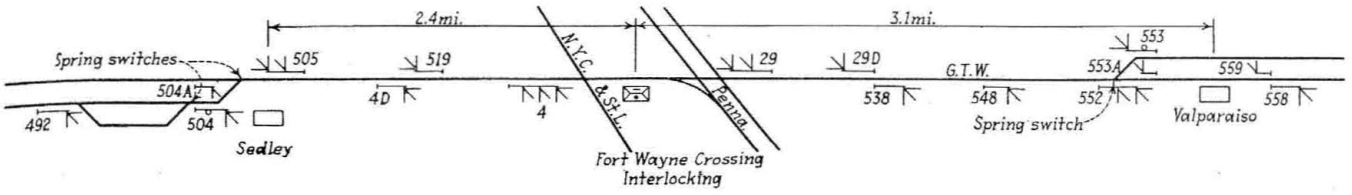
C. T. C. Replaces Staff on G. T. W.

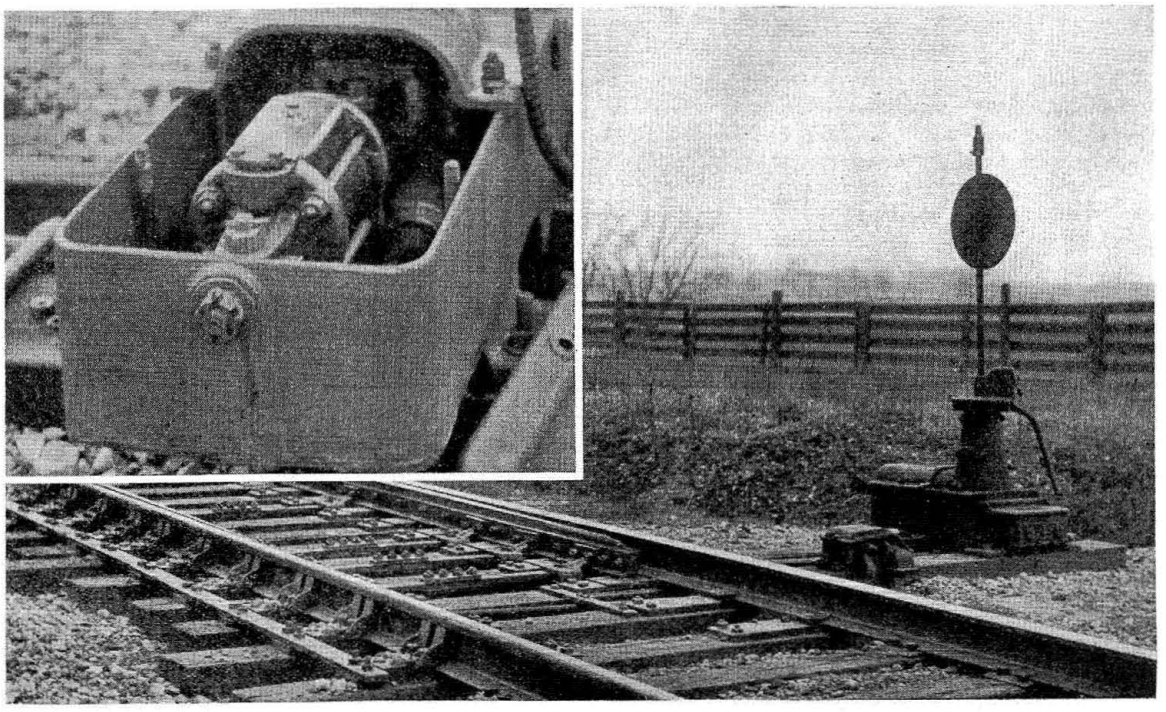
Train movements directed by signal indications, controlled manually — Spring switches used at ends of double track — Interlocking also eliminated



CENTRALIZED traffic control, together with spring switches, has been installed by the Grand Trunk Western to replace an interlocking and a staff system on a 5¼-mile section of single track, extending between two ends of double track at Sedley, Ind., and Valparaiso. When the second track was laid on other parts of this division in 1902, the construction of the second track on the section between Sedley and Valparaiso was postponed indefinitely, on account of the large expenditure required to construct a new line to eliminate the curves and grades. In order to protect train movements over the section of single track, a staff system was installed. A four-lever mechanical interlocking was installed at Sedley to handle the end-of-double-track switch and a passing-track switch. Operation of this plant required three men, 24-hour service being maintained. The end-of-double-track switch at Valparaiso was hand-thrown, handled by the operators on duty at that point.

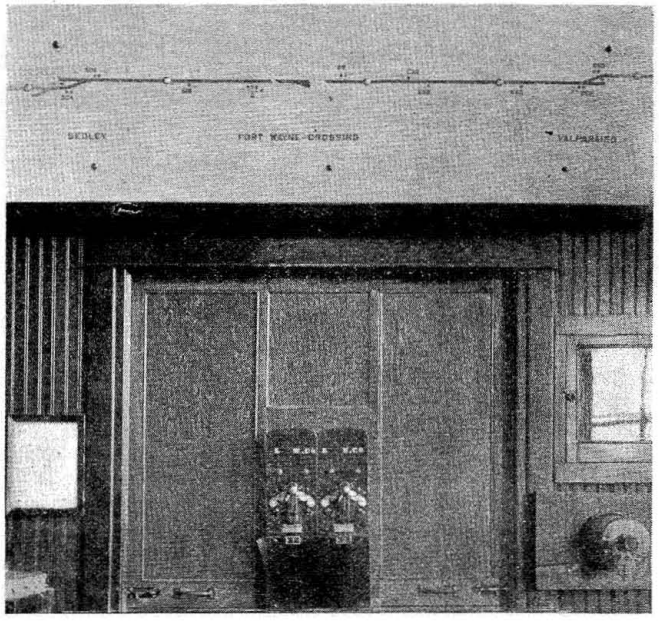
A disadvantage of operating trains with the staff system, using an absolute block, was that permissive following movements could not be made. Furthermore, considerable time was lost at each end of the single track in handling the staff. In order to reduce delays and increase the capacity of this single track by permitting following moves under signal protection, it was decided to replace the staff system with centralized traffic control, whereby signals at each end of the double track would be used for directing train movements, the signals to be controlled by a machine in the operator's office at Valparaiso. As a part of the improvements, spring switches were installed for the passing track and end-of-double-track switches at Sedley, thus permitting the removal of the mechanical interlocking and block office at that point. In order to eliminate delays occasioned by the operator handling the end-of-double-track switch at Valparaiso, a spring switch was installed at that location also.

At Valparaiso, signal 553, a two-"arm" color-light signal, controls westward train movements from the west-



Upper left—Cover removed to show buffer and springs in spring-switch mechanism . . . Lower—Spring-switch layout; note heavy braces and plates

ward main track to the single track. The top "arm" displays one of three aspects: red, yellow or green. The bottom arm is a fixed red light. This signal operates as a color-light, semi-automatic, interlocking home signal, the yellow-over-red indication giving authority for a second train to make a permissive movement into the occupied block. The automatic features in the control of this aspect are such that it will not be displayed until the preceding train has passed beyond the eastward home signal at Ft. Wayne Crossing interlocking. Signal 553A, a two-position searchlight dwarf, displaying red or yel-



The illuminated diagram, giving information as to track occupancy and other indications, is mounted over the two desk-levers

low, directs westward train movements from the eastward track to the single track. Signal 559, also a searchlight dwarf, is the distant signal for signal 553A.

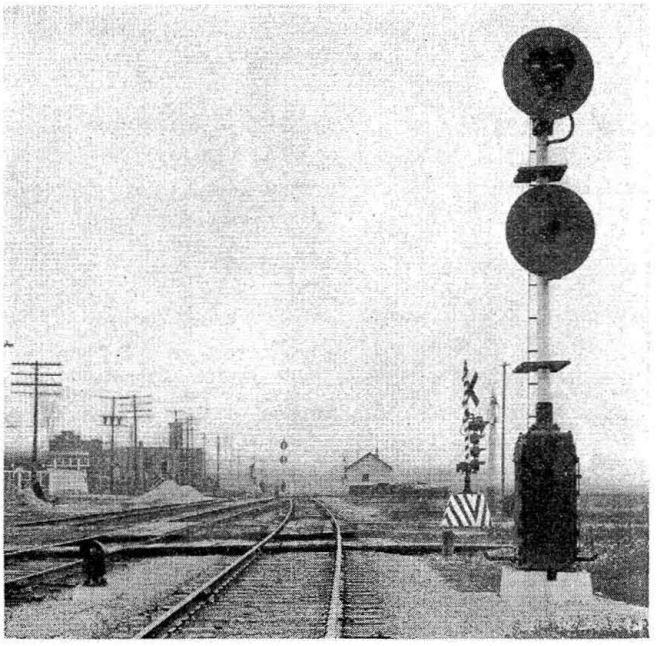
Signal 552 is an automatic signal, the top "arm" of which has three aspects, red, yellow and green, depending on the occupancy of the automatic blocks ahead and the position of the switch. The lower arm has two aspects, red and yellow, being normally red. If the spring switch is open more than $\frac{3}{16}$ in., or if the detector track section is occupied, signal 552 displays an aspect of red-over-red. Instructions require an engineman, encountering such an indication, to stop and inspect the switch, and, if it is all right, to move forward on a hand signal. If the automatic block is occupied, the top arm will, of course, display red. However, even in such a case it is desirable to get the train off the single track if enough track ahead is available. There are two reasons for this: First, to clear the single track so as to permit other trains to move, and second, to prevent a train from stopping on the ascending grade. In order to meet this condition, a "call-on" aspect was provided. The low arm is controlled only through the switch circuit controller at the spring switch and through the detector track circuit extending between signals 552 and 553-553A. Therefore, if the spring switch is closed and the detector track section is unoccupied, the low arm displays yellow. In this case, if the automatic block is occupied, signal 552 displays an aspect of red-over-yellow, a "call-on" aspect which informs an engineman that the switch is in position but that the block is occupied. This gives him authority to pass the signal without stopping, but to run at slow speed prepared to stop short of a train or obstruction.

At Sedley, signal 504 is equipped and controlled in the same manner as signal 553. Signal 504A is similar, in operation and control, to signal 553A. A telephone booth, located at signal 504, contains a dispatcher's telephone and also a short-line telephone connecting it with the tower at Ft. Wayne crossing and with the operator's office at Valparaiso. A train occupying the passing track must get permission from the operator at Valparaiso, in addition to a permissive indication from signal 504, before moving onto the main line.

Signal 29D, the distant signal for the westward home signal at Ft. Wayne Crossing interlocking, was changed from a three-position semaphore to a three-position color-light signal. Automatic signals 538 and 548 are newly installed color-light signals. Signal 4D, the distant signal for the eastward home signal at Ft. Wayne crossing, was also changed from a semaphore to a three-position color-light and relocated 5,500 ft. from the home signal. Automatic signal 519 is a newly installed color-light signal. These signals are the Union Type-TR.

The Control Machine

The control machine in the station at Valparaiso consists of two General Railway Signal Company interlocked desk levers with a large illuminated track-and-signal diagram. Leftward operation of levers controls eastward movements, and rightward operation controls



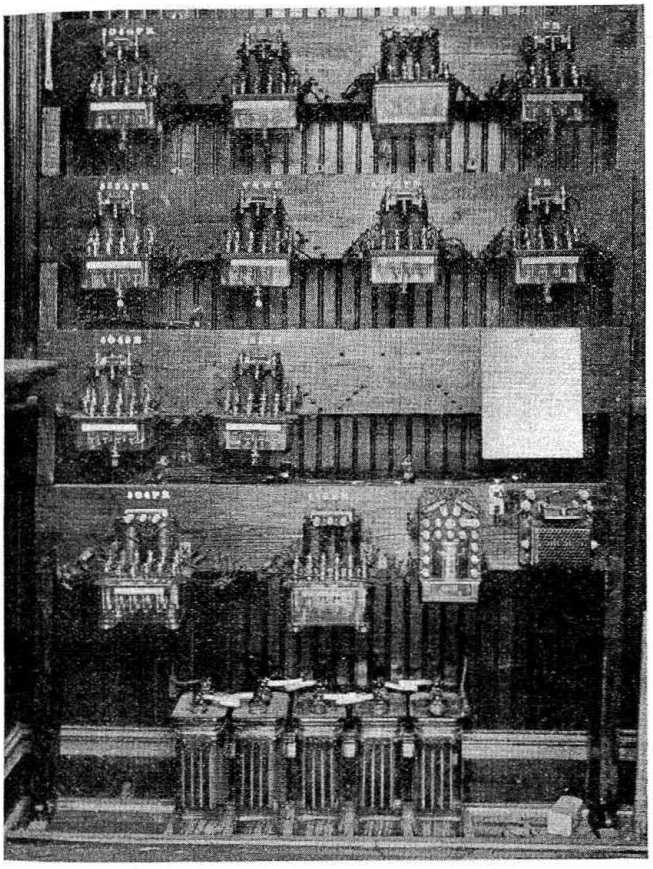
Signal 553 directs trains from the double track to the single-track block

westward movements. To clear signal 553 for a westward train movement from Valparaiso to Sedley, lever No. 1 is thrown to the right and lever No. 2 remains normal. To clear dwarf signal 553A for a westward train movement, from the reverse main at Valparaiso, to the single track, both levers are thrown to the right. When it is desired to give a permissive signal for a following train to enter the occupied block, the levers having been operated as explained, the operator pushes the push-button at the right-hand side of lever No. 1. The control of this feature is automatic, so that the signal will not be displayed until the first train has cleared the crossing as mentioned.

To clear signal 504 at Sedley for an eastward movement to Valparaiso, lever No. 1 is thrown to the left and lever No. 2 remains normal. To clear dwarf signal

504A for an eastward movement from the reverse main at Sedley, lever No. 2 is thrown left and lever No. 1 left. To give a permissive signal for a following train to enter the occupied block, the levers are operated as explained, and, in addition, the operator pushes the button at the right of lever No. 2. This operation clears signal 504 as soon as the preceding train has passed the eastward home signal at Fort Wayne interlocking plant. Mechanical locking between the two levers enforces the sequence of operation described.

The illuminated track-and-signal diagram mounted above the levers, reproduces the entire track layout and the location of the signals. Five lights indicate the occupancy of the different track sections. The lamp above the symbol for signal 553 is normally extinguished, but



The instruments and battery at the control station are mounted on a rack of wooden construction

is lighted when either that signal or signal 553A is cleared. The lamp above signal 504 at Sedley is lighted to repeat the clearing of signal 504 or signal 504A. The lamp below the word "Valparaiso" is normally extinguished, but is lighted in case the spring switch is not closed to within $\frac{3}{16}$ in. The lamp below the word "Sedley" likewise repeats the position of the spring switches at Sedley. The lamp below the word "Ft. Wayne Crossing" is a stick repeater. It is lighted when any one of the entrance signals actually clears in response to a movement of the control levers, and indicates to the operator that the control system is functioning properly. After the train has passed the home signal in either direction, this lamp is extinguished unless the home and distant signals fail to return to their normal indications. If this should occur or if the spring switch indicators should show a light while no movement is being made over them, the operator will know that something is wrong and will call the maintainer. If a line-up is to be changed, the clockwork time release, which is set at two minutes, must be operated. An annunciator buzzer operates when a train enters any of the approach circuits, cut-out switches being provided so that the operator can stop the buzzers.

The control circuits follow the standard practice for interlocked signals. There are six through line wires; the common and the two controls are No. 8 and the remainder, No. 10. All line wires are Copperweld with weather-proof covering. The line cables are made of No. 12 wire with 3/64-in. insulation, the messenger being ¼-in. Copperweld strand. For case wiring, No. 16 stranded insulated wire was used. The insulated wire was furnished by the General Cable Corporation. Parkway cable is used for running control circuits underground to the signals. Trenchlay cables of No. 8 single-conductor, are used for rail connections, Union parkway outlets being used with stranded Copperweld bonds extending from the plug in the outlet head to the plug in the rail. On the track which was newly bonded for this installation, the Ohio Brass Company's O'Balloy welded bonds were used.

At the control station and at some of the signal locations, a set of five cells of Exide storage battery is used for the control, and as a standby for signal operation. These batteries are on a-c. floating charge through Union rectifiers using ANL-40 transformer relays. At the other locations, a set of 16 cells of Edison primary battery is used for the control circuits and as a standby for the signal. A rectifier is connected across each set of these primary batteries, the rectifier being adjusted to carry all of the load except about 20 m. a. Three cells of primary battery are used on each track circuit.

The Spring-Switch Layouts

As a part of the installation of the spring switches, the switch layouts were entirely rebuilt. The rail through this territory is 100 lb. New sawed-oak ties were installed throughout each switch layout. The two turnouts on the main line are No. 20, with switch points 33 ft. long, reinforced full length with one-inch steel, and held in place by body-bound bolts. Morden adjustable rail braces are used on 10 ties, including the one ahead of the point. The tie plates are 1 in. thick, 6 in. wide and 30 in. long, the two plates being fitted and riveted in place on the job. Each tie plate is held in place by four ¾-in. bolts extending through the tie. The tie plate extends beyond the toe plate, and a tie rod ¾ in. thick and 2½ in. wide connects all the plates on each side, being held in place by the bolts. The tie plates and rail braces were installed by signal-department forces. The spring-switch stands are the Ramapo Ajax Company's Racor Type 100A, and are equipped with Union Switch & Signal Company oil buffers. As shown in one of the illustrations, this spring-switch mechanism has two sets of springs which are arranged so that each spring tends to rotate the shaft to the normal position, i. e., with the switch-point closed. When the switch is trailed through, both sets of springs are working against pressure, but the action is retarded by the oil buffer shown above the spring cylinders. The oil buffer is adjusted so that the points will close in about 20 seconds after a train trails through. A by-pass is provided so that the buffer is released when the point is about one inch from the closed position, causing the points to be snapped over under full spring pressure for this final distance, thus closing the switch with a bang, which springs the point up snugly in place. When the hand-throw lever of the switch stand is lifted, to throw the switch, the shaft is disengaged from the spring mechanism, so that the switch

(Continued on page 91)

arrow is pointing, with brass springs as shown. This requires only three leads to the panel: Negative, positive 3 volts, and positive 12 volts. The battery container is held closed by a piece of spring brass fastened to the panel and snapped into a groove on the top board of the container.

As to the hook-up: So many different wiring diagrams have been published that this is left to the preference of the individual, as is the choice of instruments and mounting.

Care of Contacts in Wig-Wag Signals

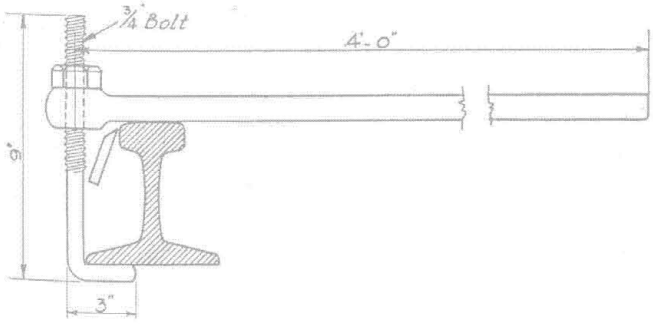
By W. L. Padbury
Signal Maintainer, Norfolk & Western, Richmond, Va.

ON wig-wag crossing signals there is a stationary contact which is wiped by a movable contact. A flash occurs as the movable contact passes off the stationary contact, thus causing the stationary contact to pit and burn and also causing the accumulation of carbon. The accumulation of carbon, in turn, causes a larger flash as the two contacts pass each other while working. To prevent this carbon from accumulating and the stationary contact from pitting, at each inspection I clean off the stationary contact with fine sand-paper. I never allow any oil or grease to get on this contact. Without carbon and pits on the contact, the bell does not have a chance to fail to respond to a train movement. I have had good service from my 12 sets of crossing bells since I initiated this policy of maintaining my stationary gaps without oil or grease. However, I always keep the other parts well oiled.

Detector Bar Tester

By P. W. Gage
Signal Supervisor, Chicago, Burlington & Quincy, North La Crosse, Wis.

THE detector-bar tester shown in the illustration, is made from an old A.R.A. switch-box connection, together with a ¾-in. hook bolt. The switch box connec-



Detector-bar tester, made from an old switch-box connecting rod

tion is 4 ft. long and the hook bolt is 9 in. long, with a 3-in. right-angle pin at the bottom, as shown. The hook bolt is placed in the eye end of the switch-box connection, and its height with respect to the rail is adjusted by means of the nut on the hook bolt.

W. N. Harris, signal maintainer on the Southern, at Fargo, Ga., says that when it is not desirable to keep adjusting the cams of switch circuit controllers, a "hair breadth" adjustment can be secured by installing a turnbuckle on the switch-circuit-controller rod. Jam nuts and lock washers should be used to lock the adjustment.

Grand Trunk Western

(Continued from page 77)

can be thrown without working against pressure. The spring-switch mechanism is considered as a signaling device and is maintained by the signal maintainer.

The installation of centralized control, including spring switches, has been in service since September 12, 1933, and the operating department is well pleased with the benefits in reducing train delays. When the staff system was in service, any eastward freight train running on short time ahead of a passenger train, would be held at Sedley until the passenger train arrived at Valparaiso. With the c. t. c. system, the freight can be run on ahead of the passenger train, thus saving from 15 to 30 min. time.

Both Sedley and Valparaiso are at a much higher elevation than Ft. Wayne crossing, a heavy ascending grade extending from approximately one mile west of the crossing to the station at Valparaiso, resulting in slow speeds particularly for eastward trains. The operator at Valparaiso keeps in communication with the leverman at Ft. Wayne crossing when a heavy eastward freight train is approaching Sedley, and, unless the leverman at the crossing knows that he can line up the route for the Grand Trunk train, the operator holds the train at Sedley until a through route can be lined up. The purpose of this is to permit the Grand Trunk train to run down the grade from Sedley to the crossing and make a run for the grade on up to Valparaiso without having to stop in the sag at the crossing. With the new c. t. c. facilities, as soon as an eastward train clears the eastward home signal at the Ft. Wayne Crossing interlocking, the operator at Valparaiso can give a permissive aspect on signal 504 to let a second eastward train enter this block. This feature of the new signaling is aiding materially in reducing delays to freight trains.

The signal installation required an expenditure of approximately $5,000 and the actual payroll saving in operating expenses, occasioned by the elimination of the interlocking at Sedley, is about $6,000 annually. The installation was designed and installed by signal department forces under the direction of W. L. Dayton, superintendent of signals.

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Cab-Controlled Switch

(Continued from page 88)

motive cab. Only such locomotives need be equipped as frequently use the passing tracks mentioned. With the dual-control power switch machine, such locomotives as are not equipped for operating the switch from the cab can enter and leave the passing tracks by hand operation of the switches.

When railroad trains become equipped with a system for telephone communication between conductor and engineman and dispatcher, as I believe that ultimately they must be, the combination of such a system with the control of the operation of the passing track switches from the locomotive will provide as nearly a perfect train operating and dispatching system as can now be foreseen. Such a communication system is adaptable to transmitting to the engineman and conductor on the train an indication of the position of each track switch approached and passed. The dispatcher may also receive such information when he desires it.

A. G. Shaver,
Consulting Engineer,
Chicago.