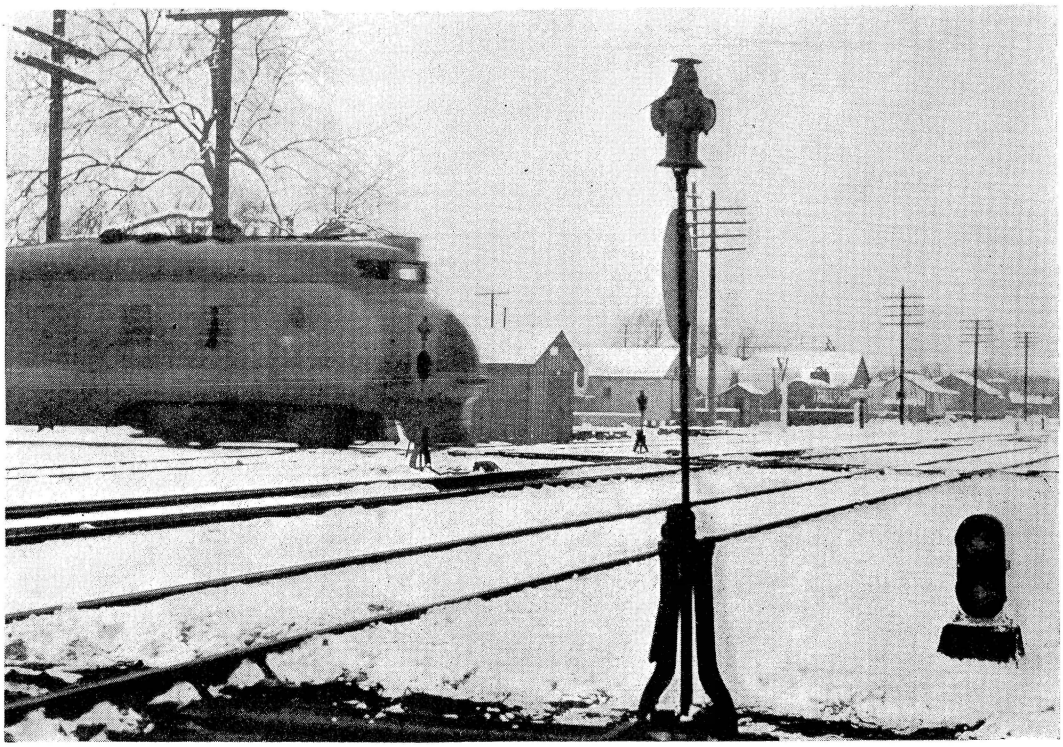


A Union Pacific Streamliner using the Rock Island track over the interlocked crossing while turning on the wye

34 Train Stops Eliminated Daily by an Interlocking

INTERLOCKING signals placed in service recently by the Union Pacific at Topeka, Kan., where a branch line of the Chicago, Rock Island & Pacific crosses a double-track line, have made possible the elimination of 34 regular train-stops and the consequent delays to important freight and passenger trains. The work of switching crews in yard service has also been greatly facilitated in the vicinity of the crossing by the new signaling and all traffic is being handled more expeditiously than formerly was possible.

For many years the Rock Island has used the Union Pacific double track from Kansas City, Mo., to Topeka, on a line following the north bank of the Kansas river. At a point near the new interlocking in Topeka, however, the Rock Island trains return to their own line, running westward on the south side of the river. This junction of the two railroads involves a double slip-switch crossover near the Union Pacific passenger station and freight-house tracks. As the junction layout must be used in a large number of the switching movements, and on short notice for passenger trains departing from the station, a switch tender is required for operation of the double-slip crossover and the adjacent switches. Furthermore, as the Rock Island branch line, connecting Topeka and St. Joseph, Mo., crosses

At the Rock Island branch line crossing of the Union Pacific main line at Topeka, Kan., a simple interlocking signal layout has been installed in order to facilitate important freight and passenger train movements and to expedite yard work

the U.P. main tracks at a point only 600 ft. west of the switch-tender's shanty, the interlocking signals at this crossing were, logically, placed under his control.

The principal benefits being derived as a result of this installation are due to the elimination of the crossing stop. Formerly, all trains were required by rule to stop and send a flagman to the crossing before proceeding. For long freight trains, this often gave rise to an eight-minute delay. Delays to westbound U. P. trains frequently occasioned considerable complaint from motorists and local civic organizations, since the main business street, a state highway and several city streets of minor importance were blocked by the larger trains. Now, however, all trains operate over the crossing by authority of the interlocked signals under a 15-m.p.h. speed restriction which applies only to the time during which the locomotive is passing between the governing signal and the crossing frogs.

Traffic over the interlocking includes approximately 60 switching movements daily. Three switching crews operate in the vicinity and part of their work involves meeting the through trains to assist in picking up and setting out cars. Passenger traffic on the Union Pacific comprises 12 trains daily and freight

traffic 18 trains. The Rock Island traffic over the branch line consists of two passenger and two local freights daily. In addition, the U.P. streamliner, operating between Kansas City and Salina, Kan., with an additional run between Kansas City and Topeka, utilizes the Rock Island crossing and the connecting wye tracks in turning around during its secondary run. The two roads use the U.P. station in North Topeka jointly.

Interlocking Layout

Union Style-N2 color-light dwarf signals were installed on the eight approaches to the crossing, all signals having two aspects, red and yellow. The southward Rock Island signal was located 265-ft. north of the crossing owing to the proximity of an industry track and a curve, which interfere with the view. The northward signal is somewhat closer. The Union Pacific signals were located approximately 200 ft. from the crossing, excepting signal 6 which was placed nearer in order to avoid the necessity for an additional signal on an industry track.

Two crossovers within home signal limits are necessary to facilitate switching. These switches are hand-thrown and are equipped with circuit controllers, which actuate switch repeater relays entering into the signal control circuit combination.

Controlled by Switch Tender

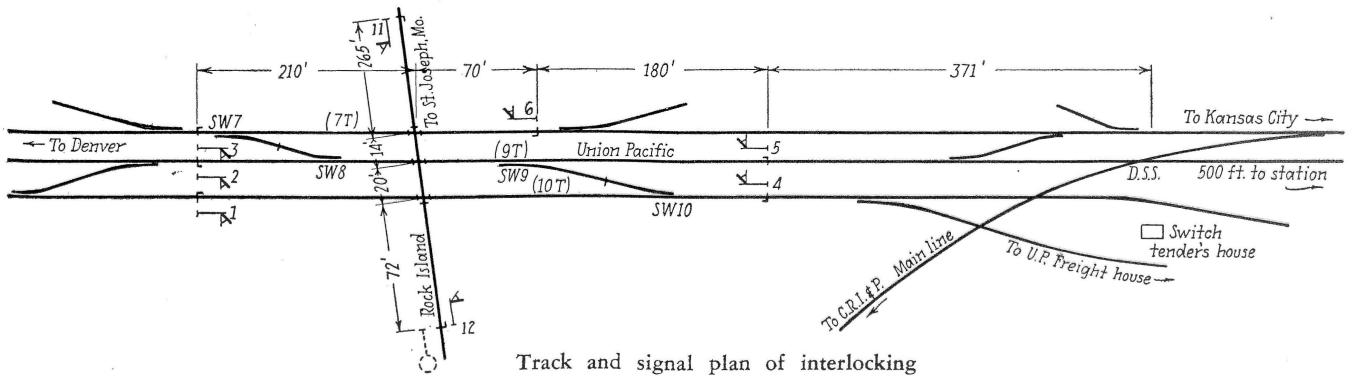
As has been indicated, the switch tender controls all of the signals from his station at the double-slip switch near by. He causes all signals on either road to assume the *proceed* aspect by operating a three-pole double-throw knife switch, while all signals on the other road assume the stop aspect automatically. If the knife switch is left open, all signals are set at *stop*. However, a 1½-minute time interval is automatically imposed between the time the selector switch is operated and the time the signals assume the *proceed* aspect. This form of time locking is necessary, of course, to prevent a change in signal authority without the certainty that all trains moving toward the crossing have had time to observe the change in signal aspect and to stop short of the crossing or to occupy the track circuits, there being no approach locking. Track circuits extend between opposing home signals only. The signals are semi-automatic in that they are subject to track occupancy.

In consideration of the relative importance of the two lines, the U.P. signals are normally set at *proceed*. This arrangement facilitates switching movements, which are principally on the U.P., and requires a minimum of selector-switch manipulation.

Circuit Arrangements

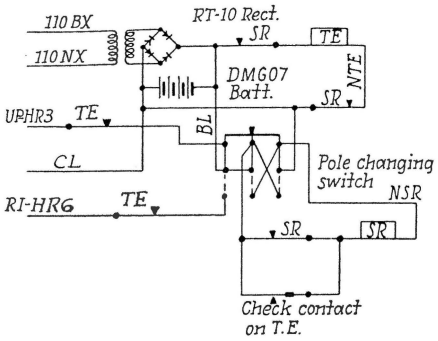
Two HR circuits, designated UP-HR and RI-HR, originate at the selector switch for the control of the signals and other HR relays at the crossing. Separate HR circuits and relays are necessary in the control of signals 2, 3, 4 and 5 owing to the dependence of these units on the alinement of the crossover switches. The latter circuits, however, are subject to the main UP-HR relay. For each of the two U.P. crossovers, a normal-repeater and a reverse-repeater relay are controlled through contacts in the two switch circuit controllers connected in series, normal and reverse. These relays enter into the U. P. HR circuit combination.

Eastbound Union Pacific train passing over the crossing—Note the three color-light dwarfs in the foreground



Track and signal plan of interlocking

Separate HR relays are required for each of the two Rock Island signals because signal 11 also governs trains approaching a Rock Island interlocking situated approximately ½-mile south, across the river. Thus, if a long southbound freight train is to be detained at the Rock Island interlocking, it should not be permitted to cross the U.P. tracks and



Signal control circuit at switch tender's shanty providing time interval between each change of line-up

thereby delay other trains unnecessarily. The control of relay 11HR provides for holding southbound Rock Island trains short of the U.P. crossing unless the distant signal has been set at *proceed* and a through route set up. All HR relays select between the corresponding yellow and red signal units, the lamps being fed through front and back contacts, respectively.

In addition to selecting the signal control circuits, the knife switch at the switch-tender's station is connected as a polarity changer for a circuit energizing a neutral relay, normally in series with one of its own front contacts. This polarity reversal, resulting from changing the switch position, is insurance against failure of this stick relay to release properly, as it otherwise might, as a result of a slight retardation characteristic or residual magnetism when the knife switch is thrown quickly. Relay SR, the stick relay, controls a circuit feeding a DT-10 time-element relay such that it also is normally energized. This timing relay, when de-energized, opens both of the main HR signal-control circuits. Furthermore, the checking contact of this unit constitutes the pick-up circuit of the stick relay mentioned, insuring that the former has released fully before the latter can be reset.

The function of this apparatus is, of course, to provide the necessary 1½-minute interval between the withdrawal of the signal authority from one road and granting it to the other, as previously outlined. The cycle of operation may be traced as follows: The switch tender, desiring to change the signal line-up, reverses the knife switch. This breaks the stick-relay circuit, de-energizing relay SR, which double-breaks the normally-energized time-element circuit, causing the relay TE to release. Dropping the timing relay, in turn, breaks all HR circuits, holding all signals in the most restrictive aspect. If relay TE releases completely as it should, the checking contact closes the pick-up circuit of relay SR, which will then stick up, and the timing cycle commences. After the 1½-minute interval the timing relay, remaining energized, closes the HR circuits again and the new line-up is thus established.

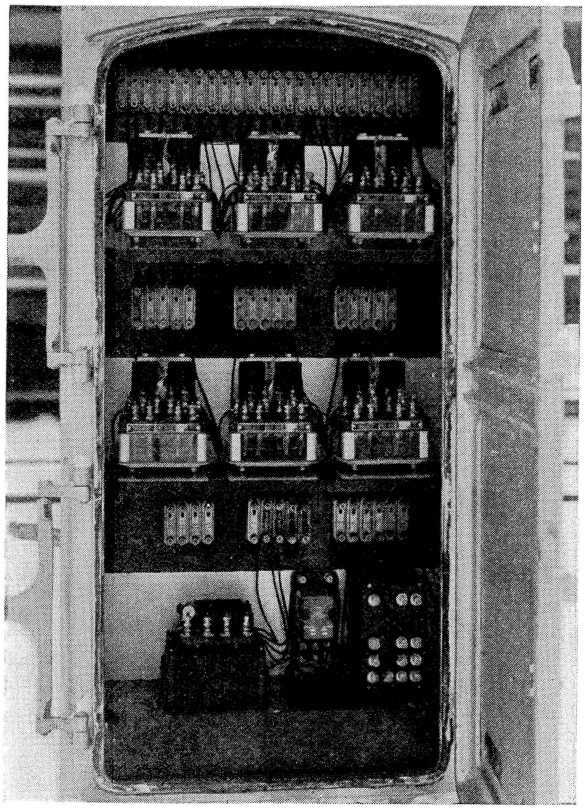
Equipment and Construction

All outside wiring is composed of Okonite parkway cable, having a bronze-tape protective armor. A five-conductor cable extends from the control station to the nearest instrument case, at signals 4 and 5. From this point a 14-conductor cable extends to a double instrument case at the crossing. A seven- and a three-conductor cable connect the main instrument housing with the signals west of the crossing.

Track and light-circuit wires are No. 6 A.W.G. solid copper. Each track lead is connected at the trunking riser to an 8-ft. No. 8 solid Copperweld bond wire and the soldered joint pushed down into the riser, the other end being bonded to the rail. The trunking risers extend 1¼ in. above the base of the rail and are placed ½ in. from the outer edge.

All signals are normally lighted with double-filament 10 plus 3.5-watt 8-volt lamps normally fed by alternating current. When necessary, an ANL-30 power-off relay transfers the lighting circuits to the d-c. standby, which consists of a four-cell Exide DMGO-9 storage battery floated with an RX-21 rectifier and a W-10 transformer. All track circuits are energized by three-cell 500-a.h. Edison primary batteries. A four-cell DMGO-7 battery and an RT-10 rectifier supply energy to the control circuits originating at the switch shanty. All batteries are housed in concrete boxes.

The track relays are of the DN-12 square-base type with 4-ohm coils. The HR and WP relays are of the same type but with 670-ohm coils. At the main instrument housing the underground wires are terminated on porcelain-based terminals mounted above the relays on the terminal boards. Flexible leads extend from these terminals to the relays, which rest on the shelves through spring-mounting plates.



The instruments at the crossing are housed in a large-size sheet-metal case having two compartments

This signal project was planned and installed by the regular forces of the Union Pacific. The principal items of material were furnished by the Union Switch & Signal Company.