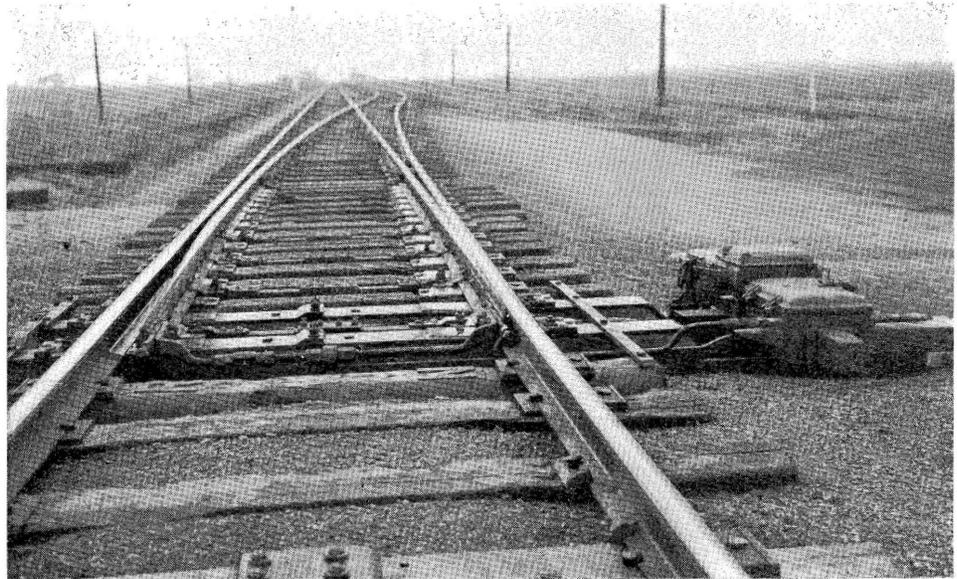


Railway Signaling

Remote Control Switch Expedites Trains

at a Junction on the Union Pacific

The power switch machine at location "C"—Note plates and rail braces

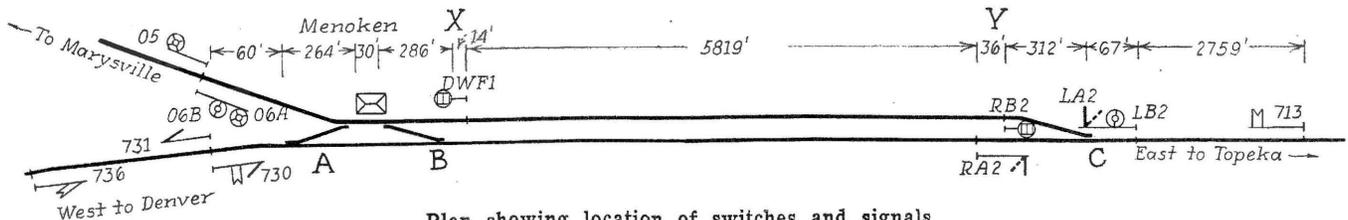


AT MENOKEN, Kan., five miles west of Topeka, the Union Pacific has installed a remotely-controlled power switch and signals to facilitate train movements at a junction of two main lines. On the Kansas City-Denver route, the main line is double track from Kansas City to Topeka and single track from Topeka westward to Denver. At Menoken, five miles west of Topeka, a single-track main line branches off to the northwest, extending through Marysville, Kan., to Grand Island Neb., and Gibbon, where connections are made with the Omaha-Ogden main line of the Union Pacific. Through freight traffic between Kansas City and West Coast points is routed via the Marysville line. All through passenger traffic between Kansas City and the West, as well as freight to and from Denver, is routed via the Topeka-Denver line. On the average, the traffic through Menoken to and from the Marysville line totals 4 passenger and 18 freight trains

daily, and the traffic on the Denver line includes 8 passenger and 4 freight trains daily, thus totaling about 34 train movements through the Menoken junction daily. The difficulty of handling trains through this junction is increased by reason of the movements being bunched during certain periods. For example, between 8 p.m. and midnight there are two freight trains northward to the Marysville line and two southward from this line, as well as one freight train in each direction and a westward passenger train on the Denver line. These train operations are so close together that movements must be made through the junction without stops or delays; otherwise, the entire operation would be disrupted.

As will be noted on the track plan, two tracks extend between the cross-

over layout at Menoken, marked *A*, and the single switch location marked *C*. Under the previous method of operation, the single switch at *C* served as the junction switch, an operator being located here to handle train orders and to operate the hand-throw stand of the junction switch. With this arrangement, the section of track between points *X* and *Y* could be used as a passing siding for trains of the Denver line, only by permission of the dispatcher. When used as a passing siding by trains of the Marysville line, the northbound train occupied the siding and the southbound train moved to the main track through crossover *B*, and in both instances, the trainmen operated the hand-throw switches of crossovers *A* and *B*. The movements on both tracks were governed by signal indications.



Plan showing location of switches and signals

Signal 06A, is also under manual control of the operator and a special rule provided indications as below:

Red—Passing track is occupied, or, must not be used.

Yellow—Passing track may be used to the dwarf signal near east end of passing track.

Green—Passing track may be used, and the east switch is lined for Eastern subdivision main track.

Signal 06B is entirely automatic and will display a yellow light when the switches of crossover *B* are lined for movement to the Denver line and block 730 is clear. Under this arrangement, when the siding was occupied, the operator could stop a train at signal 06A and instruct the crew to enter the main track through crossover *B* or wait until the train on the siding has moved.

A study of the train operation in this vicinity, developed the necessity for improvements to eliminate the delays incident to stopping trains for instructions, also the handling of switches by trainmen. It appeared this could be accomplished by power operating the two crossovers *A* and *B* and controlling them from the office at the single switch *C*. However, this plan required a total of four switch machines and several signals and after a further study, it was decided that the same results could be accomplished by moving the office to a new location near the two crossovers so that the operator could handle these switches by handthrow stands. To complete the arrangement so that trains on any route need not be stopped to handle switches, the single switch at *C* was equipped for power operation, only one switch machine and one additional signal being required, and this switch with the necessary signals being controlled from the office in the new location at *B*.

With this new arrangement, the single switch at *C* can be used as the junction switch under such circumstances, as only one train is involved. When it is necessary to use the section of second track between *X* and *Y* as a passing siding to hold a train, then crossover *B* can be used as the junction to route trains to or from the Marysville line, this crossover being operated by hand-throw stands handled by the operator.

Signaling Arrangement

At location *C*, a single-arm semaphore automatic signal, with a searchlight signal unit attached to the mast 10 ft. below the semaphore, had been in service at a point 67 ft. from the facing point of the switch. The lower unit governs trains moving through

the turnout to the Marysville line. This signal was left in place and converted to an interlocking signal and designated as LA2 and LB2. An existing eastward automatic signal of the semaphore type and a color-light dwarf signal, both approximately 348 ft. west of the switch, were also left in place and were likewise converted to interlocking signals by superimposing additional control circuits. These signals are designated as RA2 and RB2.

Two-Lever Desk Machine

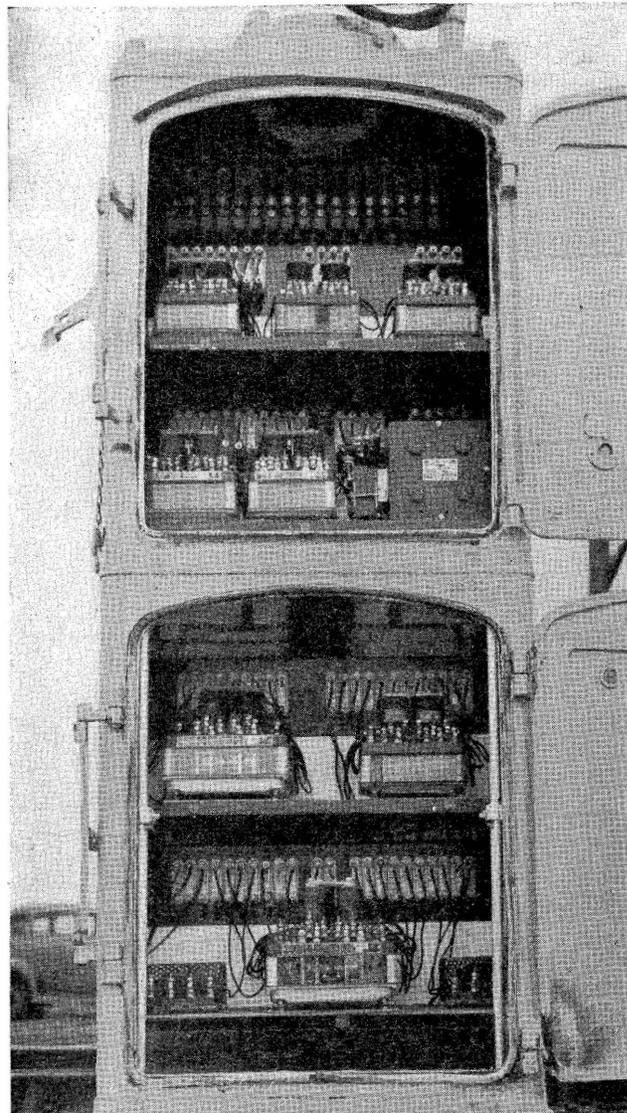
The switch machine and signals at location *C* are controlled by two desk levers on the operator's table in the office at the new location *B*. Lever No. 1 controls the operation of the switch machine at location *C* designated as SW1. Lever No. 2 controls the signals, this lever standing normally on center to cause all signals to indicate stop. When switch SW1 is lined for the through route on the

main line, lever No. 2, when moved to the right, causes signal RA2 to clear for an eastward train, and when moved to the left, clears signal LA2 for a westward train.

When the junction switch SW1 is reversed by moving lever No. 1, the control of the signals is selected through the controller on the switch, so that when lever 2 is moved to the right, dwarf signal RB2 clears to direct an eastbound train to move through the turnout on to the single-track main line. When the lever is moved to the left, the lower searchlight unit signal LB2 clears from red to yellow, authorizing a westward train to proceed from the single track over the turnout to the Marysville line.

Signaling for Hand-Throw Crossovers

In order to protect train movements in the vicinity of crossovers *A* and *B*, the controls of existing signals, 06A, 06B, 730, and the new dwarf signal



The instruments are housed in double cases

DWF1, are checked through relays which repeat the position of these switches, and, in addition, further control of signals 06A, 06B and DWF1 is established through single-throw knife switches on the operator's desk. If an eastbound train from the Marysville line is to be routed through Menoken on the second track and on to the main line at junction switch C, the operator reverses switch lever No. 1 and moves lever No. 2 to the right, clearing dwarf signal RB2. Then with the crossovers *A* and *B* normal, he closes the knife switch, which completes the circuit to cause signal 06A to display the aspect green over red, the control of relay 06HR being also checked through the track circuits intervening between signals 06 and 713, as well as through the relays that repeat the position of the crossovers and the switch SW1. Thus the knife switch provides a means for the operator to control signal 06 independently of the occupancy of track circuits, thereby affording a means by which he can hold incoming trains at signal 06.

Red Over Yellow on Signal 06

On the other hand, if an eastward train from the Marysville line is to

be routed over crossover *B* to the main line, the switches of the crossover are thrown, and if the track circuits between 06 and DWF1 as well as on the main line between signals 730 and 713, are unoccupied, then the lower unit of signal 06 will change to yellow to present an aspect of red over yellow, authorizing the train to proceed on the route over crossover *B* to the main line. If the train is to be routed through layout *C* without stopping, the operator moves signal lever 2 to the right, clearing signal RA2.

Control of Signal DWF1

Westward dwarf signal DWF1 is so controlled that it normally indicates yellow for proceed as long as track circuit between this signal and signal 06 is unoccupied, the switches of the two crossovers are normal, and the home relay for signal 05 is energized. If a westbound train waiting on the second track is to be routed to the Denver line, the operator reverses the switches of crossover *A*, which selects the control of signal DWF1 so that it will display yellow for proceed, provided no trains are occupying track circuits controlling signals 731 or 730, a time-element contact be-

ing arranged to parallel the contact in relay 730HR to eliminate unnecessary delays under certain circumstances, which are obvious.

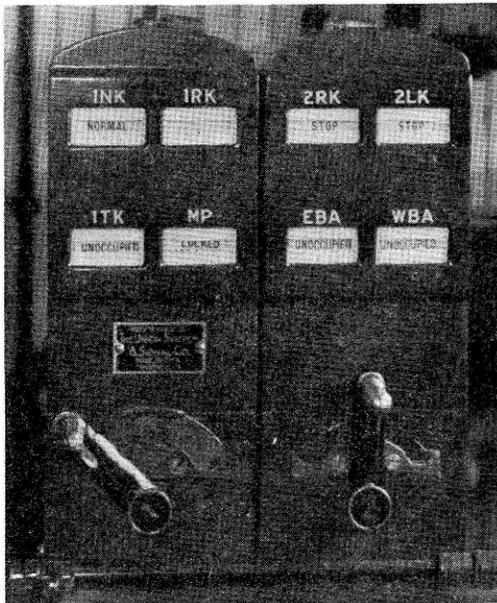
During certain periods of the 24 hours, westward trains are operated so close together that there may be some question in the operator's mind as to whether an approaching train is to be routed to the Denver line or to the Marysville line. In order to prevent any delays on this account, a whistle signal system was installed. At a point three miles east of Menoken, a microphone was installed on a telegraph pole, and energy to feed this device is cut in when a train occupies the track circuit in this vicinity. When a westward train passes this microphone, the engineman operates the locomotive whistle, the sound being picked up by the microphone and transmitted to a loud-speaker in the office at Menoken. For a train going to the Denver line, one long blast of the whistle is sounded, and for a train to the Marysville line, one long and one short blast is sounded.

Signaling Construction

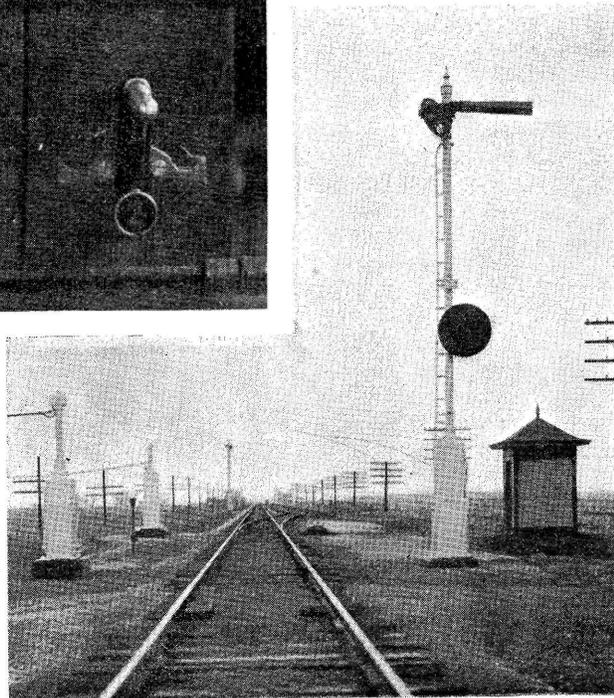
The single switch *C* is a No. 14 turnout with 24-ft. points, which are equipped with roller bearings. The power switch machine is a Style M-22 dual-control switch and lock movement. The main battery for the operation of the switch machine consists of 12 DMGO-9 Exide lead cells, the switch being operated from one position to the other in a period of 10 sec. This battery is also used to feed certain control circuits. Each track circuit is fed by a set of three cells of Edison 500-a.h. primary cells with a rectifier connected to carry the major portion of the load.

At Menoken office, a set of four cells of Type DMGO-7 cells are used to feed line control circuits. The control circuits between the Menoken office and the remotely-controlled switch are carried on signal department pole line in open line construction, using No. 9 Bethanized bare line wire. These circuits require 2 wires for switch control, 1 lock wire, 4 signal wires, 2 indication wires, 1 common, and 1 annunciator wire, totaling 11 wires.

This installation was planned and installed by the signal department forces of the Union Pacific, the principal items of signaling equipment being furnished by the Union Switch & Signal Company. A special feature of the program was that the office was moved from the old location to the new one and service was re-established under the new control system, within a period of 25 min., no train movements being delayed.



Two desk levers form the control machine. Lever No. 1 controls the switch at C and Lever No. 2 controls the signals at that switch



Westward home signals at location C. Signal LA2 above and signal LB2 search-light unit, below