at field location



Above—A disc marker is used on each spring switch



control territory and interlocking at Lock Springs

well as those used as regular automatic blocks, are of Railroad Supply Company manufacture and are of the triangular three-indication color-light type. All signals used for directing train movements are considered to be the same as interlocking signals giving a "stop-and-stay" indication. Therefore, they are so designated not only by the absence of a number plate but also by a second unit, indicating red, which is mounted on the mast 5 ft. below the top unit. The 10-watt signal lamps are rated to burn at 10 volts, but are normally fed at about 9 volts so as to lengthen the life of the filament. Approach lighting was used on all signals except those that govern movements from a siding. This permitted operating the lamps directly from the storage battery, thus eliminating power-transfer relays at all except the few continuously-lighted signals.

An arrangement of dwarf signals at the west end of Trenton is of special interest. Westbound signal 4149 is a high signal directing train movements as well as protecting the crossover switch. As the train movements out of the yard through the crossover are at slow speed, it was decided that it would be satisfactory to use a dwarf for signal 4151, since with this arrangement there would be no confusion on the part of enginemen between the two westbound signals, i. e., an engineman coming west on the main line would not have the chance of overlooking signal 4149 and accepting signal 4151 in case the crossovers were lined up and the train was about to pull out of the yard. A dwarf was used also for signal 4153. These dwarfs are of the color-light type, the bottom unit being red constantly as a second arm, while the three units above show red, yellow or green.

At each switch there is a large wooden tool box containing a spike maul, three spikes, claw bar and snow broom. The handy location of these tools proves an advantage in case of trouble or during snow storms. The box is 1 ft. deep, 2 ft. wide and 6 ft. long, being mounted upright on a pole near the switch.

The spring switches at Polo and Lock Springs are the Pettibone-Mulliken mechanical-switchman type. Eastbound trains ready to pull out of the siding at Lock Springs are governed by dwarf-signal indication the same as if a power-operated switch machine were in service.

The Interlocking at Lock Springs

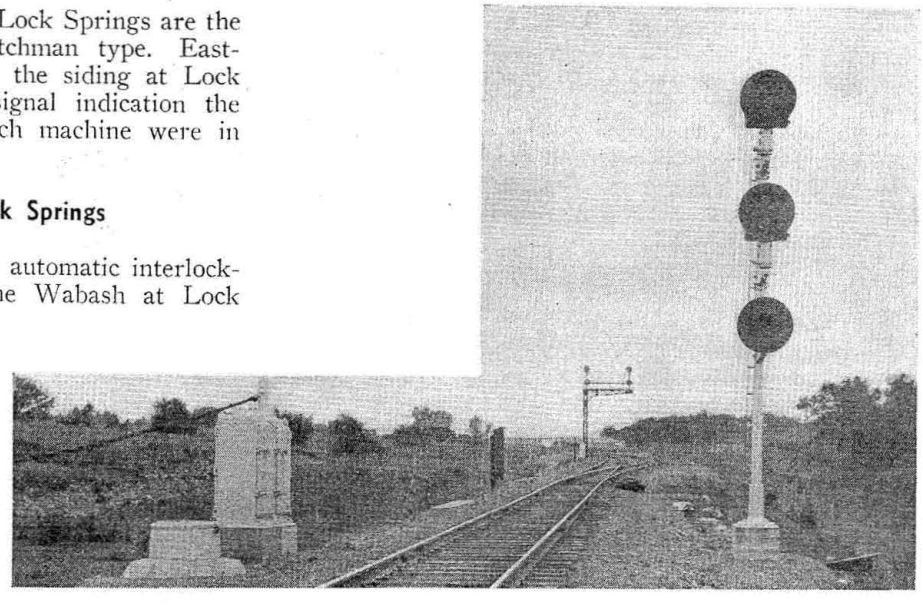
It was first planned to install an automatic interlocking plant at the crossing with the Wabash at Lock Springs. However, as it was necessary to locate operators at this point for the handling of trains, it was decided to place the control of the plant in the station so that the operator could give preference to certain passenger and heavy freight trains. Furthermore, the operator has charge of directing train movements into and out of the passing track.

The control board for this interlocking is rather unusual, being very simple in operation. An ordinary telephone-type key is used as each lever, the lever being located on the board in a position corresponding to that of the signal. The lever is moved forward, in the direction the train movement is to be made, to clear the signal, and is returned to the center position for normal. The signal indications are repeated by small lamps located near the levers. Likewise, the same type of lamp is used to indicate the position of switch 7.

Levers 9 and 10 are for the control of the dwarfs leading off the passing track, while signals 10 and 12 control train movements into the next block to Shearwood and are controlled by traffic-direction locking in conjunction with the dispatcher at Trenton. The lever at the lower left of the board is the check-lock lever, which must be set in co-ordination with the traffic direction lock lever at Trenton before signals can be cleared for either direction between Shearwood and Lock Springs. The control circuits for the Lock Springs plant are basically the same as for an automatic interlocking with the lever control of signals injected therein.

Power Supply System

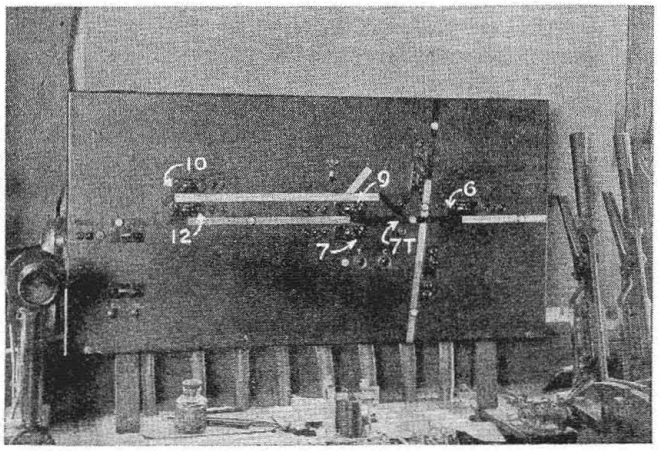
The power supply is of the a-c. floating type. The 550-volt 60-cycle line feed is carried on two No. 6 copper wires with weather-proof insulation on porcelain insulators. General Electric Type-TC air-cooled 575/115-



Right—End of double track at Shearwood

volt distribution transformers are mounted on the cross-arm and are protected by G. E. compression-chamber arresters, and the feed circuit to the primary is broken through porcelain plug-type fused cut-outs. The line transformers are of several different capacities, ranging from 75 v. a. to 500 v. a., depending on the load at the respective location. The 115-volt a-c. circuit is extended from the line transformer to the relay case where a double-pole knife-switch with cartridge fuses is connected into the circuit feeding the rectifier and light transformer, where used.

At each layout involving a power switch a set of 12 Exide DMGO-9 cells is used for operating the switch, line controls, etc., the batteries being housed in battery wells. Union rectifiers are used for charging these batteries. At each automatic signal location there is a battery of five Exide DMGO-7 cells. The storage cells used on track circuits are Edison BH4 and Exide DMGO-9. Balkite rectifiers are used for charging all the automatic signal and track circuit batteries. The storage battery is housed in the lower part of the instrument case, this compartment being open from front to back, the case having a door on both the track and field sides.



The control panel at Lock Springs

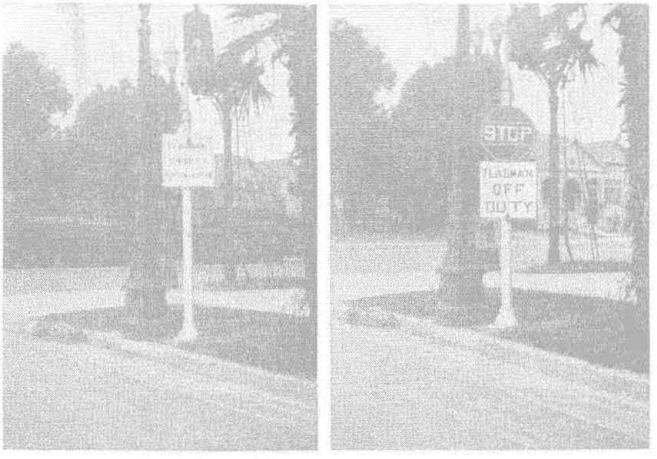
Above the battery section, a wooden partition extends to the top of the case, the relays being located on the track side and the rectifier transformers, etc., on the field side. The wires of the line cable terminate on R. R. S. three-way arresters mounted at the top of the board. Wall-mounted brackets are used for the relays, a coil spring supporting each corner of the relay. The jumpers are made of No. 16 Pullman special flexible wire, run directly from arrester or terminal to relay terminal. Porcelain enameled insulated bridle rings, screwed into the partition, are used to hold these jumpers in place. The track relays are Style-R 4-ohm and the polar-line relays are Style-S2 500-ohm.

The cables from the line to the relay cases are made up of No. 14 single-conductors with 3⁄64-in. insulation except for the 115-volt a-c. circuit which is No. 9 with 5⁄64-in. insulation. The messenger is No. 8 Copperweld wire using ties made of scrap pieces of No. 14 insulated wire. The circuits extending under the track to the signal on the opposite side are in six-conductor No. 14 cable with a lead protection and two wraps of steel tape. Each insulated conductor is covered with braid. The track connections from the relay case to the rail are single-conductor No. 9 parkway with two wraps of steel tape but no lead. No braid is used on these No. 9 conductors. At the rail, the parkway cable is brought up through a riser made of second-hand boiler flues or two-inch pipe and is joined to a piece of No. 6 Copperweld bond wire which is bonded into the rail. The joint is pushed back into the riser which is then filled with asphaltum. Each rail joint is bonded with two No. 8 galvanized iron bond wires using single 3⁄32-in. channel pins, the bonds being placed behind the angle bars. The insulated wire and parkway cable were purchased according to Rock Island specifications.

As this is a new section of railroad there is no way to determine the economic benefit derived from the centralized traffic control facilities. However, even with the comparatively light traffic prevailing at present, the advantages of having the signal facilities are readily apparent. Furthermore, as mentioned previously, the centralized control was the major factor in deferring indefinitely an expenditure for a second track and for heavier bridges between Lake and Hickory Creek.

Flagman Sign on the S.P.

THE Southern Pacific has recently developed a special signal to warn highway users whether a flagman is on duty at a crossing where part-time watchman service is in effect. The sign is mounted on a pipe post at the right curb approaching the tracks. During the hours when the flagman is on duty there is displayed to the street traffic a sign reading "Flagman on Duty 6:45 a. m. to 10:45 p. m.," this statement being changed to meet the conditions in each case. This sign is hinged at the bottom and held with a hasp and padlock at the top. When the flagman is preparing to go off duty he unlocks the lock and swings the sign down, fastening and locking it in the lowered position. Lettered on the back of the sign, and now displayed to the approaching traffic, are the words "Flagman Off Duty," while above this sign, and in a position previously covered, is a standard boulevard "STOP" sign. During hours of darkness the sign is illuminated by an electric light in a reflector, so arranged to direct the rays on the sign. At San Jose, Cal., where several of these new signs are in service, the boulevard STOP sign was readily adaptable because the tracks of the Southern Pacific are located in a street.



The large square sign is raised to cover the "STOP" sign when flagman is on duty

This combination sign has proved very effective in that it warns the highway driver that there is a flagman to watch for during the hours when he is on duty, while at other times the sign warns the driver that he must stop and protect himself as no flagman is on duty.